



REPUBLIC OF LITHUANIA

State Nuclear Power Safety
Inspectorate (VATESI)

NUCLEAR ENERGY IN LITHUANIA: NUCLEAR SAFETY

ANNUAL REPORT

Vilnius 2010



Nuclear facilities in Lithuania



Nuclear facilities in Lithuania:

1. Ignalina Nuclear Power Plant – Drūkšiniai, Visaginas m.;
2. Closed Maišiagala storage facility of radioactive waste – Bartkuškis forest, Širvintai region;
3. Spent nuclear fuel storage facility – Drūkšiniai, Visaginas m.;
4. Cemented radioactive waste storage facility – Drūkšiniai, Visaginas m.

Pictograms

-  Nuclear power plant
  Storage facility

Projected (under construction) nuclear facilities:

1. Visaginas Nuclear Power Plant – 2 sites – Drūkšiniai, Visaginas m.;
2. New spent nuclear fuel storage facility – Drūkšiniai, Visaginas m.;
3. Facilities for treatment and storage of solid radioactive waste – Drūkšiniai, Visaginas m.;
4. Very low level radioactive waste repository – Drūkšiniai, Visaginas m.;
5. Low and intermediate radioactive waste repository – Stabatiškės, Visaginas m.

Pictograms

-  Nuclear power plant
  Storage facility
 Treatment facility
 Repository

CONTENTS



About us – the State Nuclear Power Safety Inspectorate	3
Foreword by VATESI Head	4
About us – the State Nuclear Power Safety Inspectorate	6
<i>VATESI organizational structure</i>	7
Main events	7
Quality management	8
Strategic planning of operations and financial activity	8



Supervision of preparatory works for the new nuclear power plant project	9
The Environmental Impact Assessment Report	10
Training and qualification improvement of VATESI specialists	11
Upgrading of inspection activities	12
Legal framework of the new nuclear power plant	13
Providing consultations to Visagino Atominė Elektrinė UAB	13
System of nuclear safety regulation and supervision	14
Setting nuclear safety requirements	14
Licensing	14
<i>Review and assessment of application documents</i>	14
Inspection	16
<i>Planned inspections</i>	16
<i>Technical checks and control room operation inspections</i>	17



Safety of Ignalina Nuclear Power Plant	18
Operational experience feedback	19
Technical and economic indicators of Ignalina Nuclear Power Plant	20
<i>Generation of electricity in Lithuania</i>	20
Supervision of safety of Ignalina NPP operation	23
Safety assessment of Ignalina NPP	24
<i>Analysis and upgrading of reactors core physical properties</i>	24
<i>Assessment of structural integrity of the cooling circuit of Ignalina NPP reactor</i>	24
<i>Qualification of safety-related systems</i>	25
<i>Management of ageing of safety-related systems and elements</i>	25
<i>Fire hazard analysis</i>	26
<i>Analysis of design-basis and beyond-design-basis accidents and their management</i>	26
<i>Probabilistic safety assessment</i>	27
Implementation of safety improvement program (SIP-3)	28
Safety culture at the State Company Ignalina Nuclear Power Plant	29
Quality assurance system at Ignalina NPP	31
<i>Analysis of quality assurance issues in the course of licensing</i>	31
<i>Changes in the organizational structure of the State Company Ignalina Nuclear Power Plant</i>	31
Supervision of decommissioning of Ignalina NPP	31
Management of radioactive waste	32
<i>Operating spent nuclear fuel storage facility</i>	33
<i>New spent nuclear fuel storage facility (project B1)</i>	33
<i>Solid radioactive waste management facilities (project B3/4)</i>	33

Radiation protection of nuclear facilities.....	34
Emergency preparedness.....	36
International cooperation	36
Emergency preparedness of VATESI.....	37
Emergency preparedness at nuclear facilities.....	37



Accounting and control of nuclear materials, application of safeguards.....	38
Accounting and control of nuclear fuel.....	39
Accounting and control of small quantities of nuclear materials	40
Physical protection of nuclear materials and nuclear facilities.....	40
Inspection activities in the area of physical protection	40
Design-Basis Threat.....	41
Seminar on physical protection issues.....	41
Control over dual-use nuclear goods.....	42

Reports on meeting commitments under International Conventions.....	43
Reporting under the Convention of Nuclear Safety.....	43
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.....	43



International cooperation.....	44
Nuclear safety regulation in the European Union, the role of the European Commission and Member States - ENSREG	45
<i>ENSREG Working Group on Nuclear Safety Improvement</i>	45
<i>ENSREG Working Group of Radioactive Waste Management</i>	46
VATESI participation in activities of Western European Nuclear Regulators' Association (WENRA) ..	46
<i>Activity of WENRA Reactor Harmonization Working Group (RHWG)</i>	46
<i>Working Group on Waste and Decommissioning (WGWD)</i>	47
VATESI participation in the activities of European Clearinghouse on NPP Operational Experience Feedback	47
Technical cooperation projects of the International Atomic Energy Agency (IAEA).....	48
<i>IAEA regional projects in the area of nuclear safety and nuclear energy</i>	48
<i>The IAEA national project for Lithuania</i>	48
VATESI participation in the IAEA Board of Governors	49
The EU support projects for VATESI.....	49
Activities of International Cooperation Group on Nuclear Safety of VATESI	50



Contribution of Technical Support Organizations to improvement of nuclear safety.....	51
Public information.....	57
International conventions, laws and secondary legislation.....	58
International conventions	58
Legal acts of the European Union	59
Legal acts and secondary legislation in the Republic of Lithuania.....	59



About us – the State Nuclear Power Safety Inspectorate



Solving a wide spectrum of nuclear power safety regulatory tasks

Last year VATESI specialists focused their attention on supervision of safety assurance of the units at Ignalina Nuclear Power Plant (Ignalina NPP), licensing the construction projects of radioactive waste management and storage facilities, improvement of the legal framework for nuclear energy regulation, and training of personnel in preparing for supervision works of the project for a new nuclear power plant.

In 2009, Ignalina Nuclear Power Plant was operating in a safe manner – not a single event higher than the event of zero level on the IAEA International Nuclear Events Scale (INES) was recorded at the nuclear power plant, not a single employee was exposed to a dose exceeding the set limits, no cases of impermissible effects on the population or environment were reported. Regular meetings of VATESI and Ignalina Nuclear Power Plant top managers and experts were held to discuss the most outstanding safety issues. VATESI was successfully conducting the state regulation and supervision of nuclear safety and radiation protection at nuclear facilities targeted to protect the public and the environment against hazardous effects of nuclear and radiation events and accidents.

Since its commissioning into commercial operation, Ignalina Nuclear Power Plant has generated and sold 307.1 TWh of electricity – 136.9 TWh in Unit 1 and 170.2 TWh in Unit 2, respectively. In accordance with the Protocol for Admission of the Republic of Lithuania to the European Union, on 31 December 2009, at 10:54 p.m. (the time of Lithuania) Unit 2 was finally shut down and Ignalina Nuclear Power Plant ceased generating electricity.

In 2009, upon having analysed and evaluated the documents justifying safety that had been submitted by Ignalina NPP, two licences relevant to the Ignalina NPP decommissioning were issued – for the construction of a new spent nuclear fuel storage facility and for the construction of solid radioactive waste management and storage facilities.

In 2009, in the field of application of safeguards in non-proliferation of nuclear weapons, VATESI ensured smooth

transition from direct work with the IAEA to the system based on the Trilateral Safeguards Agreement: within its competence provided information both to the IAEA and the European Commission, collaborated with these organizations in the area of application of the technical control measures over nuclear materials and operations at nuclear facilities, provided consultations to the users of nuclear materials about the amended regulations in the accounting of nuclear materials and reporting procedures.

In 2009, the tenure of Lithuania in the IAEA Board of Governors expired. For two consecutive years the delegation guided by VATESI Head was successfully representing the interests of the country in this international organization. Membership in the IAEA Board of Governors enabled Lithuania to strengthen a positive opinion of international community about the capability of our country to develop nuclear energy in a safe manner and to fulfil all relevant international commitments with due competence. Participation in the IAEA Board of Governors enhanced the IAEA attention to the issues of essential importance to Lithuania – development of nuclear energy and relevant infrastructure, assurance of nuclear safety and non-proliferation of nuclear weapons.

The implementation of a national project LIT/9/009 financed by the IAEA and aimed at enhancing capabilities of VATESI and other institutions in supervising and licensing the new nuclear power plant has been consistently continued. Under the framework of the project, the mission of the IAEA experts was arranged to analyse the Environmental Impact Assessment Report of the new nuclear power plant. Specialists from VATESI, Visagino Atominė Elektrinė UAB and Lithuanian Technical Support Organizations took part in in-service training, working meetings, workshops and training courses on the key issues of licensing and safety assessment of the new nuclear power plant, gained experience necessary in getting ready for the construction of the new NPP, enhanced competence and knowledge in nuclear technologies. It is critically important to VATESI to foresee a comprehensive long-term perspective for training and preparation of employees. International companies will be recruiting qualified specialists for the construction of the new nuclear power plant by proposing better labour payment conditions, thus searching for qualified



specialists and their retention will be a serious challenge not only to VATESI but to other state institutions as well.

VATESI drafted the Concept of the Law on Nuclear Safety. The main purpose of this draft is to assure a more effective, transparent and efficient system of nuclear energy regulation and supervision, to provide a more flexible financing system of the regulatory institution, and to clearly define mechanisms for application of supervision and enforcement measures. The Concept of the Law on Nuclear Safety was approved in November 2009, and preparation of the draft Law on Nuclear Safety was started, the approval of which is scheduled for the year 2010. After the adoption of the Law on Nuclear Safety, it will be necessary to respectively revise and amend the secondary legislation indispensable for the implementation of this Law, the most important among them being the *Licensing Regulations for Activities in Nuclear Energy*. Thus in the coming year VATESI specialists will have to deal with numerous tasks in preparing, amending or updating the legal framework regulating nuclear safety.

In 2010 VATESI will further supervise the licensed nuclear facilities by conducting inspections, analysing documents justifying safety of nuclear facilities or any other documents that are of importance in terms of safety. Legal acts regulating nuclear safety will be further updated and drawn up. Attention will be concentrated on accident prevention and enhancement of the quality of management activities. VATESI will exchange information by using the European Community Urgent Radiological Information Exchange (ECURIE) system and will assure the implementation of the provisions of the Convention on Early Notification of a Nuclear Accident.

In 2010, due consideration will be also given to the qualification improvement of employees. In order to properly prepare the state regulatory and supervision system for the construction of the new nuclear power plant, VATESI has to develop the employees' competencies that will be adequate for solving the tasks related to the construction of the new NPP. This will be one of the top priorities along with other already undertaken activities.

Michail Demčenko

Acting Head of the State Nuclear Power
Safety Inspectorate

About us - the State Nuclear Power Safety Inspectorate

The State Nuclear Power Safety Inspectorate (VATESI) is the main regulatory and supervisory institution of nuclear safety, which sets safety requirements, controls whether they are complied with, issues licences and permits, performs safety assessments and other functions.

VATESI mission is to perform the state regulation and supervision of safety at nuclear facilities in order to protect the public and environment against harmful effects of nuclear and radiation events and accidents.

VATESI is a governmental institution, established in 1991, VATESI Head directly reports to the Prime Minister.

The main goals of VATESI:

- State regulation and supervision of safety at Ignalina NPP and other nuclear facilities;
- State regulation and supervision of nuclear waste management at nuclear facilities;

- Supervision of use of nuclear materials and technologies for peaceful purposes (application of the IAEA and EURATOM safeguards);
- State regulation and supervision of physical protection of nuclear facilities and materials;
- State regulation and supervision of transportation of nuclear fuel cycle materials;
- Emergency preparedness.

To solve the nuclear safety problems, functions are divided between the operating organization and the supervising institution. In Lithuania, the State Company *Ignalina Nuclear Power Plant* is responsible for safe operation of nuclear reactors and has been granted the status of the operating organization. The closed *Maišiagala Radioactive Waste Storage Facility* is supervised by the State Company *Radioactive Waste Management Agency* (RATA), and the Public Limited Liability Company *Lietuvos Geležinkeliai* has got a valid license for transportation of nuclear materials.

Ignalina Nuclear Power Plant that was operating two reactors of the RBMK type (with the designed electrical capacity of 1500 MW each) came under the jurisdiction of Lithuania in 1991, when Lithuania regained its independence. Lithuania thus became the world's 31st country to use nuclear energy for generation of electricity. Lithuania assumed obligations not to cause nuclear threat to mankind or environment while operating Ignalina Nuclear Power Plant and to use nuclear materials for peaceful purposes only. The operation of Ignalina NPP Unit 1 was terminated in 2004, and Unit 2 was shut down on 31 December 2009.

By preparing for the final shutdown of Ignalina NPP, in 2009 VATESI issued to the State Company *Ignalina Nuclear Power Plant* two licenses: for the construction of a new spent nuclear fuel facility and for the construction of solid radioactive waste management and storage facilities.

To assure round-the-clock communication with the emergency preparedness authorities of the Republic of Lithuania and international organizations, VATESI has appointed early notification officers who at any time of the day and night are ready to receive or to provide information about any nuclear or radiological accident that has occurred in Lithuania or other countries. At any time, upon the receipt of a notification about a nuclear accident in Lithuania or any other country, VATESI Emergency Centre is ready no later than within one hour to start its operations, if the accident is likely to cause a threat to the people in Lithuania.

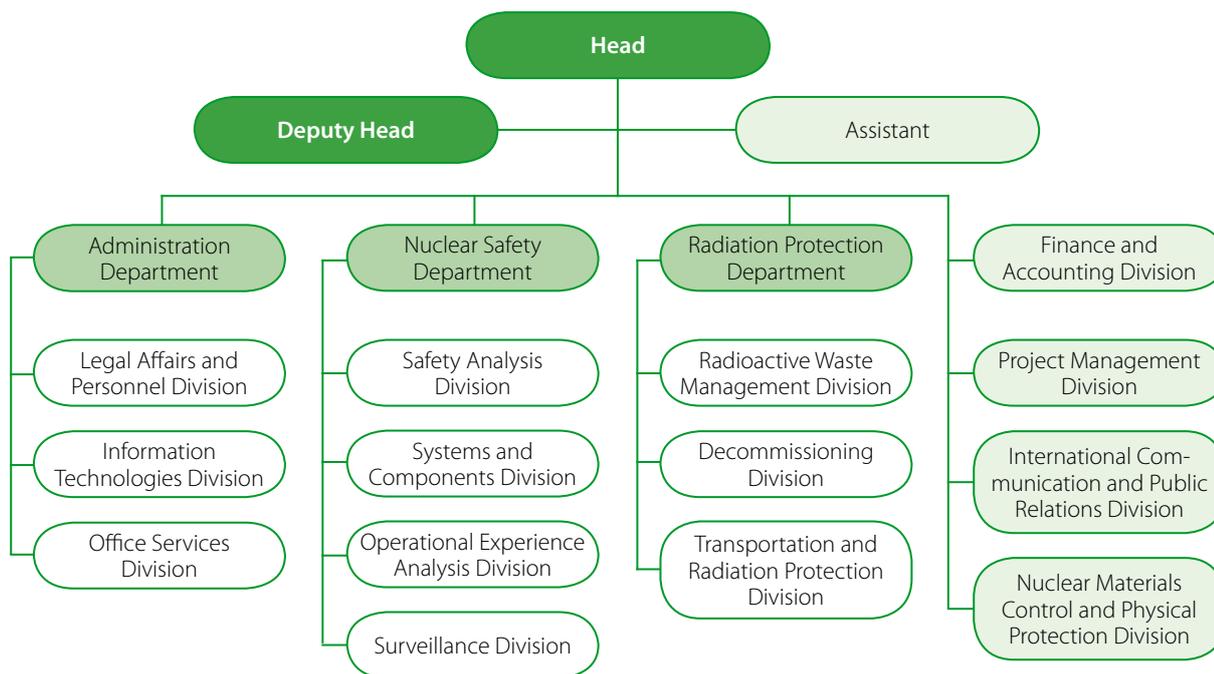
VATESI sets national nuclear safety requirements and rules, controls whether they are complied with at nuclear facilities, other companies and organizations involved in nuclear activity and /or nuclear fuel cycle materials, applies enforcement measures, and is entitled to suspend or even discontinue operation of a nuclear facility if flagrant non-compliance with requirements is established. No non-compliances that would result in suspension of works, licenses or permits were identified in 2009.



A building (on the right) where VATESI is located as well



VATESI organizational structure



Main events

01/01/2009 The bilateral inter-institutional agreement on early notification of nuclear and radiological emergencies between the State Nuclear Power Safety Inspectorate of the Republic of Lithuania and the Swedish Radiation Safety Authority of the Kingdom of Sweden was signed between VATESI and Swedish Radiation Safety Authority (SSM).

09/01/2009 VATESI specialists revised and approved the Environmental Impact Assessment Report of the new nuclear power plant.

26/01/2009 – 31/01/2009 A special mission of the International Atomic Energy Agency experts in Lithuania reviewed the procedures of the environmental impact assessment of the planned to be constructed Visaginas Nuclear Power Plant, analysed and favourably evaluated the EIA Report and noted that the report complies with the regular international practice and procedures.

18/02/2009 The Commission for Nuclear Energy of the Seimas of the Republic of Lithuania visited VATESI. During the meeting, the outstanding nuclear energy issues in Lithuania were discussed.

07/04/2009 – 08/04/2009 A seminar to discuss the physical protection issues that are important in getting ready for the construction of the new nuclear power plant in Lithuania was arranged in Vilnius. Apart of the representatives of Lithuania, physical protection specialists from Bulgaria, Sweden and the US took part in the event and exchanged their experience.

10/05/2009 – 21/05/2009 The third review meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was held in

Vienna, Austria where the second national report of Lithuania on the subject of changes and progress accomplished by Lithuania during the recent three-year period in the area of radioactive waste and spent nuclear fuel management was presented.

26/05/2009 – 28/05/2009 The symposium of the European Safeguards Research and Development Association (ESARDA) on the subject *Safeguards and Control of Nuclear Materials* took place in Vilnius. VATESI has been a member of the Association since 2005.

28/05/2009 VATESI specialists analysed technical proposals submitted by Ignalina NPP to prolong the period between the inspections of safety-related systems in Unit 2. In line with the national regulations and with regard to the international practice, VATESI specialists decided to reject the mentioned technical proposals and to obligate Ignalina NPP to perform the repair works within the given time.

06/06/2009 After the only operating unit of Ignalina Nuclear Power Plant was shut down due to the failure in the second shutdown system of the reactor, the management of Ignalina NPP decided to commence the pre-planned repair works of Unit 2 prior to the scheduled date.

26/06/2009 VATESI issued a permit to launch into operation Ignalina NPP Unit 2 after its scheduled annual maintenance.

07/07/2009 VATESI Head Gytis Maksimovas resigned from office. Michailas Demčenko, VATESI Deputy Head, started working in the capacity of the Acting Head of the State Nuclear Power Safety Inspectorate.

27/08/2009 VATESI issued a license to Ignalina Nuclear Power Plant (Ignalina NPP) for the construction of solid radioactive waste management facilities.



02/09/2009 VATESI issued a license to Ignalina Nuclear Power Plant (Ignalina NPP) for the construction of a new spent nuclear fuel storage facility.

19/10/2009 International training in nuclear safety that for the second consecutive year was organized by Lithuanian Energy Institute together with the IAEA was started.

04/11/2009 VATESI managers presented VATESI Annual Report for the year 2008 at the meeting of the Commission for Nuclear Energy of the Seimas of the Republic of Lithuania.

04/11/2009 VATESI coordinated with the State Company *Ignalina Nuclear Power Plant* a detailed plan of the land plots located in Visaginas municipality, Drūkšiniai village.

12/11/2009 VATESI specialists participated in the international emergency preparedness exercise arranged by the European Commission. The goal of the exercise was to verify the preparedness of the European Union Member States to properly and timely respond to possible nuclear or radiological accidents by using the European Community Urgent Radiological Information Exchange (ECURIE) system.

31/12/2009 Ignalina NPP Unit 2 was finally shut down.

More information about these and other events is available on the VATESI website www.vatesi.lt, under the heading *News*.

Quality management

The decision to develop the Quality Management System (QMS) at VATESI was approved on 5 October 2000 by Order No. 21 of VATESI Head. The implementation of the Quality Management System at VATESI is aimed at:

- Enhancing the efficiency of the Inspectorate's management;
- Optimizing the planning and use of the Inspectorate's resources;
- Assuring adequate licensing, safety assessment and supervision of nuclear facilities;
- Assuring sufficient supervision over the ongoing European Union (EU) support projects;
- Assuring adequate qualification improvement of the VATESI staff;
- Assuring efficient management and use of information.

In 2009 and at the beginning of 2010, in line with the altered requirements and by continuously improving the quality assurance documents, 13 revised and 13 completely new procedures and instructions of the Quality Management System were validated.

In 2009, VATESI initiated the project *Implementation of Management Systems at the State Nuclear Power Safety Inspectorate* financed from the EU structural funds. The objective of the project is to fundamentally update and upgrade the Quality Management System at VATESI. Although the project was positively evaluated by the Ministry of the Interior of the Republic of Lithuania and the European Social Fund Agency, its implementation has been postponed due to projected reorganization of VATESI in the year 2010.

Strategic planning of operations and financial activity

VATESI activities due to their specifics 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 national long-term development strategy are taken into consideration when planning the activities.

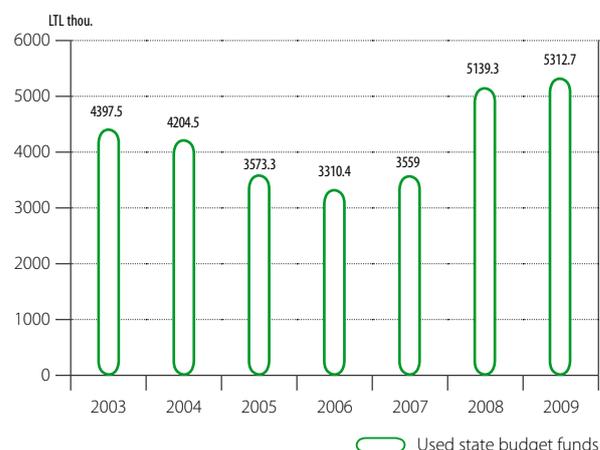
For the accomplishment of VATESI mission, the sole strategic objective - assuring a high level of safety at nuclear facilities - was set in the 2008–2010 strategic plan of VATESI activities. To assess whether the strategic objective has been attained, the single criterion of effect has been set, i.e. nuclear safety improvement defined as the absence of level two and upwards unusual events on the INES scale.

The only program, *01.01 Public and Internal Administration of Nuclear Safety*, was developed and was being implemented in 2009 with a view to achieving the strategic objective. Four goals were set for implementing the program:

- To authorize and supervise licensed activity at nuclear facilities, i.e. to assure compliance with the set requirements;
- To upgrade the system of regulation and supervision of nuclear safety, physical protection and radiation protection;
- To exercise and improve internal administration;
- To get ready for regulation and supervision over designing and construction of the new nuclear power plant.

To accomplish these goals, VATESI has been striving to further reduce the probability of events and accidents at nuclear facilities, to improve the quality of failure and accident prevention measures, to improve VATESI internal administration and the quality of decision-making process. Moreover, they were aimed at timely preparation for regulation and supervision of designing and construction of the new nuclear power plant. The program was financed with funds from the state budget. In 2009, the amount of LTL 5711 thousand from the state budget (including adjustments) was approved; VATESI was allocated from the state budget and actually used LTL 5312.7 thousand, or 93.03 percent. The funds from the state budget were used in accordance with their allocation, i.e. in line with the items of economical classification approved in the cost estimates and without exceeding them.

Use of state budget funds in 2003-2009





Supervision of preparatory works for the new nuclear power plant project

The Environmental Impact Assessment Report

In January 2009, VATESI approved the *Report of the Environmental Impact Assessment for the Construction of the New Nuclear Power Plant in Lithuania* (the EIA Report). The EIA Report has been approved on the condition that Visagino Atominė Elektrinė UAB, prior to preparing the Technical Specification for the selection of the reactor technology, will conduct an additional study on disposal of radioactive waste and will indicate specific requirements for measures mitigating impacts on the environment and will set marginal values for radioactive substances emitted into the environment in the Technical Specification. These conditions along with other environmental requirements have been stipulated in the Resolution of the Ministry of the Environment of the Republic

of Lithuania, passed in April 2009, stating that the construction of the new nuclear power plant is permissible in terms of its impact on the environment and that the power plant can be constructed at the selected site.

During the analysis of the information provided in the EIA Report, VATESI specialists focused on the available technologies of nuclear power plants, principles of nuclear safety, management of radioactive waste; they assessed the characteristics of the alternative construction sites, operational risks and potential radiological effect on the population and the environment including the trans-boundary impact. The consortium that had prepared the EIA Report revised and supplemented the Report with the information related to the classification and acceptability of the sites, assessment of radiation exposure of the population, selection of the critical group of local residents and assessment of direct exposure, management of radioactive waste and accident analysis, decommissioning and emergency preparedness.



Alternative sites for new Visaginas nuclear power plant

The environmental impact assessment for the construction of the nuclear power plant is mandatory according to the requirements of the legal acts of the Republic of Lithuania. In the EIA Report for the construction of the new nuclear power plant in Lithuania the impact on the environment – the population, social economic environment, water systems, air quality, fauna and flora, protected territories, cultural heritage, etc. to be caused by the construction and operation of the nuclear power plant with the capacity up to 3400 MW was assessed. In addition to that, the assessment of the project alternatives – two potential construction sites located in the territory of Ignalina Nuclear Power Plant, the technological alternatives of nuclear reactors – boiling water, pressurized water and pressurized heavy water, the alternatives of cooling options – were provided in the EIA Report. The environmental impact of the zero alternative – a nuclear power plant is not constructed in Lithuania – was assessed as well.

The state institutions of foreign countries, the public of Lithuania and neighbouring countries were able to familiarize themselves with the EIA Report for the construction of the new nuclear power plant in Lithuania. In the period of 2008-2009, VATESI specialists participated in the international consultations with the relevant institutions from Poland, Belarus, Latvia and Austria as well as in the meetings with the representatives of the public of Lithuania. VATESI specialists gave answers to the questions of foreign specialists and representatives of Lithuanian community concerning the licensing procedure of nuclear facilities, strategy for management of radioactive waste, management of spent nuclear fuel, and the assessment of effects of emergency situations.

In January 2009, VATESI together with the Ministry of the Environment and the Radiation Protection Centre organized a special mission of the International Atomic Energy Agency (IAEA) experts, who reviewed the procedures of the environmental impact assessment of the planned to be constructed Visaginas Nuclear Power Plant, the EIA Report and evaluated its compliance with the best international practice and procedures in terms of radiation and environmental protection. The IAEA experts stated that the information and data provided in the Environmental Impact Assessment Report are sufficient to make a decision on the admissibility of activity in terms of its impact on the environment, and affirmatively evaluated the EIA Report.

Training and qualification improvement of VATESI specialists

"In order to ensure that the proper skills are acquired and that adequate levels of competence are achieved and maintained, the regulatory body shall ensure that its staff members participate in well defined training programs. This training should ensure that staff are aware of technological developments and new safety principles and concepts."

Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety, Requirements, IAEA Safety Standards GS-R-1, 2000.

One of the priority goals at VATESI is highly qualified and equipped with special knowledge personnel. For Lithuania the significance of this goal has been increasing after having

made the decision to construct the new nuclear power plant and due to the targeted goal to get properly prepared for licensing of the new nuclear power plant and supervision over its safety.

To accomplish smooth and high quality safety review and assessment of the newly constructed nuclear power plant, it is necessary to properly prepare the legal framework regulating nuclear safety that will be followed by VATESI specialists when evaluating the documents justifying nuclear safety in the course of the assessment of the site of the new nuclear power plant, as well as in the processes of designing, construction and operation of the power plant and when conducting inspections. Specialists of various fields are required for the preparation of this legal framework who should have knowledge in reactor physics, thermo hydraulics, control, regulation and electric power systems, strength of materials, construction engineering, accident analysis, probabilistic safety analysis, fire safety, welding technologies and methods of non-destructive inspection, technologies of radioactive waste management, principles of decommissioning and other relevant fields.

In 2009, with regard to the economic situation, the number of the VATESI employees did not grow, and, abiding by the Resolution No. 394 of the Government of the Republic of Lithuania as of 6 May 2009 Re: *Approval of Maximum Official Positions of Civil Servants and Employees Working under Employment Contracts and Remunerated from the State Budget or the State Funds*, as of 1 October 2009, seventy full-time positions were allocated to VATESI instead of seventy four.

In all, 6 new employees were hired during the year, 8 employees were dismissed. On 7 July 2009, Gytis Maksimovas, Head of VATESI, resigned from his position. Sixty nine employees were working at VATESI as of late 2009, 58 of them were civil servants. Five VATESI employees of those working in the field of nuclear energy have got a qualification degree of the Doctor of Science, 5 – the Bachelor's Degree, 27 – the Bachelor and Master's Degrees, 19 – the Master's Degree.



VATESI specialists are listening to the lecture about the AP-1000 reactor, management of design basis and beyond-design basis accidents.

With regard to the reduced number of VATESI employees and the necessity to properly assure the accomplishment of VATESI goals and to have highly qualified staff, VATESI pays major attention to the training and qualification improvement of its employees. In 2009, seventy nine percent of VATESI employees were improving their qualification – 13 of them participated in the introductory workshops of civil servants, 33 employees took part in the training events aimed at the development of competences related to the implementation of strategic goals by the state and municipal offices and institutions. In all, 61 training events of this kind were attended. In order to improve the computer literacy of civil servants and employees hired under employment contracts, twenty six VATESI employees participated in the ECDL and other courses in computer literacy in 2009.

One of provisions laid down in the IAEA Statute is to support training of researchers and experts in the field of use of nuclear energy for peaceful purposes. This international organization has accrued immense experience in organizing various training events. It also provides financial support that gives VATESI specialists an opportunity to improve their knowledge and to gain experience in such organizations as the US Nuclear Regulatory Commission (NRC), Radiation and Nuclear Safety Authority of Finland (STUK) and in other offices and organizations.

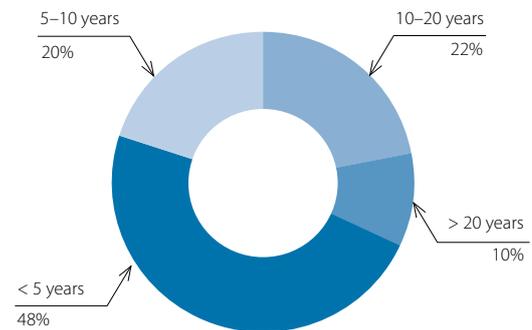
In Lithuania the specific reactor technology has not been selected yet, therefore VATESI specialists have been improving their knowledge in the technologies of various types of reactors: in 2009 VATESI specialists learned in more detail about the safety assurance principles and measures provided for in the design of the AP1000, EPR, APWR and other types of reactors (in the US, Switzerland, Korea and other countries), and also met and discussed with the employees of the US Nuclear Regulatory Commission (NRC) the issues of reactor certification and licensing, safety classification of equipment, site evaluation, integrity of the reactor's cooling circuit, inspections in the course of construction, operational experience feedback, quality assurance, safety culture and other important aspects. VATESI specialists spread the acquired knowledge at the arranged internal seminars. This information will be very beneficial in preparing legal acts on nuclear safety.

In all, 35 VATESI specialists took part in 44 events organized by the IAEA.

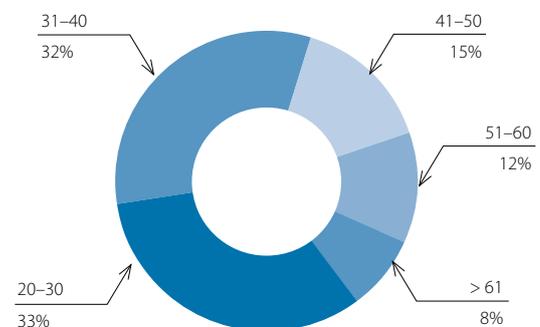
Upgrading of inspection activities

VATESI nuclear safety specialists regularly analyse the experience, knowledge and information obtained during inspections, workshops or working meetings, provide proposals on the upgrading of conducted inspection activities and the documents regulating these activities. Measures for training of inspectors (in-service training, training courses) are envisaged in the IAEA national project for 2008–2010 *Enhancing capabilities of VATESI and other institutions in licensing of a new NPP*. In 2009, the implementation of the EU institutional strengthening transition facility *Support to VATESI in Assessing Safety of Ignalina NPP* has been continued and provided VATESI inspectors with an opportunity to further enhance their knowledge in the assessment of structural integrity of

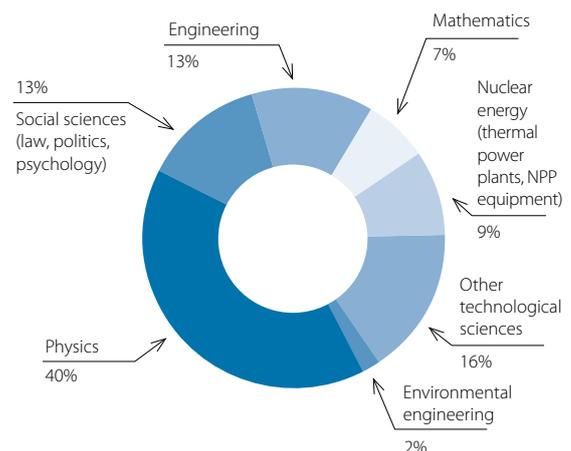
Experience of VATESI employees in nuclear energy



VATESI employees by age groups



Educational background of VATESI employees working in the field of nuclear energy



safety-related structures, systems and components. 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 supervising the implementation of the project for the new nuclear power plant. It is especially useful to young inspectors who are joining the ranks of nuclear community.

Legal framework of the new nuclear power plant

With a view to implementing the construction project of the new nuclear power plant, it is necessary to adjust the legal framework in line with international legal acts, Acquis Communautaire of the European Union and by using the best practice of other countries. Lithuania is obligated to harmonize the national legal acts with the Council Directive 2009/71/EURATOM as of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear facilities. Moreover, the requirements set for generation III/III+ nuclear reactors are to be taken into consideration. There is a fundamental difference between the regulatory practice of Ignalina Nuclear Power Plant and that of the new nuclear power plant because safety characteristics of generation III nuclear reactors essentially differ from generation II nuclear reactors to which the reactors of Ignalina Nuclear Power Plant are attributed as well. Lithuania, after making its choice of the NPP technology, will have to partially take-over the regulatory practice of the country – supplier of the NPP technology.

The legal framework for the construction of the new nuclear power plant was set forth by the Law on Nuclear Power Plant adopted in 2007 as well as in the National Energy Strategy approved by the Resolution No. X-1046 of the Seimas of the Republic of Lithuania as of 18 January 2007. The Government of the Republic of Lithuania by its Resolution No. 300 as of 22 April 2009 approved the strategic directions and indicative plan for the development and implementation of the project.

In 2009, VATESI worked out the Concept of the Law on Nuclear Safety of the Republic of Lithuania which was approved by the Resolution No. 1609 of the Government of the Republic of Lithuania as of 25 November 2009. The draft Law on Nuclear Safety of the Republic of Lithuania is under preparation; its approval is scheduled for the year 2010. The objective of the Law is to strengthen and to make more effective the system of nuclear safety supervision and regulation, to clearly regulate the mechanisms of application of supervisory and enforcement measures, to strengthen the status of the regulatory institution. After this Law is adopted, it will be necessary to respectively amend certain Laws of the Republic of Lithuania, namely: the Law on Nuclear Energy, the Law on Radiation Safety, the Law on Management of Radioactive Waste, the Law on Construction, and the Law on Supervision of Potentially Dangerous Equipment and other Laws. In order to implement these Laws it will be necessary to adopt or amend numerous secondary legislation documents, among which the most important are the *Licensing Regulations for Activities in Nuclear Energy* and *General Nuclear Safety Requirements for Site Evaluation of NPP, NPP Design and Operation*.

To get properly prepared for designing and construction of the new nuclear power plant, VATESI by the Order No. 22.3-58 as of 16 June 2009 validated nuclear safety requirements BSR-1.1.1-2009 *Description of Procedure for Preparation of Nuclear Safety Normative Technical Documents* which also defined the system of normative technical documents in nuclear safety.

In 2009, by implementing the Plan for Upgrading of Legal and Normative Technical Documents Regulating Nuclear Safety, validated by the Order No. 22.3-15 of VATESI Head as of 6 February 2008, the following legal acts directly related to the design and construction of the new nuclear power plant were drawn up:

- *Requirements for Operational Experience Feedback in Nuclear Energy* P-2009-04,
- *Requirements for Decommissioning of Nuclear Facilities* P-2009-02,
- *Nuclear Safety Requirements for Modifications of Nuclear Facilities*,
- *General Requirements for Eligibility of Radioactive Waste for Dumping in Near – Surface Disposal Facility*.

Besides, five legal acts were updated (amended), eleven legal acts were drafted.

Providing consultations to Visagino Atominė Elektrinė UAB

In 2009, VATESI and Visagino Atominė Elektrinė UAB (VAE UAB) held meetings aimed at exchanging information about the progress of preparatory activities of the new nuclear power plant project and preparation of legal acts regulating nuclear safety. VAE UAB, as the organization responsible for the preparation of the project of Visaginas Nuclear Power Plant, in December 2008 had addressed VATESI with a request to get consultations on the issues of nuclear safety of the new nuclear power plant. Upon VATESI consent, the consultation scheme with 17 consultation subjects was worked out. The consultations provided to VAE UAB were started in early 2009 and were continued throughout the year. In the course of consultations such issues as drafting of legal acts regulating nuclear safety, nuclear safety (site evaluation, quality management systems, safety culture, classification of structures, systems and components, reactor designs that would be acceptable in terms of their licensing, etc.), physical security, accounting of and control over nuclear materials were addressed. In 2009, fourteen consultations were held and four meetings of VATESI and VAE UAB representatives with the participation of top managers of both organizations were arranged, where decisions on common positions to be followed with regard to the discussed issues were made.

System of nuclear safety regulation and supervision

Setting nuclear safety requirements

Nuclear safety requirements are laid down by the Laws of the Republic of Lithuania, Resolutions of the Government of the Republic of Lithuania and other secondary legislation. In line with the Law on Nuclear Energy of the Republic of Lithuania and the Regulations of VATESI Activity, VATESI in its regulatory documents sets forth the requirements for nuclear safety, radiation protection, safety of radioactive waste management, physical protection along with the procedure for preparation of these requirements.

The *Description of Procedure for Preparation of Nuclear Safety Normative Technical Documents* BSR-1.1.1-2009 validated by the Order of VATESI Head as of 15 June 2009 defined the system of normative technical documents on nuclear safety, the procedure for their preparation, execution and approval. This regulatory document embedded the system of normative technical documents on nuclear safety consisting of:

- Nuclear safety requirements;
- Nuclear safety rules;
- Standards;
- Normative technical documents of a Licensee.

From the date of coming into validity of this legal act, all VATESI regulatory documents have been respectively divided into nuclear safety requirements and nuclear safety rules. In accordance with the *Description of Procedure for Preparation of Nuclear Safety Normative Technical Documents*, the impacts of all draft nuclear safety requirements and draft nuclear safety rules have to be assessed.

In accordance with Item 16 of the *Description of Procedure for Preparation of Nuclear Safety Normative Technical Documents*, in order to assure efficient regulation of nuclear safety, VATESI prepares and approves a five-year program for the upgrading of nuclear safety normative technical documents and yearly plans for preparation and review of nuclear safety normative technical documents. To execute these documents and to coordinate other issues related to the preparation of legal acts, VATESI has set up a working group for coordination of preparation of the relevant legal framework. A *five-year (2010 -2014) Program for Upgrading of Nuclear Safety Normative Technical Documents* and a *Plan for Preparation and Review of Nuclear Safety Normative Technical Documents for the Year 2010* were validated by the Order No. 22.3-136 of VATESI Head as of 31 December 2009. These documents have been placed on the VATESI website. A digest of the nuclear safety requirements and rules has been also placed on the VATESI website and it is updated on a regular basis.

Licensing

The use of nuclear energy is strictly regulated by the legal acts of the Republic of Lithuania to assure that the risks caused by it to the public and the environment would be minimized as much as possible. These risks have to be assessed in the course of designing, constructing and operating a nuclear facility (e.g. a nuclear power plant, spent nuclear fuel storage facility), performing modifications of the existing facilities, during storage or transportation of nuclear materials or materials of a nuclear cycle. The activity that causes unacceptable hazards to the population or the environment has to be timely terminated. Another fundamental reason for regulation of this activity – possible use of nuclear energy for terror purposes. In this context, regulation is aimed at preventing possible acts of terror and illegal movement of nuclear and radioactive materials.

During the licensing process, preparedness of an applicant (and after granting the licence – of the licensee) to carry out the activity licensed by VATESI in accordance with the Law on Nuclear Energy is evaluated. In the course of licensing, the level of nuclear safety assurance of nuclear materials or nuclear facilities, organizational structure of the applicant, qualification of personnel and other important aspects of safety assurance are assessed.

The process of licensing consists of the following main stages:

- Submission of an application;
- Review and assessment of application documents;
- Inspection of an applicant;
- Decision making regarding granting the license;
- Issuance of the license (provided that an affirmative decision has been made);
- Supervision of compliance with the license conditions;
- Termination of the license validity.

Review and assessment of application documents

The assessment of safety is a systematic process of a wide scope, the objective of which is to ascertain whether performance of the activity for licensing of which an application has been submitted satisfies all relevant safety requirements for this activity and the relevant nuclear

facilities. Depending on the type of the licensed activity, these requirements comprise the principal nuclear and physical safety requirements (e.g. sufficient implementation of “defence in depth” principle, evaluation of operational experience), the requirements for the Plant (e.g. equipment qualification and ageing analysis, their reliability in terms of isolation and reservation), the requirements for the specific systems of the facility (e.g. specific requirements for the reactor’s core, cooling system, accident confinement systems, the peculiarities of engineering safety), etc. Safety assessment of a nuclear facility is performed throughout its entire lifetime, during the stages of evaluation of a site, design of a nuclear facility, its construction, commissioning, operation and decommissioning.

One of the principal documents justifying safety of a nuclear facility is the safety analysis report. In the course of licensing,

apart of the mentioned document, VATESI reviews and assesses the applicant’s organizational structure, qualification of personnel, implementation of the management system and other important documents related to safety assurance. Licenses are issued only subject to approval by other authorities prescribed by the Law on Nuclear Energy.

In 2009, two licenses were issued (both to the State Company *Ignalina Nuclear Power Plant*): for the construction of management facilities for solid radioactive waste (No. 1/2009) and for the construction of interim spent nuclear fuel storage facility (No. 2/2009). Two licenses were withdrawn after the completion of the licensed activity (both at the State Company *Ignalina Nuclear Power Plant*): for designing a spent nuclear fuel storage facility at Ignalina NPP (No. 1/2007) and for designing management and storage facilities for solid radioactive waste at Ignalina NPP (No. 2/2007).

Applications analysed by VATESI in 2009 for issuing a license

Date of submission of application	Applicant	Type of licensed activity	Comments
September 2007	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of interim spent nuclear fuel storage facility	Licence No. 2/2009 issued on 2 September 2009
February 2008	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of management facilities for solid radioactive waste	Licence No. 1/2009 issued on 27 August 2009
September 2008	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of storage facilities and a repository for very low activity radioactive waste	Submission and review of application documents is in progress

Licences issued by VATESI whereby VATESI was supervising the licensed activities in 2009

Item No.	Licence No.	Licensee	Type of licensed activity
1.	12/99(P)	State Company <i>Ignalina Nuclear Power Plant</i>	Operation of Ignalina NPP Unit 1
2.	3/2000(P)	State Company <i>Ignalina Nuclear Power Plant</i>	Operation of interim spent nuclear fuel storage facility (SNFSF) of dry type at Ignalina NPP
3.	1/2004	<i>Lietuvos Geležinkeliai AB</i>	Transportation of nuclear materials
4.	2/2004	State Company <i>Ignalina Nuclear Power Plant</i>	Operation of Ignalina NPP Unit 2
5.	1/2006	State Company <i>Ignalina Nuclear Power Plant</i>	Operation of storage facility for cemented liquid radioactive waste at Ignalina NPP
6.	2/2006	Radioactive Waste Management Agency (RATA)	Conducting supervision of the closed Maišiagala storage facility of radioactive waste
7.	1/2007	State Company <i>Ignalina Nuclear Power Plant</i>	Designing SNF storage facility at INPP
8.	2/2007	State Company <i>Ignalina Nuclear Power Plant</i>	Designing facilities for management and storage of solid radioactive waste at INPP
9.	1/2008	State Company <i>Ignalina Nuclear Power Plant</i>	Designing facilities for retrieval and conditioning of solid radioactive waste
10.	2/2008	State Company <i>Ignalina Nuclear Power Plant</i>	Designing storage facilities and a repository for very low activity radioactive waste
11.	1/2009	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of management facilities for solid radioactive waste
12.	2/2009	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of interim spent nuclear fuel storage facility

VATESI, by exercising the right prescribed to the inspectorate by the Law on Nuclear Energy, sets forth the conditions of the license validity to the licensee. In the course of supervision of the licensed activity, in the case of flagrant violations of the license conditions, VATESI may suspend the validity of the license or to withdraw the license. In 2009, no flagrant violations of the license conditions were determined.

In 2009, to assess compliance of the performed activity with the set requirements, VATESI specialists reviewed more than 130 safety justification documents and conducted 55 inspections and checks.

Subject to the results of the safety assessment, technical checks, analytical works, the decisions were made on the acceptability of proposed safety system modifications; the requirements to upgrade the performed activity, operational and other documentation were raised in order to assure and continuously enhance the safety of the operated facility.

Inspection

The inspection activities are targeted to assess compliance of licensee's activities supervised by VATESI with the established requirements of nuclear safety, radiation protection and accounting of nuclear materials. Every year VATESI develops a plan of inspections in accordance with the established criteria. In addition to the planned inspections, the technical and control room operation inspections as well as unplanned inspections are undertaken.

In 2009, VATESI specialists conducted 55 inspections (67 in 2008), including 33 planned inspections, 8 control room operation inspections, 13 technical inspections and 1 unplanned inspection.

Inspections are conducted at all stages of the licensed activity: during the assessment of a site for a nuclear facility, its design, construction, operation or decommissioning, during transportation of nuclear materials or when performing their accounting. Moreover, VATESI inspectors are entitled to inspect organizations that provide services to the applicants and license holders.

The scopes of inspections somewhat decreased in 2009 because of the scheduled isolation works of the systems of no longer operating Ignalina NPP Unit 1. Upon the assessment of the impact of the mentioned systems on safety, the number of inspections was reduced subject to the requirements of the normative and technical regulations on the frequency of surveillance of individual systems.

In 2009, 53 out of 55 conducted inspections were performed at Ignalina NPP, 1 – at the Radioactive Waste Management Agency (RATA) and 1 – at Vilniaus Energija UAB and Lietuvos Elektrinė UAB.

Planned inspections

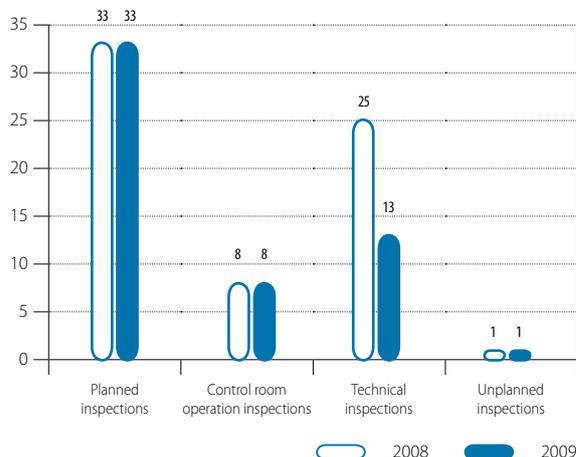
Every year, in December, upon having assessed the gained experience of inspection activities, having analysed the experience of organizations operating nuclear facilities, the results of licensing, the analysis of the safety improvement program and other safety-related documents, VATESI specialists project the scope of inspections for the coming year. Thirty four inspections were scheduled according to VATESI inspections plan in 2009. Thirty three of them were conducted; one was rescheduled for the year 2010.

In the course of inspections, the following safety-related areas were verified:

1. Training of Ignalina NPP personnel;
2. Safety systems and safety-related systems (the emergency core cooling system, emergency electric power supply system, fire extinguishing systems at Units 1 and 2, reserve control rooms, system for reactor cavity overpressure protection, system of regular and reserve power supply for the Unit's own needs, Feed water preparation and quality check system, instrumentation and control systems, operation of cluster-type control rods, system for calculation of neutron impulses);
3. Accounting and control of nuclear materials;
4. Verification of physical inventory;
5. Management of design basis and beyond-design basis accidents;
6. Management of nuclear fuel;
7. Physical protection of nuclear facilities and nuclear materials;
8. Environmental monitoring conducted by Ignalina NPP;
9. Planning of Ignalina NPP decommissioning projects;
10. Implementation of radiation protection program;
11. Equipment qualification and ageing management of the safety-related systems;
12. Management of radioactive waste at Ignalina NPP;
13. Use of imported strategic commodities intended for nuclear purposes;
14. Emergency preparedness;
15. Assessment of operational experience.

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

Inspections conducted by VATESI in 2008-2009



Technical checks and control room operation inspections

In 2009, in addition to other inspection activities, the specialists of the Surveillance Division of VATESI Nuclear Safety Department performed 8 control room operation inspections and 13 technical checks at Ignalina NPP.

Technical checks are the checks conducted by VATESI experts on technical condition of individual systems, facilities and equipment of a nuclear facility set forth in special (operation, testing, maintenance, etc.) regulations. During these checks visual inspection of safety-important equipment and pipelines, tests and other actions needed to ascertain compliance with safety requirements are carried out. The main goal of the specialists of the Surveillance Division of VATESI Nuclear Safety Department who take part in the checks of the safety-related pressurised components is to supervise the checks on the technical condition of the safety-related pressurised components and pipelines and to assess the technical conditions of the NPP components being checked.

Control room operation inspections are the inspections of certain actions (activities) of the personnel prescribed by the Operational Manual of a nuclear facility.

In 2009, seven control room operation inspections of the measurement process of physical and dynamic properties of the nuclear reactor at Ignalina NPP Unit 2, and one check related to the measurements to verify the efficiency of control and protection system, sub-criticality of the nuclear reactor, dry out of the control and protection circuit prior to launching the reactor into operation after the scheduled maintenance works in 2009 were carried out.

No non-compliances with the set nuclear safety requirements were established either during the technical checks or control room operation inspections. Compliance of the condition of the pipelines and equipment and of the physical and dynamic properties of the reactor with the prescribed requirements was confirmed. The results of the technical checks and control room operation inspections were documented in line with the established procedure.



Safety of Ignalina Nuclear Power Plant

Operational experience feedback

The systematic analysis of the NPP own operational experience along with the analysis of operational experience of other entities operating in the nuclear energy sector is deemed necessary to prevent accidents, to avoid their re-occurrence and to assure a high level of safety in nuclear energy. An appropriate level of Ignalina NPP safety has been continuously enhanced and maintained by analysing its own experience along with the experience of other organizations operating in the field of nuclear energy.

Operational experience covers information about events, accidents and their precursors, defects, near miss events, their tendencies, weaknesses and good practice, reports on analysis of safety performance indicators, the NPP self-assessment reports (reports of quality assurance audits, reports of independent experts and missions, documented good practice, etc.). Operational experience includes human activity, organizational and technological issues. VATESI has a permanent Commission of Unusual Events and Operational Experience (the Commission), which analyses the reports on unusual events at Ignalina NPP, other nuclear facilities in Lithuania and information about unusual events worldwide.

In 2009, eleven meetings of the Commission of Unusual Events and Operational Experience were arranged during which the reports of unusual events at Ignalina NPP were analysed along with unusual events that occurred at nuclear power plants of other countries.

Since the beginning of the year, Ignalina NPP provided 4 reports on the analysis of unusual events (Figure 1). The statistics of unusual events for the year 2009, as compared with 2008, illustrates that the number of unusual events at Ignalina NPP decreased more than twice. All events were recorded in the operating Ignalina NPP Unit 2 (Figure 2).

The most frequent causes of unusual events are the shortcomings in the nuclear power plant's design, procedures or operations. In 2009, at Ignalina NPP 3 events were recorded as caused by the malfunctioning of equipment, 1 – occurred due to personnel error. No events due to weaknesses in applicable procedures were recorded.

On 26 June 2009, the unplanned shut down of Unit 2 of Ignalina NPP occurred due to the failure of two channels in the second shutdown system. The mentioned event was rated as level 0 on the International Nuclear Events Scale (INES). In accordance with the International Nuclear Events Scale, in 2009 three events were rated as level 0, one event was out of the scale (Figure 3); no events were rated as level 1 or higher on the INES scale.

For the assessment of Ignalina NPP safety performance, a pre-selected system of safety performance indicators is used. In 2009, a targeted value of safety level at Unit 2 of Ignalina NPP was 53. The higher is the value of the safety level, the higher is the level of safety. In 2009, the lowest safety level was in April – 50.89, whereas the highest – 58.2 – was reached in December (Figure 4). In 2009, the average safety level was 55.38, as compared to 46.94 in 2008. The decreased number of unusual events accounted for the improvement of special operational safety performance indicators (Figure 5). In 2009, eight leaking fuel caskets were removed from Unit 2, whereas in 2008 there were 69 of them. The decreased number of leaking fuel caskets removed from Unit 2 accounted



Bird flight view to Ignalina NPP

for improved radiation protection performance indicators (Figure 6). The overall improvement in the safety level was mainly predetermined by the decreased number of unusual events along with the number of removed fuel caskets with damaged leak-proofness.

Based on the performed analysis of dynamics of safety performance indicators it can be stated that in 2009 the safety level of Ignalina NPP Unit 2 was acceptable.

On 26 May 2009, the *Requirements for Operational Experience Feedback in Nuclear Energy (P-2009-04)* were validated by the Order No. 22.3-49 of VATESI Head. The document defined fundamental requirements for the system of operational experience feedback at NPPs and other nuclear facilities. To assess compliance of the Ignalina NPP system of operational experience feedback with the mentioned requirements, on 27 October 2009 VATESI specialists conducted a special inspection at Ignalina NPP. Some non-compliances were found during the inspection and Ignalina NPP will have to draw a special plan of corrective measures to rectify them.

Figure 1. Dynamics of unusual events in 2000 – 2009

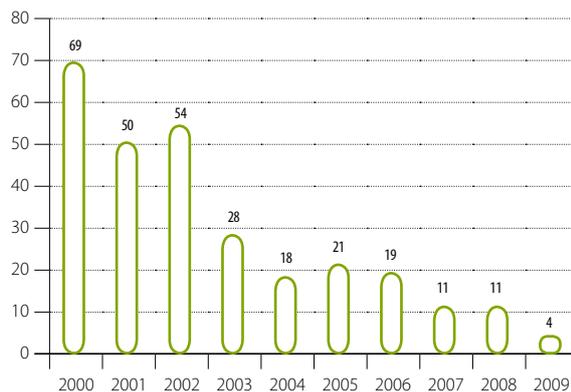


Figure 2. Distribution of unusual events by INPP facilities

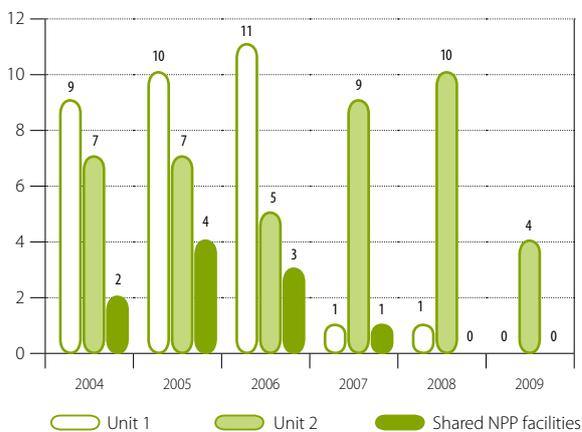


Figure 3. Distribution of unusual events on the INES scale

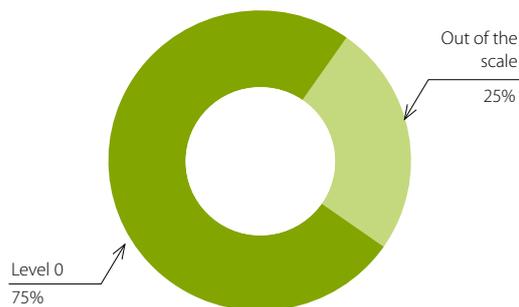


Figure 4. Dynamics of principal safety performance indicators in 2009

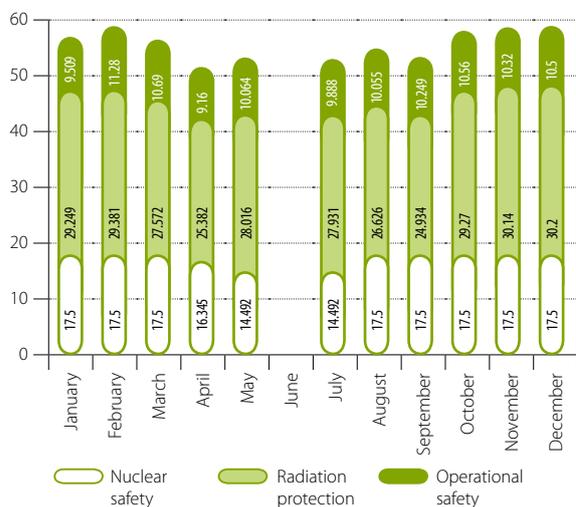


Figure 5. Dynamics of special operational safety performance indicators in 2009

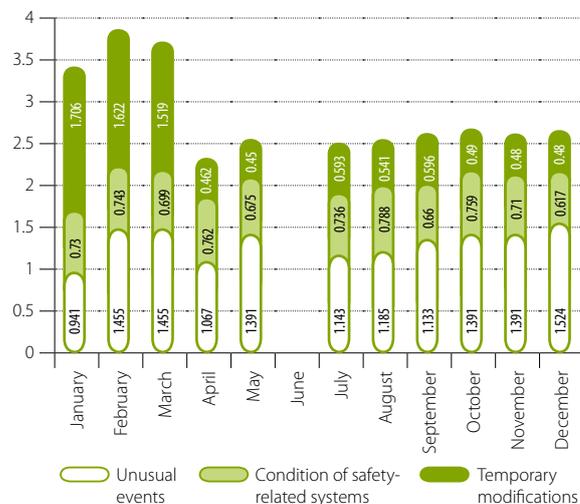
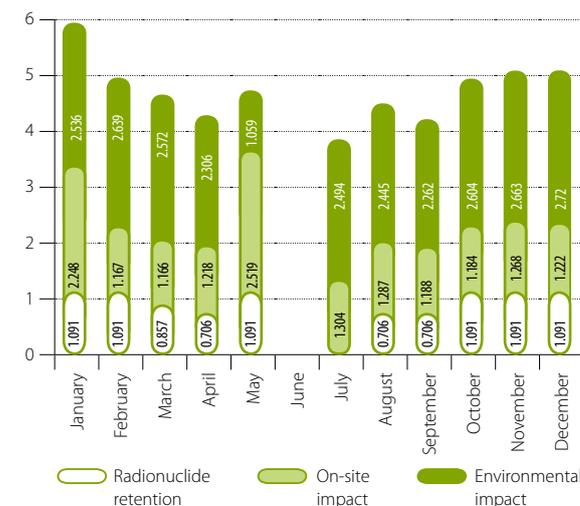


Figure 6. Dynamics of special radiation protection performance indicators in 2009



Technical and economic indicators of Ignalina Nuclear Power Plant

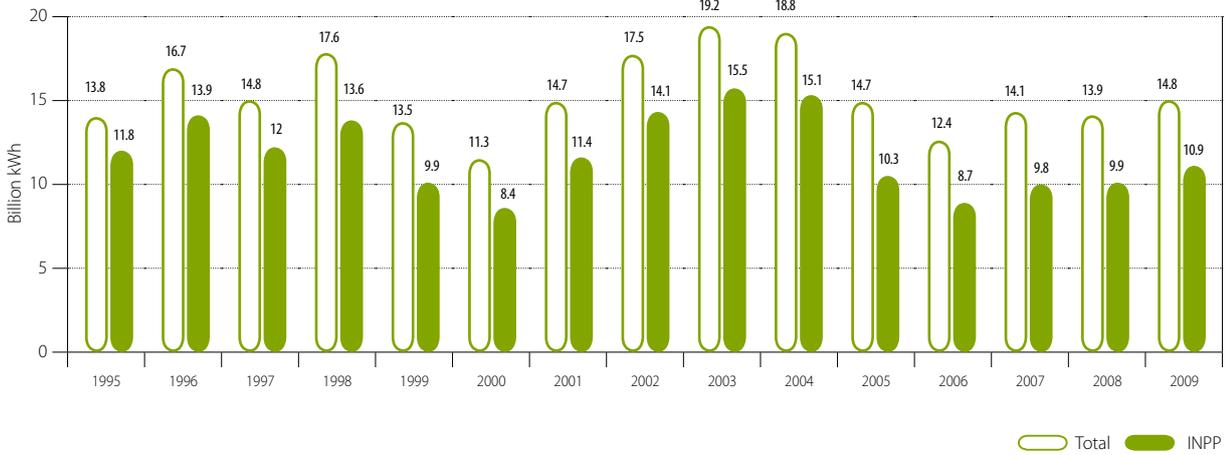
As of 1 January 2010, since the beginning of the power plant's operation Ignalina NPP has produced 307.1 TWh of electricity: 136.9 TWh in Unit 1 and 170.2 TWh in Unit 2.

Electricity quantity produced by Ignalina NPP in 2009 equalled 73.2% of the total generated output in Lithuania.

Generation of electricity in Lithuania

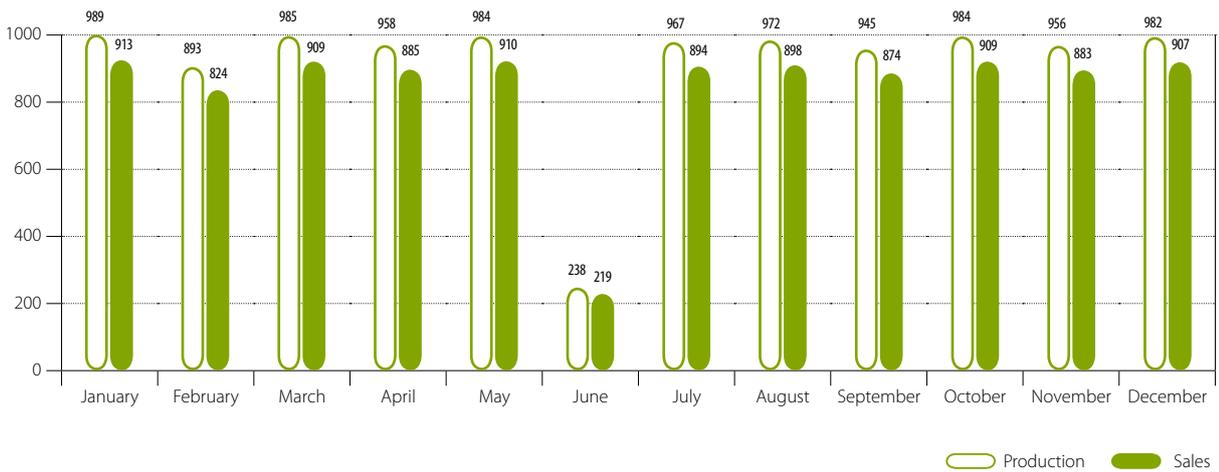
279.9 TWh of electricity were sold to consumers from the start-up of commercial operation.

Generated output in Lithuania



In 2009, Ignalina NPP generated 10852.6 million kWh of electricity, that is by 958.9 million kWh more than in 2008.

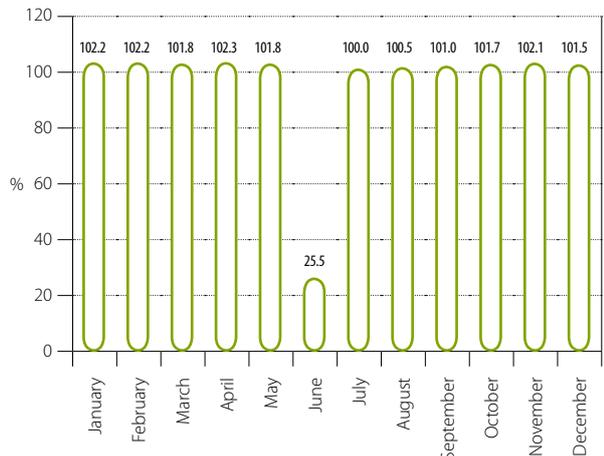
Electricity production and sales in 2009 (million kWh)



In 2009, 10025.3 million kWh was sold to Lietuvos Energija AB, of this quantity 6984.3 million kWh was supplied to the domestic market and 3041.1 million kWh of electricity was exported to other countries. The volume of electricity export increased by approx. 43% year-on-year (as compared to 2088.2 million kWh exported in 2008, 2368.6 million kWh exported in 2007).

A high level of loading and the scheduled maintenance works at the power unit undertaken immediately after its unplanned shutdown accounted for the stability of the technical and economic indicators at Ignalina NPP. In 2009 – there were no dispatch centre's limitations that could have resulted in reduced generation of electricity. In 2009, there was one unplanned automatic scram of the power unit. Therefore the generated output was below the planned one only by approx. 0.02 %. The capability factor of Ignalina NPP to use its gross capacity was as high as 94.1%. In 2009, like in 2008, 7.62% of electricity was consumed for heat energy production and electricity generation.

Last year the capacity factor of Ignalina NPP reached 94.5 %, this is the best indicator throughout the entire history of Ignalina NPP operation.



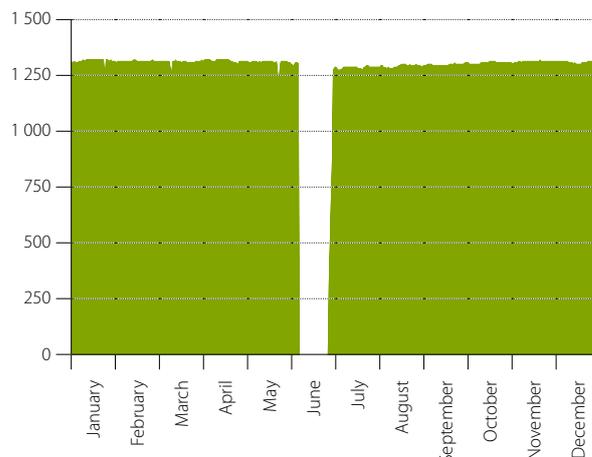
The amount of electricity not generated due to the extended routine maintenance and malfunctioning of the equipment was only 2.57 million kWh.

In accordance with the IAEA regulations, the capability factor to use the gross capacity, the capacity factor and the amount of electricity that was not generated were calculated at the Unit's installed capacity of 1300 MW.

Electricity not generated due to repairs and outages (Ninst. =1300 MW)

Indicator	million kWh
Scheduled annual maintenance	669.08
Unplanned extensions of maintenance	0
Defects of the equipment	2.57
Dispatch limitations of loads	0
Total quantity of not generated electricity	671.65

Electric load of Unit 2 in 2009 (MW)



Operation indicators of Unit 2

Indicator	Unit	Reactor	TG-3	TG-4
1. Installed capacity	1 500 MW (el.)	4 800 MW (thermal)	750 MW (el.)	750 MW (el.)
2. Gross licensed capacity	1 300 MW (el.)	4 200 MW (thermal)	750 MW (el.)	750 MW (el.)
3. Gross electricity generation	10 852.6 GWh	-	5 859.9 GWh	4 546.8 GWh
4. Gross electricity sales	10 025.3 GWh	-	-	-
5. INPP own needs	7.62 %	-	-	-
6. Relative heat consumption per supplied 1 kWh	2 871 kcal/kWh	-	-	-
7. Average load	1 317 MW (el.)	4 084 MW (thermal)	711 MW	609 MW
8. On-line hours	8 243	8 269	8 243	8 203
9. Number of outages, including:				
• Scheduled annual maintenance (after unplanned shutdown)	2	2	2	2
• Unplanned	1	1	1	1
• Reserve	0	0	0	0
• Reserve	1	1	1	1
10. Number of start-ups	1	1	1	1
11. Number of automatic scrams of reactor	-	1	-	-
12. Capability factor	94.1 %	94.4 %	94.1 %	93.6 %
13. CF N _{inst} =1500 MW	82.6 %	80.3 %	89.2 %	76.0 %

CF – capability factor to use gross capacity

Reasons for emergency outing (capacity drops) of Ignalina NPP in 2009

Nr.	Data	Reasons for emergency outing (capacity drops) of Ignalina NPP
1.	January 23	Power unit's capacity reduction up to 1250 MW to remove leakage in the branch of the TG-3 condensate collector pipeline connecting deaerator No. 6.
2.	March 11	Power unit's capacity reduction up to 50 MW to perform maintenance of the condenser's pre-treatment filter 42.
3.	May 23	Power unit's capacity reduction up to 100 MW to perform maintenance of the condenser's tubes.
4.	June 6 – 27	Automatic scram of the reactor due to the fault of two channels in the second shut-down system. In relation to the shut-down, the decision to undertake the scheduled annual maintenance.



Units 1 and 2 at Ignalina NPP

Supervision of safety of Ignalina NPP operation

VATESI exercises supervision over nuclear safety by:

- Supervising how employees of organizations (companies, institutions) comply with the requirements of the normative technical documents in performing their duties;
- Supervising whether systems, structures and equipment of safety-related systems of a nuclear facilities (NF) satisfy the requirements of the normative technical documents and assuring supervision throughout all stages of designing, construction, operation and decommissioning of these nuclear facilities.

The most important goal of the inspectorate is to exercise state regulation and supervision of Ignalina NPP nuclear safety and radiation protection, therefore the core activities of all its divisions are targeted to accomplish this goal.

The Surveillance Division of VATESI Nuclear Safety Department, directly exercising supervision functions at the nuclear power plant, performs supervision of operation of the nuclear power plant and other related activities by closely cooperating with other structural divisions of VATESI.

VATESI fulfils the supervision functions in accordance with the Laws of the Republic of Lithuania, Resolutions of the Government of the Republic of Lithuania, normative technical documents (NTD) on nuclear safety.

VATESI, by exercising supervision over nuclear safety, focuses on prevention of violation of the NTD requirements in supervised nuclear facilities (power units, spent nuclear fuel storage facilities, etc.) throughout all stages of the licensed activity.

The main areas of VATESI activities are as follows:

- Systematic inspection of compliance with the NTD requirements during all stages of operation of a nuclear facility;
- Assessment and supervision of activities related to designing, constructing, manufacturing, commissioning

and repair works of the safety important systems and equipment of a nuclear facility, its safety assessment and supervision;

- State supervision of the pressure boundary operation in pressurized equipment, pipelines and accident confinement systems that are important to the NPP safety;
- Issuance of permits for operation of pressurized equipment and pipelines important to safety at Ignalina NPP;
- Training of personnel and control over examination of their competences;
- Participation during the assessment of competences of managers and operational staff of supervised facilities;
- Analysis of causes of accidents, incidents and malfunctioning of safety important systems and equipment and control over corrective measures.

Targeted inspections of Ignalina NPP safety were conducted in accordance with the plan approved in advance. The results of the inspections were documented in the reports. Moreover, technical inspections of Ignalina NPP pressurised equipment and associated piping, supervised by VATESI, were undertaken, the results were documented in the reports and equipment certificates. Inspectors of the Surveillance Division took part in the work of the committee that examined the competence of managers and operational staff of Ignalina NPP. In 2009, the competences of 108 senior and medium level specialists of Ignalina NPP were examined.

In 2009, INPP Unit 2 was started up only once. Prior to starting its operation, a wide-ranging examination of the Unit was carried out, with appropriate permits issued for each stage of the start-up. The supervision was exercised through direct participation in the examination of the plant.

In accordance with the requirements of the Operation Manual, during operation or maintenance of the Units, specialists from Surveillance Division of VATESI Nuclear Safety Department controlled execution of operations posing nuclear hazard, including identification of sub-criticality of the nuclear reactor after shutting it down and testing the efficiency of fast-acting scram rods (FASR). In addition to that, the control of measurements of physical-dynamic parameters of the nuclear reactor at INPP Unit 2 was conducted prior to shutting it down for scheduled annual maintenance and after loading (in line with the approved program) uranium- erbium nuclear fuel into the core (8 checks were carried out).

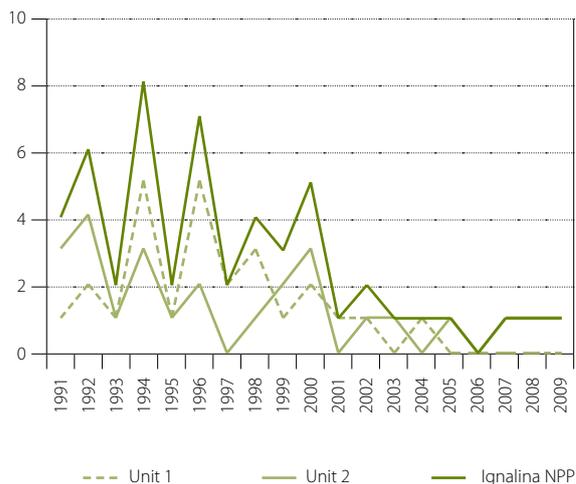
In 2009, by exercising its functions of supervision over operational safety, VATESI reviewed and analysed 7 technical proposals regarding the modification of safety-related systems of the nuclear power plant. By taking into consideration the compliance of the modified systems with the design requirements, the results of their testing and commissioning into operation (including preparation of the technical documentation and training of the personnel), VATESI issued permits to put them into service for regular operation.

Regardless of from time to time occurring malfunctioning, the results of Ignalina NPP operation in 2009 in terms of safety were up to standard. No cases of violations of safe operation conditions or marginal parameters, or unacceptable exposure of the personnel were recorded.

One of the most illustrative indicators of safe operation, representing reliability of equipment, quality of repair works and qualification of the personnel is the number of unplanned outages of power units at a nuclear power plant. In 2009, one unplanned outage of the power unit occurred. Whereas this

outage occurred in the course of capacity drop immediately before the planned shut-down of the power unit, practically no economic losses were incurred. In 2008 only one unplanned outage of the power unit took place as well. The fact allows concluding that safety improvement measures which had been undertaken at Ignalina NPP, including the upgrading of safety culture and management system, were effective and adequate.

Number of unplanned outages at Ignalina NPP



Safety assessment of Ignalina NPP

Safety assessment is the principal function of VATESI that is exercised by conducting supervision of nuclear safety and radiation protection at nuclear facilities. VATESI assesses safety throughout all stages of the nuclear facility's lifetime, from evaluation of a site, through operation, to decommissioning. Safety assessment covers multiple areas – issues related to reactor physics, mechanics, thermo hydraulics, probability theory, materials science and other fields of science are to be resolved during the assessment.

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

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

Safety assessment involves the analysis of reactors physical properties, assessment of structural integrity of the cooling circuit of Ignalina NPP reactor, qualification and control of safety-related systems, management of ageing of safety-related systems, assurance of functionality of the accident confinement system, fire risk analysis, probabilistic safety assessment and the analysis of design basis and beyond-design-basis accidents and their management.

In 2009, the preparation of the requirements for the assessment of the nuclear power plant's site in terms of nuclear safety as well as the requirements for the safety analysis report was commenced. These requirements will be applicable to the new nuclear power plant. VATESI specialists were enhancing their competences in the field of safety assessment in order to get ready for the safety assessment at the power plants with technologies differing from those of Ignalina NPP.

Safety assessment often requires comprehensive, specific knowledge, which has to be regularly updated. Therefore considerable assistance in this activity has been provided by the Technical Support Organizations (TSOs) of Lithuania and the IAEA by arranging workshops and other events, during which nuclear safety specialists had an opportunity to familiarise themselves with the most recent experience worldwide.

Analysis and upgrading of reactors core physical properties

In 2009, VATESI analysed and approved programs for nuclear fuel loading into reactor of Ignalina NPP Unit 2 together with the safety justification documents which were submitted by Ignalina NPP. Safety justification was based on the simulation of the reactor's core performed by the special computer codes.

As of late 2009, the removal of nuclear fuel from reactor core of Ignalina NPP Unit 1 was completed. Fuel assemblies were unloaded according to safety justification documents and program approved by VATESI. A fuel transportation facility installed in 2006 was used to transport fuel assemblies that has not been completely spent to Ignalina NPP Unit 2 where after appropriate examination they were loaded into the reactor for the final utilization. By the end of 2009, 988 spent fuel assemblies were delivered from the reactor of Unit 1 to Unit 2; 910 of them were loaded into the reactor. In the course of fuel removal, physical properties of Unit 1 reactor core were monitored.

At the end of 2009, Ignalina NPP Unit 2 was finally shut down. Nuclear fuel will be stored in this Unit until sufficient space is provided in the spent nuclear fuel storage pools. Fuel removal from the reactor will be carried out in line with the safety justification documents and program approved by VATESI.

Assessment of structural integrity of the cooling circuit of Ignalina NPP reactor

One of the main objectives of VATESI is to exercise the state regulation and supervision in solving the issues of nuclear safety with regard to the safe operation of the reactor's cooling circuit systems and components. The reactor's cooling system is one of the most important systems ensuring safety of operation of Ignalina NPP. The structural integrity of the reactor's cooling circuit has to be maintained both under normal operating conditions and in the case of unusual events, it has to comply with the design requirements throughout the entire operation period of the nuclear power plant by assuring reliable functioning of the systems relevant to its safety and cooling of the reactor. Hence maintenance and in-service inspections of the pipelines and equipment of the cooling circuit are performed on a regular basis.

To verify how the structural integrity of the reactor's cooling circuit is maintained by Ignalina NPP, VATESI specialists have been conducting regular inspections. In 2009, the inspection was conducted to verify how Ignalina NPP maintained the structural integrity of the cooling circuit after the implementation of the modification *Changes of Organizational Structure of Safety and Quality Assurance Service in 2009*. During the inspection no essential non-compliances having impact on the safety were established. Ignalina NPP prepared and submitted to VATESI the plan of measures for eliminating the established non-compliances and violation.

By performing supervision of the assurance of the structural integrity of Ignalina NPP equipment and pipelines, in 2009 VATESI specialists reviewed and analysed 21 technical decisions worked out and provided by Ignalina NPP and aimed to prolong the period between safety-related systems and equipment inspections till January 2010. Abiding by the national normative requirements and by taking into consideration the best international practice, VATESI decided to reject the mentioned technical decisions.

In 2009, like every year, regardless of the scheduled final shutdown of Ignalina NPP Unit 2, during the scheduled annual maintenance about 20 welded joints were checked at Unit 2 of Ignalina NPP, and among them 1 welded joint was found to have deviations from the permissible limits set forth by the requirements. The repair works of the welded joint were undertaken to rectify the defects.

VATESI, upon having assessed the documents submitted by Ignalina NPP on the results of the in-service inspection of pipelines and equipment and having ascertained that all controlled parameters remained within the permissible limits, on 26 June 2009 issued a permit No. 9/26-06-2009 to operate the reactor at Unit 2 under critical values of safety parameters with an aim to increase the capacity and to generate electric power output.

Moreover, in 2009 VATESI performed in-service inspection of operational control of the pipelines, equipment and fuel channels at Unit 1 of Ignalina NPP. VATESI specialists examined the documents drawn up on the results of operational control, which evidenced that no non-compliances with the permissible limits set forth by the relevant requirements were established.

Qualification of safety-related systems

The qualification of safety-related systems (SRS) is a set of actions aimed to justify the capability of the systems and elements to perform the given functions during their entire lifetime under the designed operating conditions, including conditions of normal operation, transient conditions and design-basis accidents. The qualification of safety-related systems is an indispensable component of technical and organizational measures aimed to ensure reliable and safe operation of the nuclear facility.

In 2001, VATESI validated the *Regulations for Qualification of Safety Related Systems of Nuclear Facilities*; according to these Regulations, Ignalina NPP is obligated to perform the qualification of safety-related systems including the functions of shutting down the reactor and maintaining its sub-critical state, removal of residual heat, release of radioactive products.

In 2009, Ignalina NPP further continued the works of qualification of the SRS in line with the *Plan of Measures for Harmonization of the Reactor safety*. By exercising supervision over these works, VATESI analysed the report of the completed qualification of control and measurement equipment (electrical part) at Ignalina NPP Unit 2. With regard to final shutdown of Ignalina NPP Unit 2 by the end of 2009, the issue whether it is reasonable to proceed with the SRS qualification works will be solved in 2010.

Management of ageing of safety-related systems and elements

In the course of operation of Ignalina NPP, due to the impacts of various factors, physical-chemical alterations have been continuously occurring in the safety-related systems and elements; this process is characterised as the ageing of constructional and functional properties of the Plant. The process that causes deterioration in the structure of materials and their properties due to the processes occurring in these materials is called ageing.

Abiding by the *Requirements for Ageing Management of Safety-Related Systems at Nuclear Facilities* (VD-E-05-99), VATESI specialists were supervising how management of ageing of the safety-related systems and elements at Ignalina NPP was implemented by using the organizational and technical ageing management measures in order to timely identify degradation in the condition of the elements, to forecast possible deterioration in their condition and to anticipate the time when the condition of the relevant component would fail to satisfy the set requirements on safety of the nuclear facility. The management of ageing of the safety-related systems by the licensee assured sufficient safety margin enabling to avoid unacceptable degradation of safety-related systems and elements.

To manage the ageing processes, Ignalina NPP has worked out the ageing management programs, methodologies, collection and storage of data deemed necessary for management of ageing and for assessment of its efficiency. In accordance with the plan-schedule approved by VATESI for management of ageing of the safety-related systems and elements the ageing management of which is mandatory, Ignalina NPP has been continuously monitoring parameters of these systems and elements, performing operational control and maintenance.

In the process of implementing the program for management of ageing of the safety-related systems and elements at operating Ignalina NPP, VATESI has been continuously supervising the ageing management strategy for the nuclear facility and its implementation, assuring sustainable functionality of the systems and components and performance of safety functions throughout the entire lifetime of the nuclear power plant.

VATESI specialists were analysing the reports on the completed ageing management measures submitted by Ignalina NPP by assessing the operational factors which impact the properties of the safety-related systems and elements, and were supervising compliance with the set requirements and timely identification and implementation of corrective measures needed to maintain the acceptable level of safety. Moreover, in 2009, VATESI specialists were analysing the progress reports of Ignalina NPP safety improvement

program SIP-3, as well as compliance with the conditions for the validity of licenses of Ignalina NPP Units 1 and 2 in terms of management of ageing.

Taking into consideration that Ignalina NPP Unit 2 was finally shut down on 31 December 2009, Ignalina NPP will have to update the relevant documents drawn up for management of ageing of the safety-related systems and agreed them with VATESI.

Fire hazard analysis

Fires occurring at nuclear facilities, especially at nuclear power plants, may impact the operation capability of safety-related systems and cause immense unpredictable losses. Therefore fire hazard analysis at these facilities is in the focus of attention worldwide. The main objective of this analysis is to demonstrate that the locations of safety-related systems and the existing fire safety measures assure nuclear safety and comply with the requirements of the national technical normative documents and international recommendations on safety.

VATESI requirements prescribe that the fire hazard analysis has to cover the following stages:

- Identification and classification of fire risks zones;
- Identification of safety-related systems in fire risks zones;
- Defining potential fire sources and level of fire risks, assessment of potential fire distribution and expected impact on the operation capability of safety-related systems;
- Defining the required flame resistance of fire walls in fire risk zones;
- Setting necessary measures for fire detection and extinction, verification of operation capability of fire detection and extinction systems;
- Analysis of radiation and other secondary fire consequences.

In 2009, VATESI analysed and provided comments on the fire hazard analyses (FHA) reports for the interim spent nuclear fuel storage facility (B1 project), facility for management of solid radioactive waste (B3/4 project), storage facility of very low activity radioactive waste (B19-1 project), waste retrieval from 155-155/1 buildings and sorting facility of very low activity radioactive waste (B2 project, part 1), dismantling and decontamination of 117/1 building (B9-0 project). Ignalina NPP revised these reports with regard to VATESI comments – the shortcomings identified in the area of fire safety were rectified, back-up measures were worked out.

Fire safety at Ignalina NPP Unit 1 and Unit 2 is implemented either by automated and/or manual means. One of the most effective fire safety means is an automated fire safety system designed to detect, liquidate fires and to mitigate their consequences.

The automated fire safety systems that are completely autonomous in each of the Units consist of:

- Automated fire extinction system;
- Automated system of fire alarms,
- Fire confinement, smoke removal and air overpressure generating systems.

In the middle of 2009, VATESI specialists reviewed and evaluated fire safety justification documents, provided by Ignalina NPP and related to the completed scheduled annual maintenance works in Ignalina NPP Unit 2. No non-compliances with the prescribed requirements were established.

In 2009, VATESI specialists conducted an inspection at Ignalina NPP; during the inspection they verified whether maintenance of the automated fire extinction system at Ignalina NPP, preparedness of the system to perform its functions, performance of works and documentation of their results were up to standard, whether Ignalina NPP conducted fire hazard analysis; in accordance with the fire safety requirements for the safety related systems (P-2002-01), the equipment and premises were inspected, documentation for maintenance and operation (technological cards, monthly plans-schedules, repair works certificates, etc.) were examined. VATESI inspected how Ignalina NPP rectified non-compliances that had been identified during previous inspections and was satisfied that all non-compliances were rectified. Upon having examined Ignalina NPP reports it was established that 202 cases of actuation of automated fire extinction and alarm systems occurred in 2007, 109 in 2008, and 115 in 2009. The decreasing tendencies in the statistics of actuation of fire alarm system evidenced the quality of undertaken repair works and relevant modifications.

In 2009, upon having received the request, VATESI performed the analysis, prepared and submitted to the Fire and Rescue Department under the Ministry of Interior and to the Ministry of Energy the position and recommendations of the inspectorate on solving fire hazard issues at Ignalina NPP after the year 2009, when Ignalina NPP Unit 2 is finally shut down.

Analysis of design-basis and beyond-design-basis accidents and their management

The analysis of design-basis and beyond-design-basis accidents is carried out by applying the method of deterministic analysis. The deterministic safety analysis (DSA) is an engineering and research study in the course of which the analyses of physical-neutronic, thermohydraulic, structural integrity and radiological aspects of safety-related structures, systems and components of a nuclear power plant are conducted by applying certain mathematical models. Behaviour of a nuclear power plant's safety-related structures, systems and components under normal operating conditions and their functioning in the case of deviation from normal operation (also referred to as the "anticipated operational occurrence"), as well as design-basis and beyond-design-basis accidents are analysed by using verified and validated computer codes. According to the results of the DSA calculations, the assessments of functioning and integrity of the power plant's physical barriers, efficiency of technical and organizational measures protecting and supporting these physical barriers, implementation of the principle of defence in depth, accomplishment of the fundamental nuclear safety functions, possible spread of radioactive materials and (or) ionizing radiation into the premises of the nuclear power plant and their release into the environment, risks to the personnel, population and the environment are made. The DSA is conducted by Ignalina NPP while preparing the nuclear safety justification documents – nuclear safety justification for modifications in the Plant and operation manuals, operating conditions, nuclear safety justification for experiments and tests, nuclear safety analysis reports, periodic safety review reports and other documents.

In 2009, by implementing analytical measures under the safety improvement program SIP-3/2009, Ignalina NPP performed the works related to upgrading of Ignalina NPP design-basis and beyond-design-basis documents. The specialists of Ignalina NPP upgraded the *Symptom-Based Emergency Operating Instructions* (SBEOI) in line with the *Manuals for Management of Beyond-Design-Basis Accidents* (BDBA MM) that had been approved in 2008. Both documents are designated to the operating personnel of Ignalina NPP for control of design-basis and, partially, beyond-design-basis accidents (SBEOI) as well as for management of beyond-design-basis accidents (BDBA MM), including severe accidents. In September 2009, VATESI analysed the justification of adjustments proposed to be included into the SBEOI by Ignalina NPP and approved the updated SBEOI.

Ignalina NPP, by getting ready for decommissioning, submitted to VATESI the *Procedure for Heat Removal from Finally Shut-down Reactor of Ignalina NPP Unit 2 in the Case of Complete Loss of Auxiliary Power Supply*. VATESI specialists analysed the mentioned Procedure, its safety justification and provided their comments to Ignalina NPP. Final decision regarding validity of this Procedure will be made after all documents deemed necessary for management of beyond-design-basis accidents and adapted for the final shut-down of Ignalina NPP and fuel unloading stage are received, and the *Safety Analysis Report of Decommissioning of Ignalina NPP Unit 2 for the Final Shut-down and Fuel Unloading Phase* is reviewed and evaluated, for the reason that the data presented in the Report have been used for the justification of the above mentioned Procedure.

In 2009, VATESI published the *Requirements for Ignalina NPP Deterministic Safety Analysis* drawn in line with the safety levels recommended by WENRA. In this document the requirements for the being prepared Ignalina NPP safety justification documents – nuclear safety justifications for modifications in the Plant and procedures, nuclear safety justifications for operating conditions, nuclear safety justifications for experiments and tests, analysis reports of unusual events, safety analysis reports and other documents – were set. Ignalina NPP managers were following these requirements while preparing safety justification documents in the course of operation, and will have to abide by these requirements during the final shutdown and fuel unloading stage as well.

In December 2008, VATESI nuclear safety specialists conducted the inspection at Ignalina NPP with a view to verify the performance of nuclear safety requirements in the processes of preventing and managing the design-basis and beyond-design-basis accidents in the spent nuclear fuel pools. The inspection commission and Ignalina NPP specialists discussed the issues related to performance of the works in the spent fuel pools after the shut-down of Ignalina NPP Unit 2 that could impact the processes of preventing and managing the design-basis and beyond-design-basis accidents. In addition to that, the inspection commission performed the verification of the condition of the equipment to be used for preventing and managing the design-basis and beyond-design-basis accidents in the spent nuclear fuel pools. Certain non-compliances were established during the inspection, and Ignalina NPP was obligated to eliminate them.

By getting ready for the construction of the new nuclear power plant in Lithuania, in 2009 VATESI specialists started

drafting a new legal act the *Requirements for the Deterministic Safety Analysis*. These requirements will be applicable to the new nuclear power plant and, along with other normative technical documents, will enable to assure the state regulation and supervision of nuclear facilities in Lithuania. In the drafted requirements, the scope of application of the deterministic safety analysis, acceptance criteria, analysis assumptions and methods will be described. The requirements are being prepared in line with the regulatory documents on nuclear safety and radiation protection valid in Lithuania, the recommendations of the Western European Nuclear Regulators Association (WENRA) and the International Atomic Energy Agency as well as the best practice principles of other countries.

Probabilistic safety assessment

The probabilistic safety assessment (PSA) is one of the most frequently used methods in assessing the risks posed by the sophisticated systems. This method is also known as the probabilistic risk analysis. The probabilistic safety assessment for the first time was applied in 1975 in the United States and is known as the *Reactors' Safety Study*. Since this original study, the PSA methods have been upgraded and the PSA has become a standard safety assessment tool for nuclear reactors and other sophisticated technical systems.

At present, there is a clear tendency to use the PSA results in making decisions related to safety. The main fields of the PSA application are the analysis and assessment of technical modifications, management of accidents, application of risk-based methods, development and optimization of the scopes of tests and regularity of testing of safety-related systems and scheduling of maintenance works.

It should be mentioned that the PSA method was applied in analysing technical decisions, proposed by Ignalina NPP regarding to prolong the period between the inspections of safety-related systems and equipment in Unit 2. Ignalina NPP, by taking into consideration the comments provided by VATESI, performed the analysis of the integral risk growth. This analysis revealed that the obtained results in terms of their acceptability are close to the marginal ones as compared to the acceptability criteria applicable worldwide. Therefore VATESI decided to object to Ignalina NPP's decisions to prolong the period between the inspections of safety-related systems and equipment in Unit 2 to January 2010.

In 2009, Ignalina NPP submitted for VATESI approval the *Probabilistic Safety Analysis Report of External Events and Events in a Shutdown Reactor*. The PSA model of Ignalina NPP was upgraded, the data were updated and a detailed analyses of potential external events (fall of a missile, extreme wind and precipitation conditions, external fire, external flooding) were carried out. In the report the initiating events at the shut-down reactor were analysed as well. VATESI specialists analysed the report submitted by Ignalina NPP which confirmed the results of the deterministic safety analysis stating that when the reactor is taken out of operation all works can be performed at a minimum risk.

By performing the state regulation and supervision over nuclear facilities and by getting ready for the construction of the new nuclear power plant, VATESI specialists started drafting the *Probabilistic Safety Requirements*. These requirements will

define the PSA target levels 1 and 2, the scope of analysis and probabilistic safety criteria. The requirements are being prepared abiding by the legal acts regulating nuclear safety and radiation protection that are valid in Lithuania, the recommendations by the Western European Nuclear Regulators Association (WENRA), the International Atomic Energy Agency and the best practice principles of other countries.

As of late 2009, the IAEA arranged in Budapest (Hungary) a seminar *Decision-Making Based on Risk Assessment*, where specialists from Lithuania participated as well. During the seminar, the PSA specialists shared experience how the PSA is put into practice in different countries in the decision-making process on the safety-related issues. In 2010 it is being planned to arrange a similar event in Lithuania which would be beneficial to the specialist of our country both in performing supervision over the safety of Ignalina NPP closure and decommissioning as well as in getting ready for the construction of the new nuclear power plant.

Implementation of safety improvement program (SIP-3)

The only way to successfully develop nuclear energy lies in unconditional assurance of safety and reliability based on rational application of scientific and technological innovations. Therefore safety at Ignalina NPP has been continuously upgraded. These works are carried out in line with the special Ignalina NPP Safety Improvement Program that has been agreed with VATESI and approved by the Ministry of Energy of Lithuania. The Safety Improvement Program was started in 1993, and it is updated and reviewed on an annual basis. The objective of the program is to continuously enhance safety at Ignalina NPP by implementing upgradings of safety-related systems and procedures, and by taking into consideration the operational experience of Ignalina NPP and organizations of foreign countries. During a sixteen-year period of the implementation of the safety improvement program, more than 360 measures were put into practice (Figure 1), approx. LTL 875 million were spent for the purpose (Figure 2).

Figure 1. Implementation of safety improvement measures at Ignalina NPP in 1993 – 2009

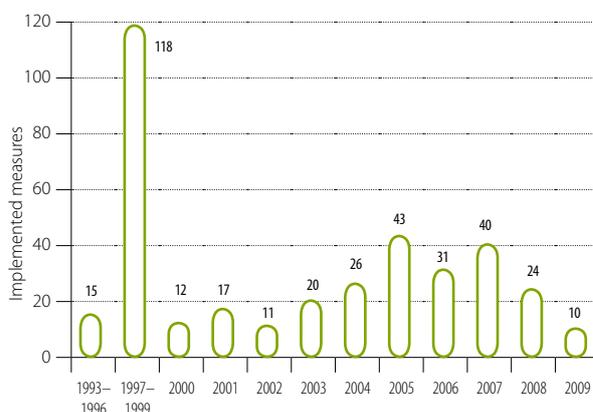
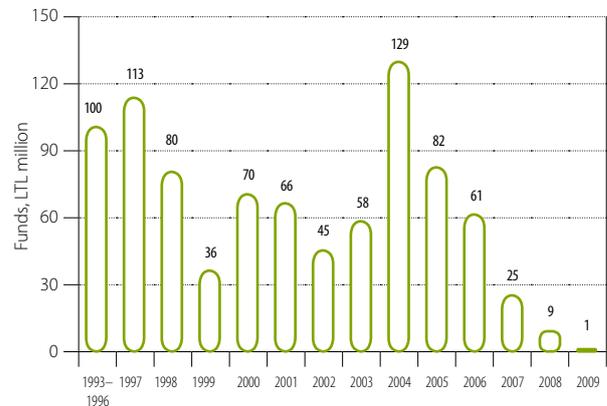


Figure 2. Funds allocated for safety improvement at Ignalina NPP in 1993 – 2009



To make sure that the safety upgrading measures are implemented on time and with adequate quality, VATESI was supervising the implementation of the safety improvement program by Ignalina NPP. Ignalina NPP, upon having implemented a SIP measure, informs VATESI and submits documents evidencing the implementation.

In addition to that, in 2009 the issues of the safety improvement program were analysed during the joint meetings of VATESI and Ignalina NPP managers and specialists. Twenty safety improvement measures were included in SIP-3/2009 program; 14 of these were to be implemented in 2009, one is to be accomplished by 2010, and one by 2012. Four of these measures are being implemented on a permanent basis.

In 2009, Ignalina NPP implemented 10 measures and agreed them with VATESI. VATESI, upon having analysed the reporting documents submitted by Ignalina NPP, provided comments on 2 measures. By the decision of Ignalina NPP and subject to VATESI approval, the works on the implementation of 2 measures were suspended due to the planned final shut-down of Ignalina NPP Unit 2 by the end of 2009. Moreover, in 2009, like in the previous years, the works for liquidation of leakages in the accident confinement system, measures to reduce the frequency of individual exposure to radiation dose (the implementation of the ALARA principle), analysis of ageing of Ignalina NPP safety-related systems and for supporting the qualified condition of safety-related systems were carried out. Upon having assessed the results of Ignalina NPP safety improvement program and with regard to the safety performance indicators of Ignalina NPP Unit 2, the level of safety of Ignalina NPP in 2009 was evaluated as being acceptable.

In 2009, Ignalina NPP accomplished and got approved by VATESI the following principal safety improvement measures:

1. Seismic warning and monitoring system modification;
2. Probabilistic analysis appliance during determination of periodicity and amount of safety related systems and elements testing;
3. Assessment of ALS hydrogen monitoring systems;
4. Hydrogen control system upgrading in a top steam reception chamber of ALS;
5. Elimination of discrepancies in the system of safety parameter presentation in MCR-2 after DSS implementation;
6. Justification of INPP organizational structure change;

7. Development, delivery and installation of the system of SFA fuel element's integrity monitoring at power Units 1 and 2;
8. Supplement of PSA model with analysis of external events and analysis of events at the shutdown reactor;
9. Justification of changes in the INPP adequate emergency operating procedures made in the process of SAMG implementation;
10. Installation of lighting protection devices and peak over voltage facilities.

Safety culture at the State Company Ignalina Nuclear Power Plant

In accordance with the Law on Nuclear Energy of the Republic of Lithuania, VATESI is responsible for ensuring that enterprises that were granted a license by the inspectorate, including Ignalina NPP, maintain adequate safety culture.

VATESI, by monitoring safety culture at Ignalina NPP, was analysing the reports regularly submitted by the State Company Ignalina Nuclear Power Plant on the safety culture in the organization, as well as the report on the results of the

safety culture assessment survey among its employees, which was carried out in 2009.

The issues of ensuring safety culture become especially important in view of getting ready for operation of new nuclear facilities when new divisions are being formed and new processes are being implemented as well as in the course of transition to the decommissioning stage of Ignalina NPP when all activities and structure of the organization responsible for the safety of Ignalina NPP are being readjusted along with the significant reduction in the number of its employees.

In 1992, 5 788 employees were working at the State Company Ignalina Nuclear Power Plant, in 2004 the number of employees dropped up to 3 642 (Unit 1 was shut down in the end of 2004). As of 1 January 2008, the number of employees at the State Company Ignalina Nuclear Power Plant was 3 145, as of 1 January 2009 – 2 995 (Unit 2 was shut down at the end of 2009), and as of 1 January 2010 – 2 354.

The monitoring of safety culture at Ignalina NPP is performed by analysing the relevant data based on the system consisting of 11 indicators implemented in the company. This system reflects the trends in ensuring and improving the competence of the employees, identification of established shortcomings and their elimination (see the below Table).

Safety culture indicators at Ignalina NPP in 2009

Safety culture indicators at Ignalina NPP in 2009		2009 m.			
Code	Short description	I quarter	II quarter	III quarter	IV quarter
I _{1.1}	Coefficient of organization of internal training at Ignalina NPP	1	1	1	0.92
I _{1.2}	Coefficient of organization of training outside Ignalina NPP	1	1	1	1
I ₂	Coefficient of implementation of Safety Committee's recommendations	0.75	0.92	1	0.86
I _{3.1}	Coefficient of implementation of audit results	0.4	0.5	0.5	0.63
I _{3.2}	Coefficient of implementation of safety inspection's results	0.89	0.97	0.99	1
I ₄	Coefficient of non-recurrence of unusual events	0	1	1	1
I _{5.1}	Coefficient of unusual events due to personnel error	1	0.5	1	1
I _{5.2}	Coefficient of incentives positive/ negative measures applied to personnel	0.17	0	0.06	0
I _{6.1}	Coefficient of implementation of personnel proposals submitted to Ignalina NPP top management	0.5	0	0	0
I _{6.2}	Coefficient of implementation of personnel proposals regarding modifications	0.71	1	0.55	0.73
I _{6.3}	Coefficient on work with personnel proposals to use their own and operational experience	1	1	1	0.82
I _{SC}	Total relative indicator of safety culture efficiency	67.45%	71.73%	73.64%	72.36%

In 2009, Ignalina NPP accomplished its goal to maintain the total yearly indicator of safety culture efficiency (in the Table – I_{3c}) above 65 %; the average indicator by quarters was 71.3 %. The following positive trends of safety culture were ascertained for a few (two - three) consecutive years:

- Efficient internal and external training processes ($I_{1,1}$ and $I_{1,2}$, respectively);
- Implementation of the State Company *Ignalina Nuclear Power Plant* Safety Committee's recommendations (I_2);
- Implementation of inspection's results ($I_{3,2}$);
- Work with personnel proposals to use their own and operational experience ($I_{6,3}$).

High level of safety culture at the State Company *Ignalina Nuclear Power Plant* is evidenced by the fact that in 2009, like in 2008, at the nuclear power plant there were no events assigned to level one or higher on the INES scale.

Taking into consideration a high value of the $I_{6,2}$ coefficient, very low levels of values of the $I_{6,1}$ indicator illustrate that the employees provide sufficient information to managers responsible for respective operations about the possibility to improve these activities and that these proposals are met with due consideration within the organization. According

to the procedure established at the power plant, employees do not have to address the proposal to the top managers of the power plant when they have received from the manager responsible for relevant activities a comprehensive and acceptable response to the submitted proposal or to the indicated problem.

VATESI noted that since Quarter II 2008, the values of the $I_{5,2}$ coefficient of incentives /enforcement measures applied to personnel have been very low. VATESI is planning to analyse this issue in more detail in 2010.

Since 1998, with an aim to get a full-scale assessment of the level of safety culture at Ignalina NPP, special surveys among employees have been conducted every few years by using special safety assessment questionnaires. According to the survey procedure, the employees, by filling in a special questionnaire, evaluate 33 statements corresponding to 11 indicators of safety culture. The surveys were conducted in 1998, 2000, 2004, 2007, and also in 2008 when the management took into consideration a complicated period of Ignalina NPP closure (the report on the results of the latest survey was prepared in the beginning of 2009).

Results of surveys of Ignalina NPP employees in the years 2004, 2007 and 2008

Safety culture characteristics at Ignalina NPP	Summarised evaluations given by employees, in percent (percentage from the possible maximum positive evaluation)		
	2004	2007	2008
Role of Heads of Divisions and obligation to assure safety	Excellent 90	Excellent 92	Excellent 92
Responsibility of Heads of Divisions and focus on safety issues	Excellent 86	Excellent 87	Excellent 88
Leadership and allocation of strategic importance in solving safety issues	Excellent 86	Excellent 87	Excellent 87
Organization of decision-making process in safety issues	Good 84	Excellent 87	Excellent 87
Involvement of personnel in solving safety issues	Good 76	Good 80	Good 81
Examination of own operational experience	Good 82	Excellent 87	Excellent 86
Assessment of safety	Excellent 90	Excellent 91	Excellent 91
Mutual trust among managers and other employees	Excellent 88	Excellent 90	Excellent 89
Openness in communication	Good 76	Good 80	Good 82
Operation without impairment of top priority of nuclear safety	Satisfactory 73	Good 78	Good 80
Attention to employees performing job assignments	Satisfactory 67	Good 76	Good 79
Number of Ignalina NPP employees who responded to questionnaire	305	825	785
Number of employees	3 642	3 268	3 145

Overall results of the surveys arranged in 2007 and 2008 revealed that in general most of the respondents evaluated the indicators that are important in the assessment of safety culture either as 'good' or 'excellent'. It should be noted that the 'satisfactory' rating of operation without impairment of top priority of safety and the attention to employees performing job assignments in 2004 was replaced by the positive ('good') rating in 2007 and 2008.

Quality assurance system at Ignalina NPP

In assuring safety of a nuclear facility it is important to develop and maintain an efficient quality assurance system (QAS) throughout all stages of the NPP lifetime.

VATESI exercises supervision over Ignalina NPP in all areas of activity that are relevant to assuring nuclear safety at the nuclear power plant, analyses compliance of the activities with the nuclear safety requirements prescribed by the legal acts, the QAS requirements applied by Ignalina NPP itself and the IAEA recommendations. All VATESI specialists, who in accordance with their competence are involved in supervising compliance with the set requirements for assurance of safety at Ignalina NPP, supervise the implementation of QAS requirements. This supervision consists of the regular technical checks, special inspections, working meetings of VATESI and Ignalina NPP specialists of the respective fields, analysis of license applications and documents on projected modifications submitted by Ignalina NPP, reviews of the Ignalina NPP's QAS documents (the Ignalina NPP's QAS documents are accessible to VATESI specialists online).

Analysis of quality assurance issues in the course of licensing

In 2009, VATESI specialists analysed the issues of quality assurance while examining the respective applications submitted by Ignalina NPP for issuing a license, e.g. an application to construct a storage facility for very low activity radioactive waste (project B19-1), issuing licenses to construct spent nuclear fuel management facilities (project B1), management facilities for solid radioactive waste (project B3/4). In reviewing the application documents, their compliance with the requirements on nuclear safety assurance prescribed by the legal acts and normative technical documents applicable to the relevant type of activity was assessed. VATESI was satisfied that the quality assurance measures at Ignalina NPP comply with the requirements raised for the quality assurance system of an organization operating a nuclear power plant.

In the opinion of VATESI, regardless the projected changes at Ignalina NPP and a rather intensive activity in organizing and supervising the decommissioning projects at Ignalina NPP, the nuclear power plant will have to give adequate consideration to timely and appropriate adjustment of the existing QAS in line with the requirements of the new legal framework and new recommendations of the IAEA on the implementation of the nuclear energy management systems. On 18 September 2009, this issue was discussed at the meeting held at VATESI headquarters among the VATESI and Ignalina NPP responsible specialists where VATESI activities

in preparing new requirements were presented (the draft new requirements were placed on the VATESI website on 30 November 2009 for comments by interested organizations), and Ignalina NPP plans on updating the QAS were discussed.

Changes in the organizational structure of the State Company Ignalina Nuclear Power Plant

In 2009, Ignalina applied to VATESI regarding the modification of the organizational structure – reorganization of Metals and Technical Control Division. VATESI, upon having analysed the documents justifying this modification as well as supplementary information submitted by Ignalina NPP regarding the mentioned adjustment in the organizational structure, approved the modification. The implementation of this modification was completed in July 2009.

In 2009, Ignalina NPP was implementing the measure of the safety improvement program (SIP-3/2009) *Justification of Ignalina NPP organizational structure change*. By getting ready for changes in the organizational structure of the company, on VATESI request, Ignalina NPP, in addition to the mentioned safety justification, was preparing the description of the new organizational structure and the plan of measures for its implementation. In November 2009, Ignalina NPP provided a set of documents on the mentioned modification for VATESI review, and subsequently revised them in line with comments given by VATESI specialists. Basically, the documents of modification of the organizational structure submitted by Ignalina NPP were acceptable. The decision on the validation of this modification will be made by VATESI in the early 2010.

VATESI is planning to perform the inspection in early 2010, during which the implementation of the projected Ignalina NPP measures on smooth transition to a new organizational structure and on safety assurance at Ignalina NPP will be verified.

Supervision of decommissioning of Ignalina NPP

Ignalina NPP, as the organization operating this nuclear facility, is responsible for the safe decommissioning, decontamination and dismantling of equipment as well as for the management of radioactive waste. Every nuclear facility has to undergo the stage of decommissioning. This stage, starting from preparation of decommissioning projects and finalized by specific decommissioning works, must be conducted in a safe manner. VATESI licenses these activities, analyses safety of the projects, and arranges special expertise of the projects in terms of nuclear safety.

In May 2004, VATESI approved the *Final Plan of Ignalina NPP Decommissioning*. The plan covered the entire decommissioning process which had been divided into individual decommissioning projects. Every project had to be coordinated with appropriate institutions, and its safety had to be justified. All decommissioning operations, organizational, technical and radiation protection measures were included into the scope of the project, dismantling and decontamination methods were identified, equipment and tools necessary for the works and the conditions of

their use were described, and methods of radioactive waste management were set forth. The safety analysis report confirmed that individual decommissioning works and the process as a whole will be safe.

On 31 December 2009, in accordance with the Protocol for Admission of the Republic of Lithuania to the European Union, Unit 2 was finally shut down. As of late 2009, all nuclear fuel was unloaded from reactor core of Ignalina NPP Unit 1.

In 2009, Ignalina NPP was further implementing the projects for decontamination and dismantling of unnecessary equipment at Ignalina NPP Unit 1. VATESI revised and approved the technical design and safety justification report for equipment dismantling and decontamination of building 117/1 at Unit 1, where high pressure emergency cooling systems of the reactor had been installed, that had been submitted by Ignalina NPP, and provided their comments on these documents. As of late 2009, Ignalina NPP submitted the technical design and safety justification report for decommissioning works in the final shutdown and fuel unloading phase of Ignalina NPP Unit 2. VATESI will analyse these documents and provide its comments in 2010.

In 2009, the works related to the construction of the new spent nuclear fuel storage facilities and other radioactive waste management equipment were continued. In 2009, VATESI examined the documents submitted by Ignalina NPP and issued licenses for the construction of the new spent nuclear fuel storage facility and solid radioactive waste management facilities, approved the technical design and the preliminary safety analysis report for the storage facility of very low activity radioactive waste that had been submitted by Ignalina NPP. As of late 2009, Ignalina NPP provided the technical design and the preliminary safety analysis report for the repository of very low activity radioactive waste and waste retrieval from the existing storage facilities that are being examined by VATESI; the inspectorate's comments on these documents will be provided in 2010.

Ignalina NPP reactors are of a channel-graphite type and not a single reactor of this type has been dismantled anywhere in the world as yet. The gas-cooled reactors with graphite moderators in France and Spain have been conserved and now they are safely waiting till the development of their dismantling and graphite handling technologies is finalized. Although the dismantling of Ignalina NPP reactor will be undertaken in the course of one of the final dismantling and decontamination projects, the *Feasibility Study for Dismantling of a RBMK-type Reactor* has been initiated and the preliminary safety assessment of such works has been carried out. In November 2008 VATESI approved the technical specification of this project.

Management of radioactive waste

The key principle of radioactive waste management is to manage the waste in such a manner that poses no danger to the public and the environment, and to avoid imposing undue burdens on future generations. Management of radioactive waste in Lithuania is carried out in accordance with this principle.

In accordance with the Radioactive Waste Management Strategy approved by the Government in 2008, Ignalina NPP is responsible for the implementation of a new classification system of radioactive waste, and has to install equipment



Spent nuclear fuel storage facility

for conditioning of radioactive waste, storage facilities of radioactive waste as well as the repositories of short-lived radioactive waste.

Considerable amounts of solid radioactive waste have been generated during operation of Ignalina NPP. The waste is stored in the buildings located in the territory of Ignalina NPP – 155, 155/1, 157 and 157/1. The volumes of solid radioactive waste accumulated by 2010 are presented in the below Table:

Groups of waste	Group 1 Combustible	Group 1 Incombustible	Group 2 Combustible	Group 2 Incombustible	Group 3	Total
Volumes of waste accumulated as of 1 January 2010 (m ³)	11 483	8287	2203	2823	829	25 625

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

In 2009, 683 m³ of bituminized waste was placed in the radioactive waste storage facility (building 158). By 2010, 13 963 m³ of bituminized waste was accumulated in this storage facility. In 2009, 207.35 m³ of ion exchange resins and perlite was conditioned in the cementation facility; total conditioned quantity was 494.44 m³. In 2009, 2197 cemented waste packages (drums) were produced that are stored in the cemented waste storage facility (building 158/2). In all, 5337 cemented waste packages were produced by 2009.

In accordance with the operational license conditions of Ignalina NPP Unit 1, the operation of solid radioactive waste storage facilities is permitted till 1 January 2011. With an aim



to extend the operation of these storage facilities (buildings 155, 155/1, 157, 157/1), in September 2009, Ignalina submitted to VATESI the updated safety analysis report for its review and evaluation. The submitted document is being evaluated by VATESI.

To manage solid radioactive waste located at Ignalina NPP in line with the latest requirements, it is necessary to retrieve the waste from the storage facilities, to process and to prepare the waste for disposal. In November 2009, Ignalina NPP submitted to VATESI for its review the technical design for solid waste retrieval from 155-155/1 buildings and a sorting facility of very low activity radioactive waste (B2 project, part 1). The submitted documents are being reviewed by VATESI. As of late 2008, Ignalina NPP submitted the technical design of a repository for radioactive waste of very low activity and a preliminary safety analysis report that VATESI reviewed together with experts and provided their comments. After the analysis of answers to these comments, on 29 September 2009 VATESI approved the technical design. In October 2009, Ignalina NPP submitted the technical design and the preliminary safety report for the repository (project B 19-2). These documents are being reviewed by VATESI.

Operating spent nuclear fuel storage facility

In February 2009, VATESI issued a permit for loading and storage of 12 additional containers of CONSTOR RBMK-1500 type at the dry interim storage facility of spent nuclear fuel (building 192). During 2009, 10 containers of CONSTOR RBMK-1500 type were delivered to the dry interim storage facility of spent nuclear fuel. As of late 2009, in total there were 112 stored containers with 51 spent nuclear fuel assemblies releasing heat in each of (20 of CASTOR RBMK type and 92 of CONSTOR RBMK-1500 type). It is being planned to deliver the remaining 8 containers of CONSTOR RBMK-1500 type in Quarter I 2010. The dry interim storage facility of spent nuclear fuel will be fully loaded then.

New spent nuclear fuel storage facility (project B1)

On 2 September 2009, VATESI issued a license to Ignalina NPP for the construction of a new spent nuclear fuel storage facility.

The license was issued subject to certain precedent conditions that will have to be implemented prior to starting the operation of this storage facility. These precedent conditions provide that by 1 September 2010 Ignalina will have to prepare and to get approved a separate project according to which not only the leakproof fuel assemblies but also the damaged ones will have to be managed and stored at the new storage facility. During the construction of the storage facility, Ignalina NPP will have to ensure adequate physical protection of the construction site, to install the relevant security systems. Moreover, the power plant will have to prove that the qualification and number of the subcontractors' organizations are sufficient for performing complex works.

The start-up of operation of the new spent nuclear fuel storage facility is scheduled for 2011; the spent nuclear fuel will be stored for a 50-year period. The storage facility will be constructed in the territory of Ignalina NPP, in Visaginas municipality.

At the interim solid radioactive waste storage facility with an area of 7.6 thousand square meters, in the CONSTOR RBMK1500/M2 type containers produced in Germany (each of them has the height of 4.5 meters, diameter – 2.6 meters, mass –73 tons, when loaded with radioactive waste – 116 tons) the bulk of the spent nuclear fuel that has been accumulated in the course of operation of the nuclear power plant will be stored. It is being planned to load 91 spent nuclear fuel assemblies into one container, and to store 201 containers at the storage facility.

Solid radioactive waste management facilities (project B3/4)

On 27 August 2009, VATESI issued a license to Ignalina NPP for the construction of new solid radioactive waste management facilities.

Ignalina NPP prepared the technical design of waste processing and storage facilities as well as a preliminary safety analysis report (project B3/4). VATESI and other experts, upon having reviewed the submitted documents, provided their comments and subsequently analysed the answers given to their comments, and in the end of 2008 approved the project. On 27 August 2009, by the Order No. 22.3-82 of VATESI Head, a license was issued to Ignalina NPP for the construction of the mentioned management facilities of solid radioactive waste.

The license was issued subject to certain precedent conditions that will have to be implemented prior to starting the operation of these facilities. In the course of construction, Ignalina NPP will have to ensure adequate physical protection of the construction site, to install the relevant security systems. Moreover, the power plant will have to prove that the qualification and number of the subcontractors' organizations are sufficient for performing specific works, and to provide in advance to VATESI the plans – schedules for inspecting progress in the constructions works and equipment surveys.

At the solid radioactive waste management facilities, all solid radioactive waste that has been accumulating in the course of operation and decommissioning of Ignalina NPP will be processed in line with the currently valid international requirements, and then stored for approx. fifty years. The start-up of operation of the new processing facilities of solid radioactive waste in the existing territory of Ignalina NPP, Drūkšiai village, Visaginas municipality is scheduled for 2012.

Solid radioactive waste is the waste that has been accumulated at a nuclear power plant, such as cable cuts, filters, parts of repaired equipment, construction rubbish, rubber and thermal insulation materials, worn-out equipment, pipes, construction elements of fuel assemblies, fuel channels, sensors, etc. Spent nuclear fuel will not be managed in this facility; a separate storage facility (project B1) will be used for this purpose.

Radiation protection of nuclear facilities

VATESI is the principal state institution that fulfils the functions of safety control and supervision over nuclear facilities and performs the state regulation of nuclear safety and radiation protection in nuclear energy. Therefore even before a license is issued for designing, constructing, operating and decommissioning a nuclear facility (a nuclear power plant, a facility for managing or storing radioactive waste) it is necessary to ascertain that the facility will be operated in a safe manner. The main objective of radiation protection is to ensure protection of the population and the environment against hazards that a nuclear facility may pose. The nuclear facility itself must have properties ensuring that the effects of ionizing radiation on the population and environment do not exceed the set limits both during normal operation and in the case of an accident. Therefore during operation of such facilities VATESI exercises control over compliance with the license conditions and requirements set forth in the safety regulations and normative documents. It is the compliance with these requirements and the use of relevant technologies and measures that help to protect the population and environment from negative effects of ionizing radiation.

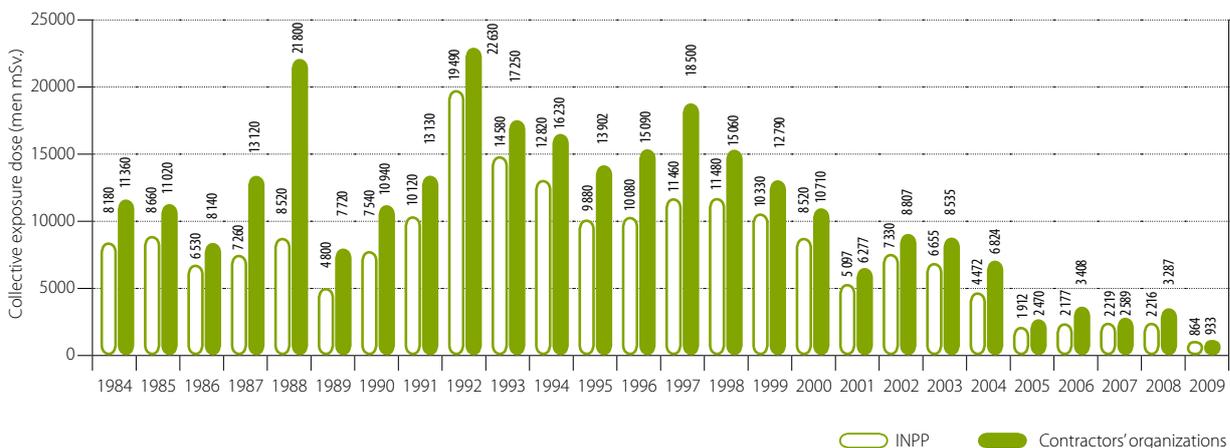
Ignalina Nuclear Power Plant is the biggest nuclear facility in Lithuania. The results of occupational exposure control as well as the results of monitoring the effects of radiation on the environment and the population show that Ignalina NPP is operated in a safe manner. Since the beginning of

operation Ignalina NPP has been conducting occupational exposure control of its own and contractors organizations' personnel. In 2009, individual dosimetric control was applied to 3 332 persons, among them 2 153 were the INPP personnel. Employees of the contractors' organisations, persons on business trips and visitors of Ignalina NPP formed the remaining part. Distribution of external exposure collective doses in 1984-2009 is shown in Figure 1.

After Unit 1 was shut down, the collective personnel's exposure dose in the period of 2005–2009 has significantly decreased. The largest collective dose is received during annual maintenance, therefore the duration and scope of this work is very important. In 2009, the annual collective dose of the Ignalina NPP and contractor organizations' personnel was 77 % of the planned yearly dose. In performing the yearly scheduled annual maintenance in Unit 2, the collective dose accounted for 81% of the personnel's overall exposure dose. The average individual dose of the Ignalina NPP and contractors organizations' personnel in 2009 was 0.28 mSv. The highest individual dose received by an employee of Ignalina NPP was 11.59 mSv, whereas the highest individual dose received by an employee of contractors' organizations was 2.71 mSv. Neither of these values exceeded the set limit of 20 mSv.

To protect the environment and the population, the activity of emitted radionuclides from Ignalina NPP into the

Figure 1. Annual collective doses of the INPP and contractors organizations' (CO) personnel



atmosphere and the lake Drūkšiai have been restricted. In the course of radiation monitoring conducted at Ignalina NPP it was established that not only the activity of emitted radionuclides was below permissible levels, but that they constituted a very small part of these levels as well. In 2009, the emissions of radioactive inert gases into the atmosphere were 0.28%, those of radioactive aerosols 0.057%, and those of ^{131}I – 0.095 of the permissible level. The total emission of radionuclides into the lake Drūkšiai was 16% of the set limit. Evaluation of the dose received by the reference group of the local population in 2009 showed that the exposure resulting from emissions into the atmosphere and the lake was 1700 times lower than the permissible dose set in the normative document LAND 42-2007. The established dose rate in the sanitary protection and monitoring zones was the same as the natural background radiation.

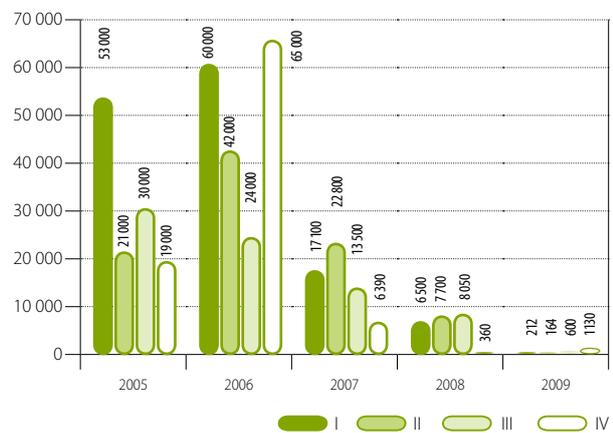
Maišiagala Radioactive Waste Storage Facility is another nuclear facility of Lithuania where radioactive waste collected from industrial enterprises, medical and science institutions until 1989 had been stored. In the mentioned storage facility, like in all other nuclear facilities, it necessary to assure the lowest possible impact of radioactive waste on the environment and on people as well.

Radiological monitoring of this nuclear facility has been conducted since 1994, with exposure doses and environmental pollution being observed on a continuous basis. Tritium (^3H) is the most important radionuclide at Maišiagala storage facility. It accounts for more than 70% of the overall activity. The maximum activity of tritium in observation wells of Maišiagala storage facility in 2005–2009 is presented in Figure 2. The data illustrate that the measured values do not exceed the set limits.

With an aim to further reduce the possibility of emission of radionuclides into the environment, additional protective barriers were installed at Maišiagala storage facility in 2004-

2006. The storage facility was covered by film coating of increased density preventing penetration of water into the storage facility from the top. Hence the possibility of leaching of radionuclides from the storage facility was constrained as well. Two monitoring wells were installed in addition to the existing ones. Samples are regularly taken from these wells and their radionuclide composition is examined. To assess whether toxic materials were not released from the storage facility, the analysis not only of radionuclide composition but of the chemical compositions of samples as well has been included in the updated monitoring program. After the installation of additional protective barriers, tritium activity in the observation wells has significantly decreased. Additional barriers are effective and have reduced the activity of emitted radionuclides from the storage facility.

Figure 2. Maximum values of tritium volumic activity in observation wells of Maišiagala waste storage facility in 2005 – 2009 by quarters of the respective year



Emergency preparedness

International cooperation

In 2009, with an aim to implement the provisions of international agreements and Conventions, VATESI was closely cooperating with IAEA, the European Commission and organizations of other countries responsible for emergency preparedness.

In July 2009, the Fifth Meeting of the Representatives of the Competent Authorities identified under the Early Notification and Assistance Conventions was held (regular meetings are arranged once in two years) that was attended by representatives from 68 countries and international organizations. At the meeting, the progress made by the respective countries in their preparedness for radiological and nuclear accidents was assessed, the IAEA activity report was presented, guidelines on the secretariat activities were defined, possibilities for the development of new measures were analysed, the ConvEx-3 Emergency Exercise Report was presented and disputed, the events at nuclear facilities that had occurred during the recent two years were discussed.

In 2009, information about six events was disseminated via the official IAEA and ECURIE systems for information exchange on radiological and nuclear accidents. On 13 February, Great Britain issued disseminated information about 2 containers contaminated with the radionuclide Co-60. The containers with the delivered metal bolts inside had been shipped from one of the companies located in China. The cargo was isolated and the reasons for contamination of the cargo are under investigation.

On 17 June, Italy issued disseminated information about fibreboards contaminated with the radionuclide Cs-137 that, according to the representative of the company, were shipped from Lithuania. This information was forwarded to the Radiation Protection Centre which in its turn inspected Lithuanian companies exporting timber to foreign countries. The radioactivity of the analysed timber samples did not exceed the established limits.

On 19 June, information was received from Belgium about an accident of local significance at the Belgium company MDS Nordion that produces medical grade radioactive Xenon gas. During the event, a small quantity of radioactive Xenon gas was released into the environment. The event had no consequences for employees, population, the environment. The total amount of released Xenon was only 4% of the allowed daily release limit of radionuclides established by the Belgian Regulatory Authority (FANC).

On 2 December information was received from France about an incident in Unit 4 at Cruas Nuclear Power Plant.



Visit of representatives of the Ministry for Emergency Situations of Belarus

During the incident that occurred due to the clogged filters in the cooling system, operation of the cooling system of Unit 4 failed, and the reactor was shut down. Water from the river Rhone is used to cool the units of the nuclear power plant. Trash that had been washed out to the river by heavy rains was sucked into the intake channel and blocked both water filters. The incident had no consequences for the employees, population or the environment; the remaining three units of the power plant were operating without disturbances.

In 2009, information was received from Argentina about the stolen Cs-137 source that has later been found and about the event in Japan when two reactors at Hamaoka Nuclear Power Plant were automatically shut down because of the earthquake. No radiological hazards were caused by the mentioned events.

In March 2009, the representatives of the Ministry for Emergency Situations of Belarus attended the in-service training at the Emergency Response Centre of VATESI. During the training they gained knowledge about VATESI activities in the field of emergency preparedness and accident management. The representatives from Belarus were interested in organization of the activities of the Emergency

Response Centre in the emergency situations, the existing equipment and its functioning possibilities.

Besides, in 2009 the Emergency Response Centre of VATESI was visited by trainees from France and Estonia.

Emergency preparedness of VATESI

In 2009, two international emergency preparedness exercises, five international communication tests and forty VATESI communication tests were arranged.

Most of the international communication tests were arranged after the regular office hours to verify the availability of the authorized institutions and their preparedness to react to emergencies at any time of the day and night.

On May 26, the ConvEx-2b international exercise was arranged by the IAEA, during which the competence of the authorized institutions in using the ENAC information exchange system was verified. During the exercise of this type, the authorized institutions are provided with information and data about a supposed accident. Depending on the content of the received information, specialists have to perform special assignments and to fill in special forms, which afterwards are sent to the IAEA. The exercise demands special knowledge and expedition because the limited time period given for the implementation of assignments.

On November 12, the international ECURIE exercise of level 3 was arranged by the European Commission where the specialists of the VATESI Emergency Response Centre participated as well. The goal of the exercise of this type is to verify the capability of specialists in exchanging information and in collaborating in line with the ECURIE agreements. To ensure functionality and due competence of VATESI Emergency Response Centre regardless of the turnover of employees, newly employed specialists were integrated into



ECURIE emergency preparedness exercise on 12 November 2009.

the VATESI exercise plan. Taking into consideration that for some specialists this was the first exercise they had ever taken part in, they can be considered to have excellently coped with their assignments. The report of the exercise stated that the goals of the exercise were accomplished. A plan of corrective measures was established with regard to certain minor shortcomings.

Emergency preparedness at nuclear facilities

As of late 2009, Ignalina NPP submitted to VATESI for their approval a draft General Part of the new *Emergency Preparedness and Accident Management Plan*. VATESI specialists provided their comments on the document. According to the presently effective VATESI requirements, the plan is revised either regularly every three years, or after important changes in operation or activity of a nuclear facility. Upon the shutdown of Ignalina NPP Unit 2 on December 31, the threat of nuclear accidents has been fundamentally reduced, but it still has remained. Therefore to get properly prepared for accidents that can potentially occur during decommissioning or termination of operation, Ignalina NPP has to prepare a new version of this plan and get approval of the plan by the end of 2010.

On 17 December, the inspection of the emergency preparedness at Ignalina NPP was conducted with an aim to check how the plan of corrective measures was being implemented, how the training of the Ignalina NPP personnel on the subjects related to emergency preparedness was being arranged, how the preparation of the new emergency preparedness and accident management plan was progressing. In addition, the condition of the control centre protected by the Emergency Preparedness Organization along with the supplies of necessary personal protective means and working tools were verified. No shortcomings were established during the inspection, however certain non-compliances were identified. The Inspection Commission brought to Ignalina NPP's attention that the validity of some protective means either had not been extended or had expired, and their quantity did not correspond to that which is indicated in the mentioned emergency preparedness and accident management plan.

The examination of Ignalina NPP documents on the emergency preparedness training of personnel, implementation of emergency preparedness measures, reports about functional training in subordinate offices and the registers of training sessions revealed that not all courses specified in the annual emergency preparedness plan-schedule for the year 2009 were delivered.

The Inspection Commission emphasized that in preparing the new draft of the *Emergency Preparedness and Accident Management Plan*, Ignalina NPP has to bear in mind that regardless of a new organizational structure and the decreasing number of employees, the responsibilities and functions in the Emergency Preparedness Organization must be maintained. Respectively, the changes in the organizational structure have to be included in the *Emergency Preparedness and Accident Management Plan*. Moreover, it is necessary to take into account the newly constructed facilities in the territory of Ignalina NPP and the ongoing decommissioning works. The Inspection Commission has drawn up the inspection protocol whereby Ignalina NPP was obligated to prepare the plan of corrective measures.



Accounting and control of nuclear materials, application of safeguards



The year 2009 was exceptional for Lithuania in safeguards application area due to the 31st Annual Meeting of the European Safeguards Research and Development Association (ESARDA) that took place in Vilnius on 25 – 26 May. This was an important event, attended by more than 150 specialists not only from Europe, but from North and South America and Asia. During the Annual Meeting more than 100 reports were delivered on the relevant subjects. Application of safeguards covers a wide scope of issues from the technical ones related to measurement of nuclear substances, inspections of nuclear facilities to the legal and political issues related to the implementation of international commitments.



In the opening session of the ESARDA Annual Meeting the report was delivered by O. Heinonen, the IAEA Deputy Director General and Head of the Department of Safeguards

In the IAEA safeguards implementation report for 2008 issued in Quarter II 2009, for a sixth consecutive year it was concluded that all declared nuclear material in Lithuania had been used for peaceful purposes only and no undeclared nuclear activities had been discovered. The IAEA is able to draw such conclusion by inspecting nuclear materials, nuclear facilities and the overall activity of a country in the use of

nuclear energy according to the Agreement on Application of IAEA Safeguards and its Protocol Additional.

The Protocol Additional provides that every year by 15 May a member country must submit an updated declaration for the previous calendar year. According to the Protocol Additional to the Trilateral Safeguards Agreement (among the EU Member States, EURATOM and the IAEA) applicable in the European Union for non-nuclear weapons countries, which has been valid in Lithuania since 1 January 2008, the respective member state and the EC bear individual responsibility for the provision of certain information. A part of the information is under the shared responsibility. VATESI, in accordance with the competence of the state, collected and summarised the information about the activities in the field of use of nuclear energy in Lithuania and submitted the information to the IAEA and the European Commission. Abiding by the requirements of the Protocol Additional, quarterly reports were also sent on Lithuania's export of nuclear equipment and technologies under control.

In August, in accordance with the Protocol Additional, the IAEA inspectors asked for complementary access to the Ignalina NPP site to verify whether no undeclared activities related to the use of nuclear materials were taking place at the site.

The conclusions on the application of safeguards for the year 2009 will be issued by the IAEA in the first half of 2010.

Accounting and control of nuclear fuel

One planned inspection of physical inventory verification at Ignalina NPP and the SNFSF was conducted by the IAEA, the European Commission and VATESI in April 2009. During the inspection the records in the accounting documents were checked, verification of fresh and spent nuclear fuel was carried out and seals selected by using the probabilistic statistical method were replaced.

Moreover, in February and November 2009, two unannounced inspections were conducted at Ignalina NPP and the SNFSF by the IAEA with the presence of inspectors delegated by the European Commission. The results of the inspections revealed that Ignalina NPP properly conducted the accounting of fuel assemblies and correctly declared their number.

Data on nuclear materials accounting and inspection activities by the IAEA, the EC and VATESI in 2009 are summarised in the Tables below along with the comparative data of two previous years.

Summary of the IAEA, EC and VATESI inspection activities in Lithuania in 2007–2009

Year	2007	2008	2009
Total number of IAEA inspectors and technicians' man days in Lithuania	164	206	156
Number of EC inspectors' man days in Lithuania	9	47	86
Number of man days spent on site by VATESI inspectors engaged in the area of safeguards	13	15	18
Number of IAEA inspectors authorised to conduct inspections in Lithuania	342	350	335
Number of EC inspectors authorised to conduct inspections in Lithuania	182	184	188
Number of VATESI inspectors engaged in the area of safeguards	2	2	2



Data of accounting of nuclear materials in 2007–2009

Year	2007	2008	2009
Amount of depleted uranium (t)	30.3	31	31.2
Amount of enriched uranium (t)	2320	2349	2368
Amount of U ²³⁵ (t)	28	27.6	27
Amount of plutonium (t)	8	8.3	8.6

Accounting and control of small quantities of nuclear materials

Under the previous arrangement all nuclear materials (with the exception of nuclear fuel) in the territory of Lithuania had been allocated to a single material balance area (MBA) – WLTC – and after transition to the Trilateral Safeguards Agreement, the European Commission had to assign individual MBA codes to each institution having nuclear materials in its disposition. Nuclear fuel had been and still remained accounted in two MBAs, namely WLTA – Ignalina NPP and the WLTD – the Spent Nuclear Fuel Storage Facility.

In 2009, 2 more MBAs were established in Lithuania: WLTU (Metesta UAB) and WLTV (Klaipėda University Hospital). As of late 2009, nine users of small quantities of nuclear materials remained in WLTC area and their reports on accounting of nuclear materials to the European Commission, which in its own turn prepares and forwards these reports to the IAEA, were submitted by VATESI. It is being planned that in 2010 all users of small quantities of nuclear materials will either hand over nuclear materials owned by them for disposal, or will be provided with individual MBA codes and will directly submit the relevant reports to the European Commission.

On 26 March 2009, VATESI conducted an inspection at Vilniaus Energija UAB and Lietuvos Elektrinė AB. During the inspection for verification of physical inventory and assessment of the accounting system of nuclear materials no infringements or discrepancies were found at Vilniaus Energija UAB and Lietuvos Elektrinė AB.

On May 12-15 2009, the inspection was conducted jointly by VATESI, the European Commission and the IAEA in 5 MBAs assigned to the users of small quantities of nuclear materials. All non-compliances with the set procedures, identified established during the inspection, were rectified.

Physical protection of nuclear materials and nuclear facilities

On 25 February 2009, to implement the reinforced international regime of physical protection of nuclear materials and nuclear facilities that had been joined by Lithuania in 2008 by ratifying the Amendment to the Convention on the Physical Protection of Nuclear Materials, the Resolution of the Government of the Republic of Lithuania was passed whereby

institutions responsible for implementation of the Convention were appointed. VATESI was designated to act as the contact point on the issues of bringing into effect the provisions of the Convention on the Physical Protection of Nuclear Materials and the Amendment of the Convention on the Physical Protection of Nuclear Materials.

To reinforce the national regime of physical protection and with regard to the Amendment of the Convention, on 25 March 2009, VATESI issued a new revision of the *Requirements for Physical Protection of Nuclear Facilities and Nuclear Materials*. These requirements regulate in a more stringent manner the security of information and data related to physical protection, including security of computer-based and information systems. The document also emphasizes that the designing process of physical protection system of nuclear facilities has to be based on Inner and Vital Areas identification. To strengthen the system of physical protection system of a nuclear facility, the requirement to install at least two independent alarm systems, operating under different physical principles was introduced.

Inspection activities in the area of physical protection

In 2009, in line with the schedule of inspections approved by VATESI Head, three planned inspections and one unplanned inspection of physical protection of nuclear facilities were conducted. The first inspection was conducted at the closed Maišiagala Radioactive Waste Storage Facility with an objective to verify how the shortcomings that had been established during the previous inspections were rectified and to assess the existing status of the physical protection system at the storage facility after completion of its upgrading works. VATESI inspectors verified in detail the operation of each installed technical system (video surveillance, access control, perimeter protection, etc.) along with the compatibility of the whole installed system to the valid requirements of physical protection. The in-service training of VATESI inspectors at the US Nuclear Regulatory Commission (NRC), and their efforts to bring gathered experience into practice in Lithuania served as an incentive for the second inspection. During the in-service training arranged in 2008, VATESI specialists were familiarized with the physical protection inspections carried out by the NRC, and had an opportunity to take part in one of these and to directly survey how the security forces of the inspected facility protected the site during the offence. On the basis of the experience gained during the in-service training it was decided to verify how similar security exercises are organized by Ignalina NPP and the Ignalina NPP Security Unit under the State Border Guard Service. The inspection consisted of two parts: the first was undertaken for the evaluation of the organization of the table exercises, and the second – for the assessment of the tactical exercises. Moreover, a lot of attention was given to the scenarios of the exercises, compatibility of the simulated offender to the characteristics of possible offenders indicated in the Design Basis Threat.

The third planned inspection of physical protection was conducted at the newly constructed nuclear facilities with an aim to verify the assurance of physical protection at the



interim spent nuclear fuel storage facility (project B1) and solid radioactive waste management facility (project B34) that both are still under construction. According to the conditions of construction licenses issued to these facilities by VATESI, during all stages of construction and till the start-up of operation of the joint security system for both facilities, Ignalina NPP is obligated to ensure the physical protection level of these facilities that should not be below the level prescribed by the Physical Protection Plan for the specific construction site. During the inspection it was verified how the Physical Protection Plan was being implemented and how Ignalina NPP security service, the Ignalina NPP Security Unit under the State Border Guard Service, the general contractor and the security service hired by the construction contractor had been performing the functions prescribed by the plan.

In 2009, Ignalina NPP upgraded the access control system. The access control system is one of the fundamental parts of physical protection of a nuclear facility the objective thereof is to assure entrance to and exit from the Inner or Vital Areas only by these persons or means of transport that have been authorized to do so. Besides, this system has to identify all attempts of unauthorized access to the protected zones of the site. VATESI inspectors conducted the unplanned inspection of the access control system with an aim to assess the testing works of the upgraded system conducted by the responsible Ignalina NPP employees and Fima UAB, the company that had performed the upgrading works, as well as the acceptance of works from the contractor by Ignalina NPP.

In accordance with the established procedure, an inspection protocols were provided to the inspected organization defining the established infringements and non-compliances. The inspected organization was obligated to rectify these shortcomings. The shortcomings established during the conducted physical protection inspections cause no threat for safe decommissioning of Ignalina NPP and safe operation of other nuclear facilities.

Design-Basis Threat

To get ready for the construction of the new nuclear power plant in Lithuania in the best possible way, even at this early stage, due consideration is being given to the security of the future nuclear power plant. The first step in this process is the identification of the Design-Basis Threat. In accordance with the Law on Nuclear Energy, Article 50, Paragraph 4, the Design-Basis Threat in nuclear facilities is defined by the State Security Department of the Republic of Lithuania with the participation of the Ministry of National Defence, the Ministry of the Interior, VATESI and the operator of a nuclear facility. To attain this goal, in 2009 the State Security Department established a working group for defining the Design-Basis Threat, consisting of the representatives of responsible institutions. In identifying the Design-Basis Threat, the Guidelines for defining the Design-Basis Threat issued by the IAEA in 2009 were followed (the representatives of Lithuania had been involved in drawing up these Guidelines as well). In accordance with the IAEA Guidelines, prior to defining the Design-Basis Threat, all publicly available information or the information kept in disposition of intelligence services about

the existing or potential threats, historic events at nuclear power plants worldwide has to be collected. Upon having analysed and systemised the available information relevant to defining the Design-Basis Threat, the working group prepared the draft Design-Basis Threat for Visaginas Nuclear Power Plant. This draft was approved by all responsible institutions and presented to the Ministry of Energy as the document identifying the Design-Basis Threat for Visaginas Nuclear Power Plant.

In addition to that, in 2009 the Design-Basis Threats for Ignalina NPP and the SNFSF were revised and updated with the involvement of VATESI.

Seminar on physical protection issues

To get ready for the streamlined implementation of the physical protection system, on 7 – 8 April 2009, VATESI together with Visagino Atominė Elektrinė UAB arranged a seminar *Physical Protection Issues in the Preparatory Stage and During the Construction of the New Nuclear Facility*. The seminar was attended by the representatives of the Ministry of Defence, Ministry of the Interior, State Security Department, Ignalina NPP and some private companies. Side by side with the representatives of Lithuania, physical protection specialists from Bulgaria, Sweden and the US took part at the seminar and exchanged their experience.



An expert from Bulgaria is presenting the experience of his country at the seminar arranged on 7 – 8 April.

Presentations on legal framework of physical protection in Lithuania and the role of the state institutions in assurance of and control over physical protection were made to the participants of the seminar. The representatives of Ignalina NPP and private companies shared their experience in implementing physical protection projects.



Control over dual-use nuclear goods

Lithuania became a member of the Nuclear Suppliers Group (NSG) in 2004. The conditions for hand-over of dual-use nuclear materials, equipment and technologies by one country to another are laid down in the *Guidelines of the Nuclear Suppliers Group*. By implementing these conditions, as of late 2004, VATESI together with the Ministry of Economy issued to the country – supplier of the imported dual-use nuclear goods the first state assurance for the use of these goods for peaceful purposes. VATESI has been conducting yearly inspections of the use of imported dual-use nuclear goods since 2005.

As of late 2009, the inspection was conducted at Ignalina NPP to verify whether the dual-use nuclear goods for which

the formal governmental assurances had been issued were delivered to Ignalina NPP and were used according to the obligations under the state assurance. During the inspection a single non-compliance was found that was related to internal control at the NPP. Ignalina NPP prepared and submitted to VATESI the plan for rectifying the indicated non-compliance whereby it undertook to strengthen control over the use of strategic goods.

When dismantling of Ignalina NPP is started, some of its dual-use parts or equipment that are still suitable for further operation will be sold (exported). The Ignalina NPP top management has been notified about the risks of proliferation of nuclear strategic goods, and the importance of export control over dual-use strategic goods has been emphasized.



Reports on meeting commitments under International Conventions

Reporting under the Convention of Nuclear Safety

The Convention on Nuclear Safety (CNS) was adopted on 17 June 1994 in Vienna. The Republic of Lithuania ratified the Convention on Nuclear Safety on 17 October 1995. The goals of the Convention on Nuclear Safety are as follows:

- To achieve and maintain a high level of nuclear safety worldwide, by consolidating international measures, including international cooperation as well as technical cooperation related to safety assurance;
- To develop and maintain efficient measures of nuclear facilities protection against potential radiological hazard, with a view to protect humans and the environment from dangerous effects of ionizing radiation emitted by these facilities;
- To prevent accidents with radiological impacts, and to mitigate their effects if they do occur.

Meetings of the contracting parties under the Convention on Nuclear Safety are held every three years. On 14-25 April 2008, the fourth review meeting of the CNS was held in Vienna. The fifth meeting has been scheduled for the beginning of April 2011.

VATESI took part in the first extraordinary meeting that was held in Vienna on 28-30 September 2009, where the issues related to the preparation of the national reports were discussed. The report of the Republic of Lithuania regarding the implementation of the provisions of the Convention on Nuclear Safety the preparation whereof is coordinated by VATESI has to be completed and submitted to the IAEA by 1 September 2010. To assure timely and high quality preparation of this report, in the beginning of 2010 VATESI will work out and reconcile with other institutions and organizations the plan for drawing up the report and will prepare the relevant information.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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



provisions of Article 32 of the Convention, Lithuania, like other contracting parties, is obligated to prepare the report in which the information about fulfilment of obligations under the Convention has to be provided to other contracting parties.

In 2008, VATESI together with other institutions prepared the second national report of Lithuania, mandatory under the Convention. The report was worked out in line with the provisions of the *Guidelines on the Form and Structure of the National Reports* approved by the contracting parties. In the second national report VATESI updated the information of the first report on the legal framework for spent nuclear fuel and radioactive waste management, existing facilities, practice of spent nuclear fuel and radioactive waste management and the planned safety improvement measures in this area. The contracting parties had to provide their questions and comments on the national reports by 11 February 2009. Thirty nine questions were provided on the national report of Lithuania. VATESI and other institutions that had been involved in preparation of the report prepared answers to the received questions. The reports were discussed at the third review meeting arranged in Vienna 11-20 May 2009. The delegation of 7 representatives that had been formed by the Decree of the Prime Minister of the Republic of Lithuania participated in the meeting. Lithuania took part in the activities of the second review group together with the Republic of South Africa, France, Slovakia, Estonia, China, Belarus and Senegal. Lithuania presented its national report on 15 May. Lithuania was asked some additional questions and the immediate answers were given to these questions. The conclusions of the meeting are favourable to Lithuania – Lithuania fulfills its obligations under all Articles of the Convention.



International cooperation

Nuclear safety regulation in the European Union, the role of the European Commission and Member States – ENSREG

All Member States of the European Union that are operating nuclear facilities follow the main internationally acknowledged principles of nuclear safety and spent nuclear fuel and radioactive waste management. These principles are laid down by the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The High Level Group (HLG) on Nuclear Safety and Waste Management was established by the resolution of the European Commission in 2007. Later the HLG was renamed the European Nuclear Safety Regulatory Group (ENSREG) that was delegated the mission to establish the conditions for continuous improvement and to reach a common understanding among the EU Member States in the areas of nuclear safety, spent nuclear fuel and radioactive waste management.

By following the principle of continuous improvement of nuclear safety, ENSREG is seeking to accomplish the following goals: assuring and further improving safety of nuclear facilities, safety of radioactive waste and spent nuclear fuel, decommissioning, raising finance for management of radioactive waste and spent nuclear fuel.

All EU Member States are represented in ENSREG by high officials and experts from their national regulatory institutions supervising nuclear safety and nuclear waste safety. Lithuania in ENSREG is represented by VATESI Head and his Deputy.

In 2009, four ENSREG meetings were held where the issues of implementing the ENSREG work program were discussed. At the meetings, special attention was given to the draft Nuclear Safety Directive establishing a Community framework for the nuclear safety of nuclear facilities (the Directive was adopted on 25 June 2009), discussions on new challenges in the period of 2010-2011, and on the draft of the first ENSREG Report to European Parliament and European Council. ENSREG approved the mentioned report in July 2009.

To accomplish the objectives of the ENSREG program, three working groups have been established:

- Group on nuclear safety improvement;
- Group on safety improvement in radioactive waste management, decommissioning and spent nuclear fuel;
- Group on public information and transparency.

VATESI has delegated its specialists to the first two working groups.

ENSREG Working Group on Nuclear Safety Improvement

In 2009, the ENSREG Working Group on Nuclear Safety Improvement (WGNS) was working in several directions: the analysis of relevance of the European Union instruments for regulation of nuclear safety; more efficient application of the mechanism defined by the Convention on Nuclear Safety in the EU Member States for improvement of nuclear safety; implementation and evaluation of nuclear safety regulation measures at the national level.

While discussing the expediency of the European Union mandatory instruments for regulation of nuclear safety, the ENSREG members voiced very diverse opinions, therefore the WGNS was asked to make a more comprehensive analysis of the subject and to prepare the report. This primary analysis, by considering *pro et contra* arguments, was conducted in 2008. Various scenarios were considered:

1. New instruments should not be developed; the existing international mechanisms and measures applied on a national level should be used instead;
2. Framework Directive should be developed by using the relevant elements from the Convention on Nuclear Safety;
3. Framework Directive should be developed with an obligation to set strict safety standards;
4. Directive setting detailed safety standards should be developed;
5. Development of non-binding instrument (detailed or not detailed).

Most of the EU Member States favourably evaluated the report of the completed analysis of the impact of the EU binding legal instruments on nuclear safety, and approved the final report on April 2009.

It should be mentioned that at the meetings of the Working Party on Atomic Questions at the EU Council of Ministers held in 2008 – 2009, the draft Nuclear Safety Directive was analysed and revised. VATESI specialists also attended these meetings, analysed the draft documents and provided their comments and proposals. With regard to the adopted Council Directive 2009/71/EURATOM establishing a Community framework for the nuclear safety of nuclear facilities (Nuclear Safety Directive) as well as changes in the ENSREG priorities, WGNS prepared the draft Work Program for the period of 2010-2011, the discussion whereof is projected at the ENSREG meeting that will take place in January 2010. For the implementation of the program it is being planned to establish three separate sub-groups that will work in the following areas:

- Drawing up the guidelines on the content and preparation of the Member States reports in accordance with Article 9.1 of the Directive;
- Drawing up the guidelines for self-assessment (Article 9.3 of the Directive);
- Compilation of schedules and planning of resources for the Member States self-assessment and collegial assessment.

In 2009, WGNS completed the assignment that had been started in the previous year, aimed at summarising the results of the IAEA missions by the International Regulatory Review Team (IRRT) and the Integrated Regulatory Review Service (IRRS) that had been arranged in the EU Member States since 1998 to give independent appraisal of the nuclear safety regulatory institutions. The report of this activity was approved by ENSREG in October 2009. In 2010, WGNS is going to continue the work for the assessment of the EU Member States infrastructure of nuclear safety (in line with the provisions of Chapter 9 of the Directive).

Four meetings of this working group were held in 2009. In principle, the goals set by the working group have been accomplished - the drafted documents were submitted to the ENSREG for approval.

ENSREG Working Group of Radioactive Waste Management

The Working Group on Improving Spent Fuel, Radioactive Waste Management and Decommissioning Arrangements is responsible for safety of radioactive waste and spent nuclear fuel management, decommissioning and management of radioactive waste and spent nuclear fuel accumulating in the decommissioning process, and financing issues. The goals of this working group are:

- To develop safe management of all types of spent nuclear fuel and radioactive waste;
- To exchange ideas on solving the challenges regarding availability of highly qualified personnel and know-how management during decommissioning process;
- To share information and good practice in the fields of radioactive waste management and decommissioning.

By implementing the set objectives, the Working Group is seeking to identify the key elements of spent fuel and radioactive waste management and decommissioning practices. To accomplish the targeted objectives, preparation of the following documents was finalized in 2008-2009:

- Better use of Joint Convention processes in the European Union;
- Identification of drivers and obstacles for the progress in waste management and waste safety;
- Identification and enhanced use of best practices for safe management of radioactive waste in the European Union;
- International assessment and effectiveness of regulation;
- The content and objectives of national programs and plans for waste management and waste safety,
- Better exchange of information on radioactive waste safety.

These documents were also approved by ENSREG. Later the measures envisaged by the provided documents will be implemented.

At the end of the year a new assignment was given for the Working Group – to prepare the draft wording of the Directive on Radioactive Waste Management. This work will be further continued in the coming year. It is expected that the draft Directive will be submitted by September 2010.

VATESI participation in activities of Western European Nuclear Regulators' Association (WENRA)

Heads and specialists of regulatory institutions of the countries that use nuclear energy participate in the activities of Western European Nuclear Regulators Association (WENRA).

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 are represented in the Association. At WENRA events the representatives of the regulatory institutions discuss the issues of nuclear safety regulation and harmonization of supervision; they exchange information important in terms

of safety, share experience, and envisage the trends of safety improvement.

Representatives of nuclear safety and radiation protection institutions of the countries that do not have nuclear power plants are also invited to take part at WENRA meetings.

Two working groups are functioning in WENRA - the Reactor Harmonization Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD). Lithuania joined both Working Groups in 2004. In 2006, after WENRA approved the reference safety levels for 18 areas of reactor safety prepared by RHWG, all the countries of RHWG drew up 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.

Activity of WENRA Reactor Harmonization Working Group (RHWG)

The objective of WENRA Reactor Harmonization Working Group (RHWG) is to establish the key requirements for the presently operating nuclear power plants, safety reference levels of reactors and to harmonize these levels in WENRA member countries.

Currently the representatives of nuclear safety regulatory institutions of 17 countries – Finland, Italy, Belgium, France, Great Britain, Sweden, Lithuania, Germany, Spain, Slovakia, Switzerland, Czech Republic, Rumania, Bulgaria, Holland, Hungary and Slovenia – are the participants of WENRA RHWG activities. The Ukraine has joined the Working Group by the rights of an observer.

Every country participating in the activity of WENRA, including VATESI which is representing Lithuania, since 2006-2008 has been conducting in their respective countries the comparative study of their national legal framework regulating nuclear safety with the WENRA safety reference levels. The comparison of its normative documents with these reference levels was also conducted by Ignalina NPP. Each country drew up its own national action plan for removal of non-compliances and implementing safety reference levels in the respective country by 2010 by transposing them to the national legal acts.

With regard to the final version of safety reference levels, prepared by WENRA RHWG in 2008, the national action plan of Lithuania for the year 2008 was adjusted. The plan stipulated that the missing 120 WENRA RHWG safety reference levels would be transposed to the legal framework regulating nuclear safety, and 76 safety reference levels would be implemented at Ignalina NPP.

As of late 2009, VATESI issued 2 new legal acts which included 11 WENRA RHWG safety reference levels. The remaining safety reference levels have been included into draft rules and regulations that are still being prepared by VATESI.

As of late 2009, Ignalina NPP accomplished all safety reference levels that had been projected to be implemented by 2010. The remaining 24 WENRA RHWG safety reference levels will not be implemented basically due to the final shut-down of Ignalina NPP Unit 2 in 2009.

To harmonize the requirements for the new nuclear power plants, in 2008-2009 RHWG discussed the main targeted

goals in terms of safety quality and quantity. It has not been planned as yet to set the specific safety reference levels for new reactors.

Working Group on Waste and Decommissioning (WGWD)

As of late 2001, the Working Group on Waste and Decommissioning (WGWD) started the project for harmonization of the requirements in force in the WENRA member countries in the areas of decommissioning of nuclear facilities and operation of radioactive waste storage facilities. The goal of this assignment is to develop the safety reference levels which have to be followed by the WENRA member countries. If necessary, the national requirements will be amended. The safety reference levels are worked out with regard to the already existing legal frameworks and international recommendations.

As of late 2005, the WGWD prepared two reports in which the safety reference levels for decommissioning of nuclear facilities and operation of radioactive waste storage facilities were presented. In early 2006 these reports were officially publicized on the Internet.

The WGWD member countries analysed the legal framework of their respective countries and its practical implementation, and compared these in terms of compliance with the safety reference levels for operation of storage facilities and decommissioning of nuclear facilities. The results of these analyses were reviewed by specialists of other WGWD member countries to ascertain that all the countries interpret the safety reference levels in the same way.

Two meetings of the WGWD were held in 2009, one of them took place in Brussels on April 20-24, another was held in Madrid on November 23-27. At the meetings in Brussels and Madrid the proposed adjustments in safety reference levels for operation of radioactive waste storage facilities were discussed that were introduced after the analyses and their reviews conducted by all member countries. Besides, the Terms of Reference for setting the safety reference levels for radioactive waste disposal were drawn. For the purposes of preparation of the Terms of Reference for setting the safety reference levels for radioactive waste disposal, all WGWD member countries were divided into four working groups, each of them was preparing the safety reference levels for the respective safety area assigned to them. Lithuania was appointed to the working group together with Czech Republic, Slovakia and Finland and was preparing the safety reference levels for radioactive waste related to such areas as the responsibility, organizational structure of the licensee, safety management and characterisation of the construction site of the disposal facility.

VATESI participation in the activities of European Clearinghouse on NPP Operational Experience Feedback

In 2008, nuclear safety regulation institutions from seven European countries signed a Multilateral Agreement on establishing a network on operational experience feedback (OEF) for nuclear power plants. The project was called the

European Network on Operational Experience Feedback, sometimes in short referred to as the Nuclear Safety Clearinghouse (NUSAC). The overall objectives of the project are to promote cooperation in the NPP operation experience feedback, disseminate information about the "lessons learned", understanding of the importance of NPP operational experience feedback for safe and cost-effective operation of the presently operated and newly constructed NPPs and to propagate perspective methods for the assessment of events relevant to NPP safety. The project participants are Finland, Hungary, Lithuania, Netherlands, Rumania, Slovenia and Switzerland. Spain and Czech Republic are participating by the observer rights. It is expected that in 2010 France, Germany and Belgium will become the members of the NUSAC. The project is being implemented by the Energy Institute that is one of the seven institutes of the European Commission's Joint Research Centre (JRC) established in Peten (Netherlands).

To coordinate the implementation of the main objectives and goals of the European Clearinghouse and to approve the annual work programs, the Technical Board has been established whereat the organization from each country that had signed a declaration of intent sent one representative. At the meetings of the Technical Board Lithuania is represented by VATESI Head.

The objectives of the European Clearinghouse are as follows:

- Improving the existing and newly constructed NPPs safety through strengthening co-operation between licensees, regulatory authorities and their Technical Support Organizations;
- Making input to the use of operational experience feedback by strengthening and sharing competencies, enhancing mutual relations within the European Clearinghouse and with international community using nuclear power;
- Collecting, summarizing and disseminating information on NPP operational events along with the continuous and systematic application of knowledge gained from European countries participating in the project;
- Establishing the best-practice for assessment of NPP operational events through the use of state-of-the-art methods, computer aided assessment tools and information gathered from different national and international sources;
- Providing support in defining the long-term EU policy needs on the operational experience feedback.

In 2009, the European Clearinghouse prepared two high level analysis reports; four reports are still under preparation, including the reports on events that occurred in the nuclear power plants with the pressurized water reactors (PWR), events related to fuel management and NPP maintenance. European Clearinghouse has developed and launched the website (<https://clearinghouse-oefjrc.ec.europa.eu/>) and the data basis. Publication of a quarterly online newsletter was started, providing summarized information about the incidents related to nuclear energy that occurred during the last quarter worldwide. European Clearinghouse experts provided assistance to the regulatory institutions of the countries-project participants by performing independent survey of analysis reports on unusual occurrences at NPPs. These reports later will be placed on the special IAEA /NEA IRS database.

Technical cooperation projects of the International Atomic Energy Agency (IAEA)

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

In 2009, VATESI coordinated the participation of Lithuanian specialists in eleven IAEA European regional projects for technical cooperation in the area of nuclear safety and nuclear energy:

- RER/0/029 – Supporting the Introduction of Nuclear Energy (jointly with the Ministry of Energy),
- RER/3/006 – Supporting the Repatriation, Management and Disposal of Fresh and/or Spent Nuclear Fuel from Research Reactors,
- RER/3/008 – Strengthening Safety and Reliability of Nuclear Fuel and Nuclear Materials in Nuclear Power Plants,
- RER/4/030 – Strengthening Capabilities for Nuclear Power Plant Performance and Service Life including Engineering Aspects,
- RER/4/031 – Improving Quality Management and Quality Assurance in Nuclear Power Plant Constructing, Equipment Manufacturing and Maintenance Activities,
- RER/4/032 – Enhancing the Sustainability of Research Reactors and Their Safe Operation Through Regional Cooperation, Networking and Coalitions,
- RER/9/085 – Capacity Building for Upgrading Nuclear Security Related National Infrastructure,
- RER/9/095 – Strengthening Safety Assessment Capabilities,
- RER/9/098 – Improving Safety Management Systems and Operation Feedback,
- RER/9/099 – Strengthening the effectiveness of Regulatory Authorities and Advanced Training in Nuclear Safety,
- RER/9/102 – Developing Human Resources in Nuclear Security.

In 2009, while engaged in the above projects, Lithuania's representatives participated in 29 events outside the country, including 17 working meetings, 4 training courses, 8 technical meetings. Fifty five specialists from Ignalina NPP, Visagino Atominė Elektrinė UAB, 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 established business contacts with their foreign counterparts.

In 2009, two events arranged by the IAEA were held in Lithuania:

- On 2 - 6 March a workshop *Safety Analysis in the Course of Modifications of a Nuclear Power Plant* was arranged in Kaunas (under the framework of RER/9/095),
- Part II of *Basic Professional Training Courses on Nuclear Safety* was arranged on 19-30 October at Lietuvos Energija AB's head office in Vilnius and Ignalina NPP Training Centre in Visaginas (under the framework of RER/9/099).

These two meetings were attended by the specialists from Lithuania, Albania, Armenia, Azerbaijan, Belarus, Bulgaria,

Georgia, Montenegro, Kazakhstan, Croatia, Latvia, Poland, Romania, Russia, Slovakia, Slovenia, Turkey, the Ukraine, Hungary, Germany and the IAEA.

Under the framework of the IAEA regional projects, more than 70 international events have been planned for the year 2010, including numerous meetings, courses and consultations that are important to Lithuanian specialists. Among these, one regional seminar on the issues of application of probabilistic safety analysis and decision making with regard to risks has been planned to be arranged in Lithuania under the frameworks of the project RER/9/095.

The IAEA national project for Lithuania

In 2009, the implementation of the national project by the IAEA *Enhancing capabilities of VATESI and other institutions in licensing of a new NPP*, LIT/9/009 has been further continued. The project was started in 2008 and will proceed till the end of 2011. In 2009, approx. LTL 170 thousand were spent from the budget of the project for the implementation of the relevant measures, the bulk of which are the funds allocated by the IAEA.

On 26-30 January 2009, under the framework of LIT/9/009 project, the mission by the IAEA experts was organized to evaluate the Environmental Assessment Report of the new nuclear power plant. Specialists from VATESI, Lithuanian Energy Institute, Visagino Atominė Elektrinė UAB participated in the in-service trainings, working meetings and seminars arranged in various countries on the outstanding issues of licensing of the new nuclear power plant and safety assessment, gained



A visit of Brian Wittick, the representative of the US Nuclear Regulatory Commission (second on the right) to VATESI on June 2009.



experience necessary for the construction of the new nuclear power plant, enhanced competence and knowledge in the field of nuclear technologies.

The project enabled VATESI to invite an expert from Bulgaria to take part and share his professional expertise at the seminar *Physical Safety Issues in the Preparatory Stage for the Construction of the New Nuclear Power Plant and during the Construction* arranged in Vilnius on 7-8 April.

VATESI participation in the IAEA Board of Governors

The decision on Lithuania's membership in the IAEA Board of Governors for the period of 2007-2009 was made at the IAEA 51st General Conference held on 17-21 September 2007. In 2007, by the Resolution of the Government of Lithuania, VATESI Head Gytis Maksimovas was appointed the Governor representing Lithuania in the IAEA Board of Governors. After Gytis Maksimovas changed his job, Renatas Norkus, Permanent Representative of the Republic of Lithuania to the International Organizations in Vienna, has been appointed the Governor since 7 July 2009. By the Order of the Minister of Foreign Affairs of Lithuania a working group was established with an assignment to formulate the position of Lithuania on the issues discussed at the IAEA Board of Governors. VATESI specialists, together with other institutions, took part in the activities of the working group.

In 2009, VATESI was actively involved in preparing the position of Lithuania on the issues discussed at the IAEA Board of Governors. VATESI Head acting in the capacity of the Governor of the IAEA Board of Governors represented the interests of Lithuania and spoke at the Board's meetings on the subjects having importance to Lithuania, namely:

- The IAEA technical cooperation activities. Strengthening of international cooperation in the areas of nuclear safety and radiation protection;
- Strengthening of the IAEA activities in the areas of research, technology and application in nuclear energy;
- Nuclear safety – instruments of defence against nuclear terrorism. Assurance of the state control over international commitments in the area of non-proliferation of nuclear weapons and use of nuclear materials and nuclear facilities for peaceful purposes only.

Lithuania, as a member of the IAEA Board of Governors, was actively participating in the elections of the IAEA General Director. After the tough contest between Yukiya Amano, a candidate from Japan, and Abdul Samad Minty, a candidate of the Republic of South Africa, at the meeting of the IAEA Board of Governors, the candidate supported by Lithuania Yukiya Amano gained a necessary number of votes. Mr. Yukiya Amano has started working in the position of the IAEA General Director since 1 December 2009.

Membership in the IAEA Board of Governors enabled Lithuania to strengthen a positive opinion of international community about the capability of our country to develop nuclear energy in a safe manner and to fulfil all relevant international commitments with due competence. Participation in the IAE Board of Governors enhanced the IAEA attention to the issues of critical importance to Lithuania –

development of nuclear energy and relevant infrastructure, assurance of nuclear safety and non-proliferation of nuclear materials.

The EU support projects for VATESI

In 2009, VATESI was working on three EU support projects: the implementation of one project was ongoing, two EU support projects were completed.

Project	2009	2010	2011
Support to licensing activities related to the decommissioning of Ignalina Nuclear Power Plant to VATESI (Stage 4)			
Enhancement of VATESI and its Technical Support Organizations specialists knowledge through seminars and internships			
Technical assistance to VATESI in the field of decommissioning (Stage 5)			

1. Project of the Ignalina program *Support to Licensing Activities Related to the Decommissioning of Ignalina Nuclear Power Plant to VATESI (Stage 4) No. PI.05.01.01.*

The implementation of the project was started on 23 April 2007. The project works were completed on 30 April 2009. The value of the project – EUR 999 849.

The main objectives of the project:

- To continue support to VATESI in review of documents related to licensing of Ignalina NPP decommissioning activities;
- To obtain relevant consultancy support from West European experts in relation to the assessment of decommissioning of the NPP.

2. The transition facility project *Enhancement of VATESI and its Technical Support Organizations (TSO) specialists knowledge through seminars and internships* No. 2006/018–183–03–01.

The implementation of the project was started on 15 December 2008. The project works were completed on 15 December 2009. The value of the project – EUR 450 000.

The main objectives of the project:

- To enhance competences of VATESI and its TSOs specialists in three areas of activities – operations with spent nuclear fuel, instrumentation and control, structural integrity of safety-related systems;
- To prepare recommendations for upgrading of the existing regulations for operations with fuel, and instrumentation and control;

- To prepare recommendations for inspection programs in the field of structural integrity.
- 3. **Project of the Ignalina Program Technical assistance to VATESI in the field of decommissioning (Stage 5), No. VAT.05.**

The implementation of the project was started on 23 January 2009. The scheduled completion date of the project works – 30 April 2011. The value of the project – EUR 1 999 810.

The main objectives of the project:

- To provide support to VATESI in reviewing the documents related to decommissioning of Ignalina NPP;
- To consult VATESI on the issues related to decommissioning projects.

In 2009, VATESI initiated two projects financed under the EU structural assistance for Lithuania, Operational Program for the Development of Human Resources, Priority 4 *Fostering Administrative Competences and Increasing Efficiency of Public Administration Resources*:

1. Implementation of management systems at the State Nuclear Power Safety Inspectorate (LTL 850 000, 2009–2012). The project is prepared under the framework of the facility VP1-4.3-VRM-01-V *Initiatives on quality of public services*.

Activities planned within the scope of the project: documentation of management systems; upgrading of implemented systems, certification of management systems; expansions of server-based hardware resources; implementation and upgrading of a computerized processes management system.

2. Improvement of qualification of specialists of the State Nuclear Power Safety Inspectorate (LTL 160 000, 2009–2011). The project is prepared under the framework of the facility VP1-4.1-VRM-03-V *Qualification improvement of employees of governmental institutions and offices*.

Activities planned within the scope of the project: analysis of training aids and preparation of the program in the area of examination of non-compliance with nuclear safety requirements and application of enforcement measures; preparation of lecturers; preparation of training aids, organization and implementation of the courses.

Activities of International Cooperation Group on Nuclear Safety of VATESI

The International Cooperation Group on Nuclear Safety (ICG) of VATESI was set up on 18 March 2005, with a view to continuing mutually useful collaboration initiated by the completed project for assistance in licensing.

The ICG is a working group in whose activities the representatives of VATESI, foreign regulatory institutions, TSOs

and other organizations take part on a voluntary basis. The Group's main objectives are as follows:

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

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

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

One meeting of the ICG was arranged on 3 June. During the meeting, the reorganization of nuclear safety regulatory infrastructure in Lithuania, preparation of legal framework regulating nuclear safety and development of its system, supervision of operation of Ignalina NPP Unit 2, Ignalina NPP decommissioning projects were discussed. The experience on outstanding issues in the field of nuclear regulation in other countries and the most important events in nuclear power plants of foreign countries were reviewed.



Meeting of the International Cooperation Group (ICG) on 3 June 2009.



Contribution of Technical Support Organizations to improvement of nuclear safety

The objective of the nuclear safety technical support system is to assist VATESI and organizations operating nuclear facilities or organizations involved in any other activity related to nuclear materials in performing the assigned functions of nuclear safety assurance, regulation, supervision and control. This support is provided in the form of consultations, design, research, expertise and other works the performance thereof requires high scientific-technical qualification, competence, special knowledge and skills.

In cooperation with VATESI, the Technical Support Organizations (TSOs) of Lithuania provide expertise services in the assessment of safety of nuclear facilities, preparation of draft legal acts and in performing other works. To achieve the most efficient use of the scientific-technical potential of Lithuania in solving the problems of nuclear safety, the Coordination Council of VATESI Technical Support Organizations was established, which coordinates the TSO expertise assistance to VATESI, promotes the development of nuclear energy research-industrial infrastructure, upbringing of scientific-technical potential in the country and training of nuclear energy specialists.

In 2009, VATESI further developed cooperation with the Institute of Physics (FI); the Laboratory of Nuclear Engineering Problems (LNEP), the Nuclear Installations Safety Laboratory (NISL) and the Laboratory of Research and Testing of Materials of the Lithuanian Energy Institute (LEI); the Department of Thermal and Nuclear Energy (DTNE) and the Institute of Energy Technologies (IET) of Kaunas University of Technology; Vilnius Gediminas Technical University, the State Institute of Information Technologies (VITI); ITECHA UAB, the Research Centre of Electromagnetic Compatibility (RCE) and other organizations.

The Institute of Physics (FI) in 2009 was implementing the program funded by the State Metrology Service *Developing the metrology system of ionising radiation. I. Creating a state standard of a radionuclide activity unit*, the study ordered by the Radiation Protection Centre *Activity Research of plutonium and trans-uranium elements*, 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 analyses of air in the zone of direct impact of Ignalina NPP*. Specialists of the FI together with their partners participated in the implementation of the projects financed by the EU and the Agency for International Science and Development Programs under the EC Seventh Framework Programme for Research and Technological Development (FP7), such as *Treatment and disposal of irradiated graphite and other carbonaceous waste (CARBOWASTE)*, *The redox phenomena controlling system (RECOSY)*, as well as the EU-financed project *Support to the Radiation Protection Centre related to radiation safety in the course of decommissioning of Ignalina NPP*, *Scientific – technical assistance to VATESI in performing decommissioning of Ignalina NPP* and started its activities under the EU TACIS Program project *Transfer of European management methods and practices to Georgian Nuclear Safety Authority*.

In addition to the mentioned activities, the FI took part in the following research works related to nuclear safety and radiation protection:

- *Development of sorption processing technology of radioactive waste by using inorganic sorbents of high selective capacity* (the assignment was performed with the assistance by the State Science and Studies Foundation and the Agency for Science, Innovation and Technology);

- *Preparation of equipment dismantling and decontamination project for Ignalina NPP boiler house* (ordered by Sweco Lietuva UAB);
- *Additional radiological measurements in ion exchange resins of Ignalina NPP Unit 1 condensate treatment facilities* (ordered by IEEC UAB);
- *Software upgrading for radioactive materials accounting system in a protective container of the spent nuclear fuel storage facility* (ordered by Ignalina NPP);
- *Study of the nuclide composition of solid radioactive waste from Ignalina NPP operation and development of the activity assessment method* (ordered by Naujų technologijų projektavimas UAB);
- *Performance of comprehensive radiometric research at the closed Maišiagala Radioactive waste storage facility and development of scientific analysis of obtained results* (ordered by RATA).

In 2009, the following laboratories of the **Lithuanian Energy Institute (LEI)** took part in the safety upgrading activity: the Laboratory of Nuclear Engineering Problems (LNEP), the Nuclear Installations Safety Laboratory (NISL), and the Laboratory of Research and Testing of Materials (LRTM).

The key areas of activity of the **Laboratory of Nuclear Engineering Problems (LNEP)** are related to the assessment of the environmental impact and safety of the interim storage facilities for SNF under construction and radioactive waste processing and storage facilities as well as the Landfill type repository very low activity radioactive waste, the medium and very low activity short lived radioactive waste near-surface repository.

In 2009, the LNEP specialists were further implementing the following projects and works:

- *Designing and construction of an interim storage facility of dry type for RBMK spent nuclear fuel assemblies from INPP Units 1 and 2 (B1)*. LEI is a subcontractor of NUKEM Technologies GmbH (Germany) that leads the consortium NUKEM-GNS. In 2007, the specialists of the Laboratory agreed the Environmental Impact Assessment (EIA) Report with the relevant responsible institutions; the EIA Report was approved by the Ministry of the Environment (MoEn). In 2008, the Preliminary Safety Analysis (PSA) report was presented to the State Nuclear Power Safety Inspectorate (VATESI) for its review. In 2009, final approval of the PSA report was given by VATESI, and on the basis of this report and other technical documentation VATESI issued a license for the construction of an SNF interim storage facility of dry type.
- *New solid radioactive waste management and storage facility at Ignalina NPP (B234)*. In 2007, the EIA and B34 PSA reports for this facility were prepared and presented for review by the relevant regulatory institutions. In 2008, the EIA report was approved by the MoE, and B34 PSA report was approved by VATESI. In 2009, the PSA report was prepared for the 1st module of waste retrieval and the Landfill-type waste sorting (i.e. the first part of the B2 project) and presented to regulatory institutions for their review.
- *Analysis of radiation impact and optimization for dismantling of NPP equipment and radioactive waste management*.
- *Preparing documentation for decontamination and dismantling of Ignalina NPP building 117/1*. The LEI has been implementing this project together with experts from VT Nuclear Services (Great Britain) and NUKEM (Germany).

The LNEP specialists participated in preparing the EIA and the General Documents Digest (GDD) reports and together with the Nuclear Installations Safety Laboratory were preparing the safety justification report, technical design and detailed design. In August 2009, the EIA report was approved by the MoEn. By using the VISIPLAN ALARA PLANING TOOL software, the LNEP specialists assessed the employees' exposure to radiation, quantities of waste and packing material, by using the software CORA-CALCOM – the costs of decontamination and dismantling of Ignalina NPP building 117/1. In 2009, the EIA report, safety justification report and the GDD report were finally approved and were handed over to the Employer.

- *Services of preparation of environmental impact assessment documents and safety analysis report for decommissioning of Unit 2.* The LEI partner in the project is Specialus montažas – NTP UAB. The objective of the project is to prepare the EIA report and the safety analysis report for the nuclear fuel unloading phase during decommissioning of INPP Unit 2. The LEI LNEP specialists are implementing this project jointly with the Nuclear Installations Safety Laboratory. The specialists of the Laboratory prepared the EIA report, agreed the report with the Employer (Ignalina NPP) and participated in preparing the safety analysis report for the final shutdown of Ignalina NPP Unit 2 and the nuclear fuel unloading phase. The EIA was approved by the regulatory institutions and handed over to the MoEn. At present the implementation of the project is temporarily suspended.
- Under the EU Seventh Framework Programme for Research and Technological Development (FP7) the project *Treatment and Disposal of Irradiated Graphite and Other Carbonaceous Waste CARBOWASTE*, (2008-2012) was further continued. The project is implemented together with other 27 partners of the consortium and coordinated by Forschungszentrum Juelich GmbH. The objective of CARBOWASTE project is to prepare the methodology and databases by evaluating various disposal technologies: direct dumping in specially prepared containers, conditioning and treatment prior to disposal to the repository or even recycling of waste for its re-using in the nuclear industry.
- *The Landfill type repository for short-lived very low activity radioactive waste.* The project is implemented together with the partner Specialus montažas-NTP UAB. In 2008, the EIA program was prepared and approved by the MoEn as well as the EIA report and the preliminary safety analysis report of the buffer type repository. In August 2009, the Ministry of the Environment of the Republic of Lithuania gave their consent for the construction of the repository for short-lived very low activity radioactive waste.
- The LNEP (LEI) specialists actively continued their work in the research project coordinated by the IAEA *Use of digital models in characterizing the site of geological repositories and their safety assessment*.

The following projects were completed in 2009:

- *Preparation of the environmental impact assessment report for the construction of the new nuclear power plant.* The LNEP and the specialists of the Finnish company Pöyry prepared the EIA Report for the construction of the new nuclear power plant in Lithuania, presented the EIA Report to the public and the interested foreign countries (Latvia, Estonia, Belarus and others). The Report was adjusted in

accordance with the motivated proposals of the public and was revised and approved by the regulatory institutions. In early 2009, the concerned organizations provided positive conclusions on the planned economic activity and the EIA Report, and in April 2009 the Ministry of the Environment of the Republic of Lithuania on the basis of the Environmental Impact Assessment Report made an affirmative decision on the feasibility to construct the new nuclear power plant.

- *Converting the bituminized radioactive waste storage facility at Ignalina NPP (building 158) into a repository.* In 2007, a Feasibility Study for conversion of the bituminized radioactive waste storage facility into a repository (justification of long-term safety) was prepared. In 2008, the report was revised by VATESI and other regulatory institutions and in 2009, after the review of the report, its final version was prepared. After having summarized all results from the conducted long-term safety analysis, it was stated that the bituminized radioactive waste storage facility can be converted either into a repository or a long-term storage facility (operable for some 100 years).
- *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 provided to the Commission of European Communities on the activities related to radioactive waste disposal at the Ignalina NPP interim SNF fuel facility and at the management and storage facility of solid radioactive waste*. In 2008, the report was provided for review by respective institutions and their comments on the report were received. The implementation of the project was terminated in 2009 by mutual agreement between Ignalina NPP and LEI due to the fact that within the framework of the Agreement certain institutions will accept the final version of the digest of general documents for review and approval after the Probabilistic Safety Assessment (PSA) reports will have been agreed for certain main projects (B1, B2 and B3/4) related to the preparation of this project. Whereas for the project (B2) is the last to be reviewed and approved, the conclusions of the PSA report can be expected in the middle of 2010 at the earliest, the full scope of the services during the time period defined in the Agreement (by 31/07/2009) will not be completed.

In 2009, the specialists of the LNEP started implementing the following new projects:

- under the EU Seventh Framework Programme for Research and Technological Development (FP7) the project *Behaviour of gases accumulating in geological SNF/RW repositories* (2009-2013) was started. The project is being implemented together with other 24 partners of the consortium and is coordinated by Natural Environment Research Council – British Geological Survey. The objective of the LNEP specialists is to obtain knowledge about the behaviour of gases that are generated in geological repositories. Upon having obtained relevant experience in modelling the gas generation and migration processes, a computer-based model for the assessment of gas migration in the projected geological SNF repository in Lithuania will be developed. In 2009, the information on the accomplishments of foreign countries in the area was collected,

analysed and systemized, the preliminary model for the assessment of gas migration was developed.

- *Dismantling and decontamination of Ignalina NPP building V1.* LEI have been implementing this project jointly with the experts from VT Nuclear Services (Great Britain), NUKEM (Germany) and Ansaldo Nucleare (Italy). The LNEP specialists have been participating in preparation of the Environmental Impact Assessment Report and the Report on the Digest of General Documents, and together with the specialists of the Nuclear Installations Safety Laboratory they have been taking part in preparing the safety analysis report, technical design and detailed design. In 2009, the Employer Ignalina NPP approved the time schedule for the implementation of the project.
- *Very low and medium activity short-lived radioactive waste repository (design phase) B25-1.* LEI have been implementing this project together with its partners AREVA TA (project leader) and ANDRA from France, and its partners Specialus montažas-NTP UAB and Pramprojektas AB from Lithuania. The LNEP specialists are involved in the project management, preparation of the site selection report, the report of the site verification, report on the project alternatives, preliminary technical design, technical design, and the PSA report.

The LNEP specialists continued their work in the IAEA organizational committee developing an international database of irradiated graphite, and in the activity of the Nuclear Installations Decommissioning Group of the European Commission's Joint Research Centre.

Scientists from the **Nuclear Installations Safety Laboratory (NISL)** of LEI in 2009 carried out the works related to the preparation for the construction project of the new NPP and the assessment of energy security as well as in the activities related to Ignalina NPP operation and projected activities during its decommissioning.

The primary goal which has to be accomplished in getting ready for the construction of the new nuclear power plant is to uphold competence and to acquire, develop and transfer knowledge in nuclear safety that would comply with the most advanced international practice, thus enhancing competencies of specialists under changing conditions. One of the vivid examples of such activity are the regional professional training courses in nuclear safety that for the second time were arranged in Lithuania on 19-30 October 2009. Apart from representatives of foreign countries, specialists from VATESI, Visagino Atominė Elektrinė UAB, Vilnius University, State Information Technologies Institute were active participants of the courses. The courses were organized by Lithuanian Energy Institute.

Under the framework of the transition facility for institutional strengthening, the scientists of the laboratory together with a nuclear research group from Piza University, Italy, arranged a cycle of seminars and technical visits to the EU organizations related to nuclear energy. In the course of the project, knowledge and recommendations on the improvement of documents regulating nuclear safety were handed over to VATESI and the TSO experts in order to assure safety supervision and safety analysis at Ignalina NPP including the phase after final shutdown of the reactor. Educational and cognitive activities covered the subjects of spent nuclear fuel management, verification (control) of regulation and control equipment and systems, and the structural integrity of the systems related to safety.

The Study for the *Assessment of potential Visaginas NPP construction sites with regard to external impacts* was carried out by the order of Visagino Atominė Elektrinė UAB. In accordance with the Ignalina AE safety requirements, the acceptability of the potential Visaginas NPP construction sites was assessed with regard to events caused by human activity, meteorological phenomena, flooding of the area. The results of the completed study are important in making a decision on the selection of the specific site and planning risk management at the site.

The Laboratory's scientists continued research works in the IRIS project for the development of a new-generation nuclear reactors that are important in the context of construction of a new reactor in Lithuania. In the recent years they took part in IRIS probabilistic safety and economic efficiency analyses and in performing the research aimed to decrease the risks of external hazards and the uncertainty of obtained results.

In 2009, by the VATESI order a new legal act regulating nuclear safety *General requirements for assurance of safety at nuclear power plants* was worked out. This document will replace the *General safety assurance regulations for nuclear power plants*, adopted by VATESI in 1997 and will be one of the main documents regulating safety requirements for the planned to be constructed Visaginas NPP.

During the construction of the new nuclear power plant, at the same time and at the same site the works of Ignalina NPP decommissioning and construction of storage facilities of various level of radioactivity will be carried out. Hence it is important that the facilities of the new nuclear power plant being constructed and Ignalina NPP being decommissioned would not negatively impact each other in the course of their construction, dismantling or operation. The scientists of the laboratory together with their partners were involved in two projects for decontamination and dismantling of Ignalina NPP equipment. In 2009, by continuing the project *Preparation of the decontamination and dismantling project (B9-0) for Ignalina NPP building 117/1*, the technical design and safety analysis report were completed and approved by the Employer. In the newly commenced project *Preparation of the decontamination and dismantling project (B9-2) of the equipment located at Ignalina NPP building V*, the strategy for decontamination and dismantling was drawn up and submitted for the Employer's approval.

In 2009, the Agreement was signed on participation in the new project SARNET-2 that will continue the four-year activities of the SARNET network of excellence, aimed at integrating research on severe accident phenomena and management in Europe. The NISL scientists were active participants in the EU 7BP SECURE program, the objective of which is to develop the methodology for the assessment of energy security with regard to various problems of security of energy supply and geopolitical changes, in the NULIFE network of excellence for developing the methodology for managing the lifetime of nuclear installations, in one of the biggest international research programs PFEBUS FP for safety of water-cooled nuclear reactors and research in severe accidents, in the *Ageing Probabilistic Safety Analysis (APSA) study The use of probabilistic safety assessment (PSA) for evaluation of ageing effects to the safety of energy installations*, coordinated by the Energy Institute of the EC Joint Research Centre, in the activity of European network for equipment operational control and qualification ENIQ as well as in the

new promising thermonuclear energy program *FUSION* that is the focus of great interest.

In 2009, the project for the OECD *The international standard problem ISP-49* was started aimed at investigating hydrogen combustion in the nuclear reactor containment. The NISL scientists also participated in the research program coordinated by the IAEA for the development and analysis of new-generation reactors. By carrying the assignment *The economic and power benefits of low and medium capacity reactors with reduced requirements for accident planning zone: the case of Lithuania*, the situation of energy security in Lithuania was analysed along with various scenarios related to possible interruptions in the supply of energy resources as well as the research related to impacts of installation of low-capacity (IRIS) and big-capacity reactors on electricity and heat production in Lithuania by 2018.

The NISL employees also took part in providing assistance to the nuclear safety regulatory institutions in other countries. The objectives of the project that was started in 2009 and financed by the EC are to provide assistance to the Nuclear Safety Inspectorate of Armenia (ANRA), to promote effective safety culture and to expand the application of the methodology and supervision applied in the EU.

In 2009, experts from the laboratory started implementing and took part in the following national projects aimed at upgrading safety of Ignalina NPP and other works related to VATESI activities:

- System for control of leakproofness in the caskets of spent nuclear fuel heat releasing assemblies in the "hot chamber" of Unit 1;
- Probabilistic safety analysis for external events and events in the shutdown nuclear reactor;
- Optimization of testing intervals of safety-related systems;
- *Rejection of sensors in Unit 2 depending on the results of diagnostics in the year 2009;*
- *Justification of amendments to be included into the Ignalina NPP Symptom-Based Emergency Operating Instruction;*
- *Justification of amendments to be included into the Ignalina NPP Instruction for Classification of Accidents;*
- *Application of Ignalina NPP probabilistic safety analysis model in VATESI activities;*
- *Safety analysis report for the final shutdown and fuel unloading phase during Decommissioning of Ignalina NPP Unit 2.*

The **Laboratory of Research and Testing of Materials (LRTM)** of LEI in 2009 was implementing the project *Analysis of resistance of spent nuclear fuel claddings to hydro fracturing during their long-term storage*, supported by the State Study and Research Foundation under the activity *Projects implemented by the scientists' groups*. During the research the analysis of peculiarities of slow hydro-fracturing processes in zirconium alloys and the condition of spent nuclear fuel claddings after their operation in nuclear reactors was conducted, the impact of various factors on the structural integrity of the claddings of fuel elements during their long-term dry storage was assessed. Special devices, samples were produced for experimental testing of fuel caskets, experimental procedures were defined. The process of slow hydro-fracturing was examined in the RBMK reactor cladding of Zry-4 PWR, BWR and Zr-1Nb types by applying different methods of thermal-mechanical processing (CW, CWSR and RXA). The influence of reorientation of hydrides

on potential brittle disintegration and the SHF was evaluated by experimental methods. With regard to the long-term storage conditions of Zr-1Nb cladding of the RBMK reactors, their condition and properties after operation, the digital analysis of stress and possible tear was carried out. On the basis of complex research and with regard to the SHF processes in different types of cladding, the possibility of occurrence of SHF processes in Zr-1Nb cladding of the RBMK reactors after a 50-year storage period in the containers was assessed.

The main works completed in 2009 by the **Department of Thermal and Nuclear Energy (DTNE)** and the **Institute of Energy Technologies (IET)** of **Kaunas University of Technology (KTU)** were as follows:

- The draft Law on Nuclear Energy was prepared and agreed with VATESI;
- Participation in the EU assistance project for Ignalina program *Technical assistance to VATESI in decommissioning of Ignalina NPP No.VAT.05.01.0001*. An independent analysis and expertise of Ignalina NPP documents for licensing of activities related to decommissioning of the NPP was conducted. The main documents submitted for expertise: B9-0 project (Technical design and safety justification report), B2 project (PSAR), B19 project (PSAR). The project is implemented together with RISKAUDIT (France, Germany), SSM (Sweden), IRSN (France), GRS (Germany), STUK (Finland), AVN (Belgium), Serco Assurance (the U.K.) and the Institute of Physics of Lithuania. The scheduled implementation period – from 23/ 01/ 2009 till 30/ 04/ 2011.

On 19-30 October 2009, KTU took part in organizing the IAEA seminar C7-RER-9.099-001/09 *Regional training in fundamentals of nuclear safety*.

KTU has been continuing training of specialists in nuclear energy. In 2009, 4 third-year students, 3 fourth-year students, 4 postgraduate students studying for a master's degree, 3 – studying for a doctor's degree were specializing in nuclear energy.

In 2009, employees of the **Centre for Strength and Fracture Mechanics (KTU)** took part in implementing RF/TS/53 project *Institutional and technical support to the Federal Nuclear Regulatory Authority of Russia and its TSOs in developing their capabilities on the basis of transferred Western European safety principles and practices* under the framework of an international project R3.01/06.

In 2009, specialists from the Laboratory of Numerical Simulation (LNS) and the Department of Strength of Materials (DSM) took part in the following works related to nuclear safety and radiation protection:

- By performing the order of Prampjektas AB and NUKEM, took part in performing calculations for Ignalina NPP solid waste management and storage facilities (B3, 4), short-lived solid waste and long-lived solid waste storage facilities and seismic calculations, consulted on the issues of reinforcement of structures.
- Together with LEI, completed the research work *Modelling and analysis of seismic impacts on building 101/2 of Ignalina NPP Unit 2*. VGTU works covered analysis of interaction between the building and the ground and calculations of counteraction spectrum.

In 2009, the **State Institute of Information Technologies (SIIT)** continued works under the Agreement with RISKAUDIT (France) by implementing the TACIS project *Assistance*

to Nuclear Safety Inspectorate of Armenia (ANRA) in safety assessment during licensing and decommissioning of Medzamor 2. SIIT was performing works for the assessment of design proposals and expertise of the safety analysis reports in upgrading and rehabilitation of reactor protection system at Medzamor 2, the system for capacity regulation and the reconstruction of the control room of the reactor.

SIIT took part in implementing the transition facility project *Support to VATESI in Safety Assessment of Ignalina NPP*, prepared and delivered to VATESI specialists lectures on the below subjects:

- Modern methods in digital safety assessment systems,
- Verification and licensing of modern equipment important to safety of Ignalina NPP,
- Design requirements for regulation and control systems,
- Lifetime cycles of regulation and control systems,
- Management of technological process and safety, safety justification.

Apart of the mentioned activity, SIIT performed the analyses of compliance of international standards for electric (electronic) programmable safety-related systems that are applicable in the certification of safety systems with nuclear power standards of Russia. Also the analysis was conducted and the report was drawn on the subject *Assessment of efficiency and reliability of automated control and regulation equipment at the radioactive waste processing cementation facility*.

In 2009, **ITECHA UAB** according to the subcontracting agreement with the State Institute of Information Technologies (SIIT), took part and completed the expertise review of technical documentation for the Nuclear Safety Inspectorate of Armenia (ANRA) in safety assessment during licensing and decommissioning of Medzamor 2 that had been started in 2008 (expert review of technical documentation under *Assistance to Nuclear Safety Inspectorate of Armenia (ANRA) in licensing activities related to upgrading of information, control and power system*). To improve their qualifications, the company's specialists took part in specialised training events arranged by the IAEA.

The **Scientific Research Centre of Electromagnetic Compatibility (ESMTC)** in 2009 took part in drafting VATESI documents regulating nuclear safety and carried out the following works:

- Preparation of the draft requirements for design, installation and operation of the reactor's cooling system (Agreement No. EMC 08-02),
- Preparation of the new wording of the legal act regulating nuclear safety *Nuclear safety regulations for NPP reactors* (Agreement No. EMC 08-03),
- Review of requirements regulating application of operational limits and conditions at NPPs and of the legal act regulating nuclear safety *Regulations for application of operational limits and conditions in nuclear power plants* (Agreement No. EMC 08-04).

Public information

As of late 2009, Unit 2 of Ignalina NPP was shut down, therefore it is understandable that the media and the public were mainly interested in the perspective of nuclear energy in Lithuania and the feasibility of construction of the new nuclear power plant.

One of the VATESI goals is to prepare and disseminate the information on the issues of nuclear safety. In 2009, in order to inform the public and to maintain relations with the media, more than one hundred information notices were prepared and placed on the VATESI website, press releases were sent to the media that had been met with significant interest. The information was disseminated about the evaluation of the Environmental Impact Assessment Report for the construction of the new nuclear power plant, the IAEA mission that had evaluated the mentioned Report, the ESARDA symposium, licensed projects – the solid radioactive waste management and storage facilities, a new spent nuclear fuel storage facility (more information is available under the heading *Main Events*).

In October-November 2009, by the request of VATESI, the market research and public opinion survey company **Baltijos tyrimai (Baltic Surveys)** performed a representative survey of Lithuanian residents whose age ranged between 15-74. The data collected during the survey were compared with the results obtained during the special survey on nuclear safety conducted in October 2006 by *Eurobarometer*. The research illustrated that the public has insufficient information on nuclear energy. The residents of Lithuania would like to know more about the methods of storage of radioactive waste, the construction of the storage facilities, the impact of Ignalina NPP on the health of people and the environment. New

information aimed to educate the public is being prepared with regard to the results of the survey.

New column *Frequently Asked Questions* was developed on the VATESI website (under the heading *Feedback*). Questions under this heading are classified according to specific subjects related to nuclear safety; they are followed by short concrete answers. Moreover, on the main page of the website the operative information about the background radiation is displayed that is updated on all weekdays. The mentioned information is provided only in Lithuanian.



International conventions, laws and secondary legislation

International conventions

The key principles and requirements of nuclear safety regulation are set forth in the 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.	The 1968 Treaty on the Non-Proliferation of Nuclear Weapons	Lithuania joined it by Resolution No. I-1492 of the Seimas on September 23, 1991.
2.	The 1959 Agreement on the Privileges and Immunities of the IAEA	Ratified on 14 December 2000, by Law No. IX-78.
3.	The 1963 Vienna Convention on Civil Liability in the Field of Nuclear Energy.	On 30 November 1993, the Seimas declared it having the force of law in Lithuania. (Law No. I-314.)
4.	The 1988 Joint Protocol Relating to the Application of the Vienna Convention and Paris Convention.	On 30 November 1993, the Seimas declared it having the force of law in Lithuania. (Law No. I-314.)
5.	The 1986 Convention on Early Notification of a Nuclear Accident.	The Government of the Republic of Lithuania joined the Convention on 13 October 1994. (Government Resolution No. 972.)
6.	The 1979 Convention on Physical Protection of Nuclear Materials.	Lithuania joined the Convention on 16 November 1993. (Order of Prime Minister of Lithuania No. 778p.)
7.	The 1994 Convention on Nuclear Safety.	Ratified by the Seimas on 17 October 1995. (Resolution No. I-1063.)
8.	The Comprehensive Nuclear Test Ban Treaty.	Ratified by the Seimas on 28 October 1999. (Law No. I-1372.)
9.	The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.	Ratified by the Seimas on 20 July 2000. (Law No. VIII-1882.)
10.	The 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Ratified by the Seimas on 18 December 2003. (Law No. IX-1921.)
11.	The 1997 Convention on Supplementary Compensation for Nuclear Damage.	Signed on 30 September 1997.
12.	Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage.	Signed on 30 September 1997.



13.	Agreement among 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.	Ratified by Law No. X-1051 of the Seimas dated 13 March 2007.
14.	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 on implementation of Article III, (1) and (4) of the Treaty on Non-Proliferation of Nuclear Weapons.	Ratified by Law No. X-1051 of the Seimas dated 13 March 2007.
15.	Amendment of the Convention of Physical Protection of Nuclear Materials.	Ratified by Law No. X-1548 of the Seimas dated 20 May 2008.

In 2009 VATESI took part in preparation of a new wording of translation of the Convention on Nuclear Safety ratified by the Seimas Resolution No. I-1063 as of 17 October 1995 into the Lithuanian language.

Legal acts of the European Union

The European Commission, in response to the growing role of nuclear energy in the European Union's power industry and by envisaging its further development, striving to assure nuclear safety and with regard to the Convention on Nuclear Safety and other international documents, on 25 June 2009 passed the Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities (Nuclear Safety Directive), the main objective thereof is to accomplish high-level nuclear safety in the Community, to maintain and promote the continuous improvement of nuclear safety and to enhance the role of regulatory institutions of the EU Member States in assuring nuclear safety. In the Nuclear Safety Directive the right of each Member State to decide on the use of nuclear energy has been fully acknowledged. It is expected to accomplish several objectives under this Community framework on nuclear safety: to strengthen the role of regulatory institutions of the European Union Member States, the primary responsibility of a licensee for nuclear safety, to enhance independence of the regulatory institution, to ensure transparency in the issues related to nuclear safety, regular supervision of nuclear safety, availability of experts in nuclear safety, priority of nuclear energy. Laws and other legal acts deemed necessary for the implementation of the Nuclear Safety Directive will have to be adopted by 22 July 2011.

In 2009, VATESI was participating in drafting the new Council Directive on the Management of Radioactive Waste and Spent Fuel; this process will be further continued in 2010.

Legal acts and secondary legislation in the Republic of Lithuania

The main legal document governing the use of nuclear energy in Lithuania is the Law on Nuclear Energy of the Republic of Lithuania passed in 1996. Other Laws of the Republic of

Lithuania directly relating to safe use of nuclear energy are as follows: the Law on Radioactive Waste Management, the Law on Radiation Protection, the Law on Control of Import, Export and Transit of Strategic Goods and Technologies, the Law on Civil Protection, the Law on Constructions, etc.

After Lithuania started planning and implementing the preparatory works for Ignalina NPP decommissioning, the following Laws of the Republic of Lithuania were passed: the Law on Decommissioning of Unit 1 of the State Enterprise Ignalina Nuclear Power Plant, the Law on Decommissioning Fund of the State Enterprise Ignalina Nuclear Power Plant, the Law on Additional Employment and Social Guarantees for the Employees of the State Enterprise Ignalina Nuclear Plant. On 4 November 2009, the Government of the Republic of Lithuania passed the Resolution No.1448 *Re: Decommissioning of Unit 2 of the State Enterprise Ignalina Nuclear Power Plant*.

On 25 November 2009, the Government of the Republic of Lithuania by its Resolution No. 1609 approved the Concept of the Law on Nuclear Safety of the Republic of Lithuania. This Law is meant for strengthening the regulatory system of nuclear safety and for setting the state regulation and supervision of nuclear safety in nuclear facilities, use of nuclear materials and materials of nuclear cycle, transportation, management of radioactive waste and spent nuclear fuel, the functions and responsibilities of the nuclear safety regulatory institution along with the functions and responsibilities of other state institutions and offices in exercising administrative procedures, the functions and responsibilities of organizations operating nuclear facilities and other institutions and offices the activities thereof are related to the assurance of nuclear safety. As a constituent part of the nuclear safety measures, the Law will also regulate the radiation protection in nuclear facilities, use of nuclear materials and materials of nuclear cycle, transportation, management of radioactive waste and spent nuclear fuel. With an aim to implement the obligations of the Republic of Lithuania in the field of safeguards under the IAEA and Euratom Agreement, as well as the measures for prevention of terror acts in nuclear facilities, the provisions regulating the physical protection of nuclear materials and nuclear facilities constituting an indispensable part of nuclear safety assurance as well as the nuclear weapons non-proliferation issues will be defined. The Law will stipulate the fundamental aspects of safety of the population and prevention of nuclear

radiological accidents and incidents, liquidation of their consequences.

In order to strengthen and to reorganize the nuclear safety regulatory system, other Laws related to regulation of nuclear safety and radiation protection will have to be amended. In addition to that, it will be necessary to pass the relevant secondary legislation required for bringing these Laws into effect (see Chapter *Regulatory documents of the new nuclear power plant*).

In 2009, VATESI was also participating in preparation of the draft Law amending the Law on Additional Employment and Social Guarantees for the Employees of the State Enterprise Ignalina Nuclear Plant of the Republic of Lithuania, draft Law amending the Law on Radiation protection of the Republic of Lithuania, draft Law amending the Law on Radioactive Waste Management of the Republic of Lithuania, draft Law amending the Law on Energy of the Republic of Lithuania, other draft Laws.

List of abbreviations

ACS	– accident confinement system	IRSN	– French Institute for Radiological Protection and Nuclear Safety
ANA	– additional neutron absorbers	JRC	– Joint Research Centre
B1	– project for spent nuclear fuel storage facilities	Kcal	– kilo calorie
B19-1	– project for very low activity radioactive waste storage facilities	KTU	– Kaunas University of Technology
B234	– project for SNF retrieval from NPP old storage facilities (project B2) and a new facility for treatment and storage of solid radioactive waste at Ignalina NPP	KWh	– kilowatt hour
B34	– project for solid radioactive waste treatment and storage facilities	LEI	– Lithuanian Energy Institute
B9-2	– nuclear reactor's gas circuit dismantling and decontamination project	LNEP (LEI)	– LEI Laboratory of Nuclear Engineering Problems
BDBA MM	– Manual for Management of Beyond-Design-Basis Accidents	LRTM (LE)	– LEI Laboratory of Research and Testing of Materials
CF UGC	– capability factor to use gross capacity	MBZ	– material balance zone
CNS	– Convention of Nuclear Safety	mSv	– millisievert (unit of doze equivalent) millisivert (exposure measurement unit)
DSA	– deterministic safety analysis	MW	– megawatt
EC	– European Commission	MWd/HRE	– megawatt per day/heat releasing element
ECCS	– emergency core cooling system	NF	– nuclear facility
ECOEF	– European Clearinghouse for Operational Experience Feedback	NISL (LEI)	– LEI Nuclear Installations Safety Laboratory
ECURIE	– European Community Urgent Radiological Information Exchange	NPP	– nuclear power plant
EIA	– environmental impact assessment	NRC	– the US Nuclear Regulatory Commission
ENAC	– Emergency Notification and Assistance Convention of the IAEA	NSG	– Nuclear Supplier's Group
ENSREG	– European Nuclear Safety Regulatory Group	NTD	– normative technical documents
ESMTC	– Research Centre of Electromagnetic Compatibility	OECD	– Organization for Economic Cooperation and Development
EU	– European Union	OO	– operating organization
EURATOM	– European Atomic Energy Community	OSART	– Operational Safety Review Team under the International Atomic Energy Agency
FASR	– fast-acting scram rods	PSA	– probabilistic safety analysis
FI	– Institute of Physics	QAS	– quality assurance system
FRA	– fire risk analysis	RATA	– Radioactive Waste Management Agency
GRS	– German State Nuclear Reactor Safety Consulting Association (Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH)	RBMK	– high power channel-type reactor
GWh	– gigawatt hour	SBEOI	– Symptom-Based Emergency Operating Instructions
HLG	– high level group	SIIT	– the State Institute of Information Technologies
IAEA	– International Atomic Energy Agency	SPNFA	– spent nuclear fuel assembly releasing heat
ICG	– International Cooperation Group on Nuclear Safety of VATESI	SNFSF	– dry type storage facility for spent nuclear fuel
Ignalina NPP	– Ignalina Nuclear Power Plant	SAM	– scheduled annual maintenance
INES	– International Nuclear and Radiological Event Scale	SRS	– safety-related systems
IRRS	– Integrated Regulatory Review Service	SSM	– Swedish Radiation Safety Authority
IRRT	– International Regulatory Review Team	SIP	– safety improvement program
		TSO	– technical support organizations,
		VATESI	– State Nuclear Power Safety Inspectorate
		VGTV	– Vilnius Gediminas Technical University
		WENRA	– Western European Nuclear Regulators' Association
		WGNS	– Working Group on Nuclear Safety
		WGWD	– Working Group on Waste and Decommissioning



NUCLEAR ENERGY IN LITHUANIA: NUCLEAR SAFETY **Annual report 2009**

The present Report compiled by VATESI specialists: Michailas Demčenko, Asta Mensonė, Jolanta Tumasaitė, Lina Vaitkienė, Ovidijus Šeštokas, Zofija Adomaitienė, Kristina Tumosienė, Kristina Palevičienė, Sigitas Šlepavičius, Mindaugas Abraitis, Ugnė Adomaitytė, Birutė Purlienė, Rolandas Čiučelis, Dainius Brandišauskas, Eva Krištapovičiūtė, Evaldas Kimtys, Vytenis Barkauskas, Vilmantas Lašiūnas, Marius Gutaravičius, Gintas Pliuškevičius, Vida Jakimavičienė, Kęstutis Sabas, Emilijus Vanagas, Vladislavas Legenis, Nerijus Bucevičius, Rimantas Daubaras, Saulius Stravinskas, Darius Lukauskas, Sigizmundas Styro, Algirdas Vinskas, Audrius Pašiškevičius, Emilis Baškys, Marius Davainis, Laima Narbutė, Renaldas Sabas, Daiva Čelutkaitė, Rimantas Semėnas, Vidas Paulikas, Jūratė Prokopovič, Kristina Ramonienė, Nerijus Rakštikas.

Photos by VATESI, Lj „Kriventa“ and Ignalina NPP archive.

Translated by Džemilija Stogienė

Signed on August 4, 2010.

Published by Lj „Kriventa“, tel./fax: +370 5 265 0629
E-mail: kriventa@takas.lt
www.kriventa.lt

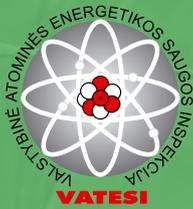
Designer:
Simonas Barščiauskas

STATE NUCLEAR POWER SAFETY INSPECTORATE (VATESI)
12 A. Goštauto St., LT-01108 Vilnius, Lithuania
Tel.: +370 5 262 4141, fax: +370 5 261 4487
E-mail: atom@vatesi.lt
www.vatesi.lt

Operating units of nuclear power plants in Europe



Source: European Nuclear Society, www.euronuclear.org (March 2010)



**State Nuclear Power Safety
Inspectorate (VATESI)**

A. Goštauto St. 12, LT-01108 Vilnius, Lithuania

Tel.: +370 5 262 4141, fax: +370 5 261 4487

E-mail: atom@vatesi.lt

www.vatesi.lt