



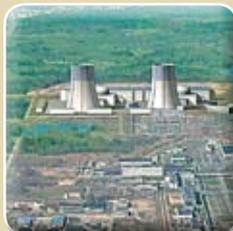
REPUBLIC OF LITHUANIA

STATE NUCLEAR POWER SAFETY  
INSPECTORATE (VATESI)



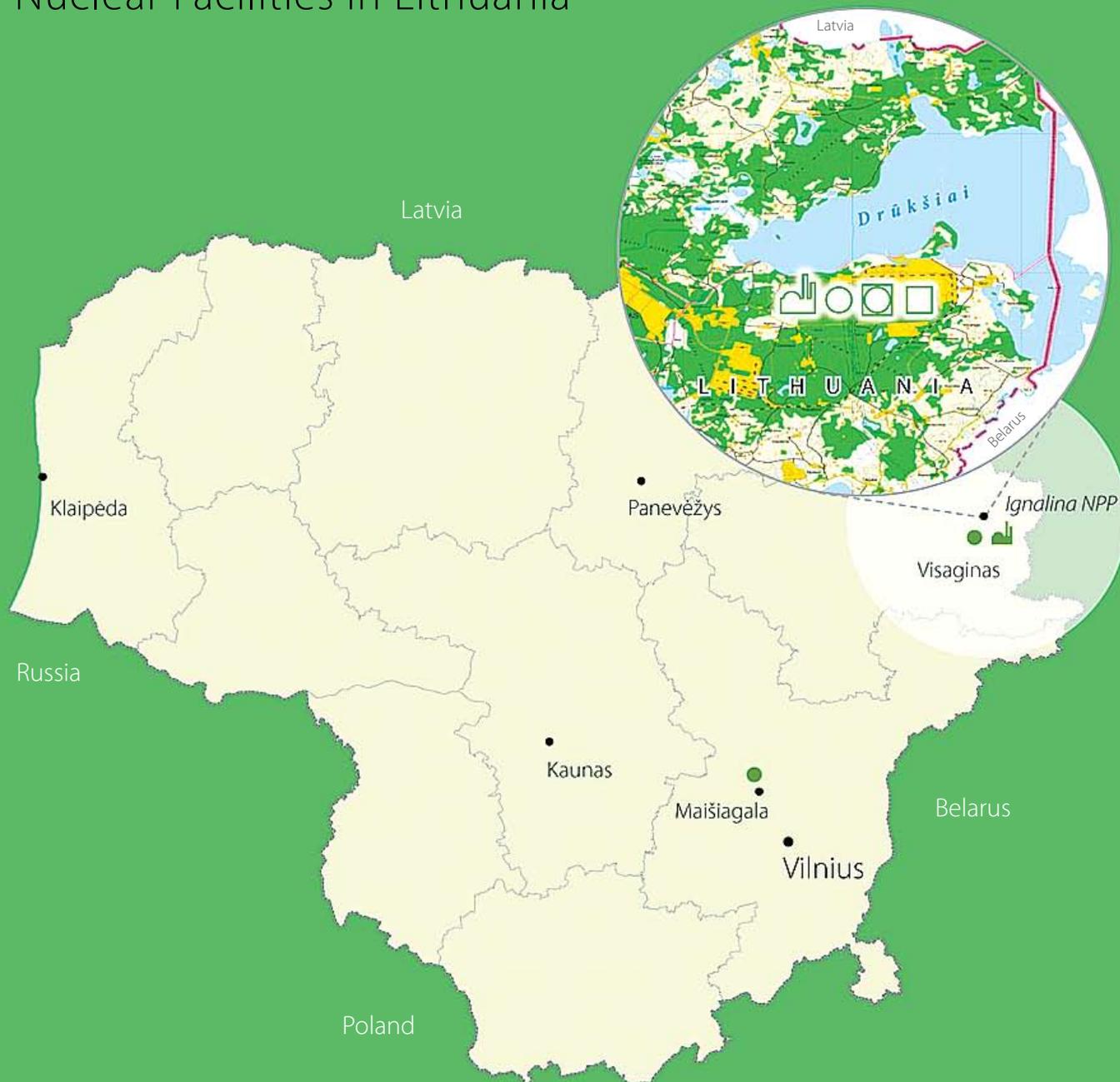
NUCLEAR ENERGY IN LITHUANIA:  
NUCLEAR SAFETY

ANNUAL REPORT 2010



**Vilnius**  
2011

# 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 – Stabiškės, Visaginas m.

## Pictograms

 Nuclear power plant     Storage facility     Treatment facility     Repository



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About us –  
the State Nuclear Power  
Safety Inspectorate



**The Acting Head of VATESI  
Michailas DEMČENKO**

The competence of the State Nuclear Power Safety Inspectorate (hereinafter – the “VATESI”) includes the development of the system of requirements for nuclear safety and physical protection, radiation protection and accounting of nuclear materials, as well as licensing and supervision in the nuclear energy sector in line with these requirements. VATESI carries out its activities with an aim to accomplish the strategic objective – to assure a high level of nuclear safety.

Last year, VATESI specialists focused their attention on supervising the safety of the finally shut-down units of *Ignalina Nuclear Power Plant* (hereinafter – the “Ignalina NPP”), licensing the construction projects of radioactive waste equipment and storage facilities, and, by getting ready for supervising the project of a new nuclear power plant, on upgrading the legal framework regulating the nuclear energy sector and on training of the personnel.

In 2010, upon having analyzed and evaluated the documents justifying safety that had been submitted by Ignalina NPP, one licence related to Ignalina NPP decommissioning was issued – to construct a storage facility of very low level radioactive waste.

In 2011, VATESI will consistently perform supervision of the licensed nuclear facilities by conducting inspections and verifications, analyzing documents justifying safety of nuclear facilities with increased risks and other documents that are important in terms of safety. Legal acts regulating nuclear safety will be further updated or newly drawn up.

With regard to the objective to implement the project of the new nuclear power plant that has been listed among the priorities of the Government and to continue decommissioning of Ignalina NPP, the legal framework regulating nuclear safety has been further improved. In 2010, the draft Law Amending the Law on Nuclear Energy of the Republic of Lithuania, the draft Law on Nuclear Safety of the Republic of Lithuania, the draft Law Amending the Law on Radioactive Waste Management of the Republic of Lithuania and other relevant draft



laws were drawn up and submitted to the Seimas of the Republic of Lithuania. The Law on Nuclear Safety of the Republic of Lithuania and the Law Amending the Law on Nuclear Energy of the Republic of Lithuania will enable to reach compliance with the Council Directive 2009/71/EURATOM as of 25 June 2009 establishing a Community framework for nuclear safety of nuclear facilities. To enforce the mentioned laws, VATESI will have to work out the relevant secondary legislation documents.

The construction of the new nuclear power plant is an important assignment to the entire state regulatory and supervisory system, and in particular to VATESI as the main institution regulating nuclear safety – during a relatively short period of time the existing nuclear safety regulations will have to be reviewed and upgraded, and, where necessary, a new legal framework will have to be developed, qualified specialists for supervision of design and construction of the new nuclear power plant, and at a later stage – for supervision of its operation, will have to be employed and trained. To get properly prepared for this assignment, since 2007 VATESI has been drafting new legal acts and upgrading the existing ones, employing and training new specialists. For training of the new specialists, the opportunities provided by international assistance projects have been used by sending them for training at the regulatory institutions of the countries that are more advanced in the field of nuclear energy.

Proper preparedness of VATESI has already become indispensable in providing consultations on nuclear safety, radiation protection and licensing issues to Visagino Atominė Elektrinė UAB that is responsible for performing the preparatory works for the project of the new nuclear power plant. In 2011, the specific nuclear safety and radiation protection requirements for nuclear reactors will have to be defined, because then the technical specification of the new nuclear power plant will be under preparation. In preparing the technical specification, the results of the assessment of the selected construction site in terms of nuclear safety will be used (the Site Assessment Report). VATESI specialists will also have to analyze and approve the mentioned report. ■



## The main goals and mission of VATESI

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 of nuclear facilities, conducts inspections and verifications, and carries out other functions.

VATESI mission is to perform the state regulation and supervision of safety at nuclear facilities in order to protect the public and the 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 safeguards set by the International Atomic Energy Agency (hereinafter – the “IAEA”) and the European Energy Community (hereinafter – the “EURATOM”));
- State regulation and supervision of physical protection of nuclear facilities and nuclear materials;
- State regulation and supervision of transportation of nuclear fuel cycle materials;
- Emergency preparedness.

Decommissioning of Ignalina NPP is a long-lasting process. VATESI assesses and supervises whether the activity undertaken during this process complies with the nuclear safety requirements by analyzing documents justifying safety, approving modifications, conducting inspections. It should be noted that the RBMK-1500 reactors at Ignalina NPP are the graphite moderated, channel-type reactors, and there has not been yet a single case of practice of dismantling the reactor of this type. In 2000, VATESI issued a licence for operation of the spent nuclear fuel facility at Ignalina NPP, where the spent nuclear fuel is stored in special containers. By now this storage facility has been fully stocked, and a new spent fuel facility is under construction in order to accommodate the nuclear fuel that is being kept in the finally shut-down Ignalina NPP units. This activity is also assessed and supervised by VATESI.



VATESI has been focusing its attention on preparing for the implementation of the project of the new nuclear power plant by drawing up nuclear safety regulations, training employees to properly conduct the works of the new nuclear power plant's safety regulation and supervision. In getting ready for the construction of the new nuclear power plant, each stage of the process has to be strictly regulated and preparations for this purpose have to be taken in advance because the construction of the new nuclear power plant is a long, complicated and responsible process.

The primary responsibility for assuring the safety of nuclear facilities and operations involving nuclear materials is borne by the organizations operating these installations or performing operations with nuclear materials. In Lithuania, the State Company *Ignalina Nuclear Power Plant* is responsible for the safe condition of the finally shut-down nuclear reactors, the State Company *Radioactive Waste Management Agency (RATA)* supervises the closed *Maišiagala Radioactive Waste Storage Facility*, and the Public Limited Liability Company *Lietuvos Geležinkeliai* has got a valid licence for transportation of nuclear materials.

*Ignalina Nuclear Power Plant* that was operating two reactors of the RBMK type (with the designed 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 finally shut down on 31 December 2009.

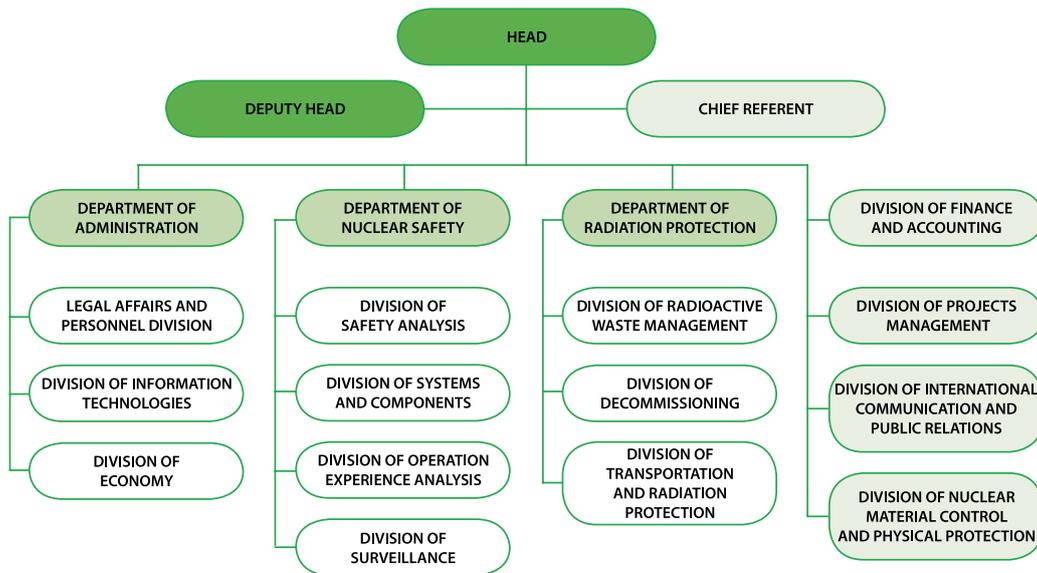
By preparing for the final shut-down of *Ignalina NPP*, in 2010 VATESI issued one licence to the State Company *Ignalina Nuclear Power Plant* for the construction of a storage facility of very low level radioactive waste.

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, if the accident is likely to cause a threat to the people of Lithuania, VATESI Emergency Centre is ready to start its operations no later than in an hour.

VATESI sets the requirements and regulations on nuclear safety, controls whether they are complied with at nuclear facilities or in performing any other activity related to nuclear and /or nuclear fuel cycle materials. In the case of established non-compliances, VATESI is entitled to apply the respective enforcement measures, e.g. to obligate the organization operating a nuclear facility to undertake rectifying measures, to suspend works and even to suspend or terminate the validity of the licence or permit issued by VATESI.



## VATESI ORGANIZATIONAL CHART



### Quality management

The decision to develop the Quality Management System 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 institution's management;
- Optimizing the planning and use of the institution's resources;
- Assuring adequate licensing, safety assessment and supervision of nuclear facilities;
- Assuring sufficient supervision over the ongoing European Union support projects;
- Assuring adequate qualification improvement of the VATESI staff;
- Assuring efficient management and use of information.

With regard to the changing requirements and by continuously improving the quality assurance documents, in 2010 three new quality management procedure regulations and instructions were approved and fifteen of such documents were updated at VATESI.



### Key events

**5 March 2010.** VATESI issued a licence to the State Company *Ignalina Nuclear Power Plant* whereby the latter was allowed to construct a very low level radioactive waste storage facility.

**24-27 May 2010.** By invitation of VATESI, a group of experts set by the International Atomic Energy Agency (hereinafter – the “IAEA”) visited Lithuania. The objective of the visit was to provide recommendations and proposals regarding the following drafts of safety regulations and requirements: *General Safety Assurance Requirements for Nuclear Power Plants, Rules for Design of the Reactor Cooling Systems of Nuclear Power Plants, Rules for Designing, Installation and Operation of the Power Supply Systems at Nuclear Power Plants.*

**14-16 June 2010.** Yukiya Amano, the IAEA General Director, visited Lithuania.

**27 August 2010.** VATESI submitted to the IAEA the fifth national report on meeting the commitments under the Convention on Nuclear Safety.

**30 August – 3 September 2010.** The regional training courses *Computer Safety in Nuclear Facilities* were arranged in Vilnius by the IAEA and VATESI together with *Visagino Atominė Elektrinė UAB.*

**21 September 2010.** During the 54th IAEA General Conference in Vienna (Austria), Gregory Jaczko, Chairman of the United States Nuclear Regulatory Commission (NRC) and Michailas Demčenko, Deputy Head of VATESI acting in the capacity of VATESI Head, signed the Agreement on the exchange of technical information and cooperation in the field of nuclear safety between NRC and VATESI, whereby extending cooperation between VATESI and the NRC for another five-year period.



**27 October 2010.** The implementation of the project for decontamination and dismantling of the Ignalina NPP building accommodating a part of the emergency cooling system of Unit 1 was authorized.

**3 November 2010.** The European Commission submitted to the EU Council of Ministers the draft Directive on Management of Radioactive Waste and Spent Nuclear Fuel. The approval of the Directive is expected in 2011. The programs for management of spent nuclear fuel and radioactive waste will have to be prepared by 2015, after the provisions of the mentioned Directive will have been transposed to the national legislation of the EU Member States.



**3 December 2010.** In Kiev (the Ukraine) Olena Mycholaichuk, Head of the State Nuclear Regulation Committee of the Ukraine, and Michailas Demčenko, VATESI Deputy Head, acting in the capacity of VATESI Head, signed the Agreement on the exchange of information and cooperation in the area of safety regulation in the use of nuclear energy for peaceful purposes.

**9 December 2010.** VATESI permitted to start decommissioning of the finally shut-down Unit 1 of Ignalina NPP and preparation for the dismantling projects. After Ignalina NPP was finally shut down, the power plant stopped generating electricity; hence its operation has to be performed in accordance with the new parameters: redundant systems have to be isolated, some systems have to be modified, and others will be operating as usually. Ignalina NPP will be able to load the spent nuclear fuel into the spent nuclear fuel storage pools after it has reconciled the fuel loading program and its safety justification with VATESI.

**27 December 2010.** VATESI permitted to continue operation of the solid and bituminized radioactive waste storage facilities.

### 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 the VATESI mission, the sole strategic objective – assuring a high level of safety at nuclear facilities – was set in the Strategic Plan of VATESI activities for the period of 2010-2012. 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 International Nuclear and Radiological Event (INES) scale.

To accomplish the strategic objective, the only program – *Public and Internal Administration of Nuclear Safety* – was developed and was being implemented in 2010. Four goals were set for implementing the program:

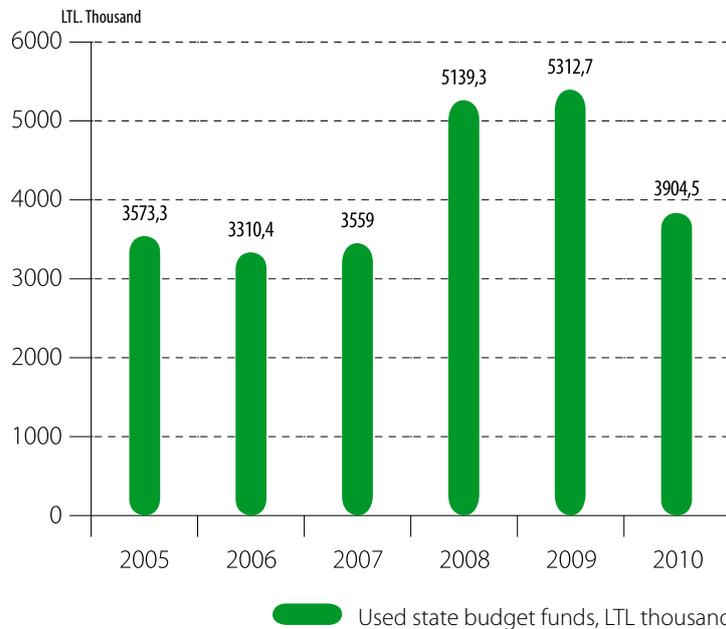
- To authorize and supervise the licensed activity at nuclear facilities, i.e. to assure compliance with the set requirements;
- To assure continuous upgrading of the systems of regulation and supervision of nuclear safety, physical protection and radiation protection to reach their compliance with the IAEA and Western European Nuclear Safety Regulators Association's recommendations and with the best international practice, legal framework of the European Union, international and national laws;



- To assure the administration of the institution's structure and management of documents, personnel and available material and financial resources in the manner enabling to efficiently perform the institution's functions;
- To get ready for regulation and supervision of designing and construction of the new nuclear power plant.

By accomplishing 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 ensuring 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 2010, the amount of LTL 4295 thousand from the state budget was approved for the implementation of the VATESI program; VATESI was allocated from the state budget and actually used LTL 3904.5 thousand (expenses), or 90.09 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 2005-2010





Preparation  
for licensing of the new  
nuclear power plant



## Legal regulation of the new nuclear power plant

### Upgrading of the legal framework in Lithuania

The Program of the Government of the Republic of Lithuania approved by Resolution No. XI-52 as of 9 December 2008 of the Seimas of the Republic of Lithuania (*Official Gazette, 2008, No. 146-5870*), provides that the implementation of the project of the new nuclear power plant will have to be further continued. The Plan for Implementation of the National Energy Strategy in 2008-2012, approved by Resolution No. 1442 as of 27 December 2007 of the Government of the Republic of Lithuania (*Official Gazette, 2008, No. 4-131*), envisages the following measures relevant to the development of the legal framework on nuclear safety:

- 1) To draft the legal acts regulating nuclear safety in the course of designing, construction and operation of the new nuclear power plant;
- 2) To draft the Law on Nuclear Safety of the Republic of Lithuania;
- 3) To draft the Law Amending the Law on Nuclear Energy of the Republic of Lithuania.



Alternatives sites for new Visaginas nuclear power plant.



In 2010, the draft Law on Nuclear Safety was submitted for discussions at the Seimas of the Republic of Lithuania. The key objective of the Law is to strengthen nuclear safety, to prepare the regulatory environment for the planned development of the nuclear energy infrastructure, to stipulate in detail the functions of the state regulation and supervision in the area of nuclear safety including licensing, issuing permits and safety assessment procedures. In order to strengthen and reorganize the nuclear safety regulatory system, other laws that are relevant to the regulation of nuclear safety and radiation protection will have to be amended, and the respective secondary legislation deemed necessary for the enforcement of these laws will have to be passed. Therefore in the period of 2009-2010 VATESI also participated in preparing the draft amendments of the respective paragraphs of the Law on Radiation Protection of the Republic of Lithuania, the draft Law Amending the Law on Radioactive Waste Management of the Republic of Lithuania, the draft Law Amending the Law on Nuclear Energy of the Republic of Lithuania, other draft laws.

VATESI bears responsibility for harmonization of 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. The provisions of the mentioned Directive will be transposed into the Law on Nuclear Energy (the draft Law Amending the Law on Nuclear Energy has been already submitted to the Seimas of the Republic of Lithuania), and the new Law on Nuclear Safety of the Republic of Lithuania (the draft Law has been submitted to the Seimas of the Republic of Lithuania as well). At the meeting of the Seimas of the Republic of Lithuania held on 14 December 2010 the approval was given for discussing the draft Law Amending the Law on Nuclear Energy, the draft Law on Nuclear Safety, other relevant laws in 2011 at the Sixth (Spring) Session of the Seimas. Therefore, the priority of VATESI in 2011 will be to draw up the secondary legislation for the enforcement of these laws.

### ***Development of the system of nuclear safety requirements and regulations***

To assure that the nuclear power plant planned to be constructed in Lithuania would be safely operated and comply with the highest possible safety level, first of all it is necessary to develop the system of nuclear safety requirements enabling to accomplish these goals.

As early as in 2008, VATESI resolved to draw up the nuclear safety requirements and regulations for the implementation of the project of the new nuclear power plant in line with the IAEA safety requirements and manuals, WENRA safety reference levels and the best practice of other countries and international organizations. The set objective – to establish the system of nuclear safety requirements for the successful licensing of the new nuclear power plant by the year 2012. In addition to that, it was resolved that until the decision on the reactor technology will have been made, these requirements and regulations



have to be set in general terms in order to avoid possible obstacles in choosing any of the different technologies of the nuclear power plants with either vessel-type pressurized water or boiling light water reactors or channel-type heavy water reactors. As soon as the type of the reactor is selected, VATESI will further upgrade the nuclear safety requirements and regulations for the implementation of the project of the new nuclear power plant by taking into account the peculiarities of these reactors and the requirements and standards valid in the supplier's country.

**In 2010, the following nuclear safety requirements and regulations for the implementation of the project of the new nuclear power plant were approved:**

- Nuclear Safety Requirements BSR-2.1.3-2010 *General Requirements for the Site Evaluation of a Nuclear Power Plant* validated by Order No. 22.3-58 of VATESI Head as of 20 July 2010 (Official Gazette, 2010, No. 91-4845);
- Nuclear Safety Requirements BSR-1.4.1-2010 *Requirements for the Management System* validated by Order No. 22.3-56 of VATESI Head as of 21 June 2010 (Official Gazette, 2010, No. 75-3852);
- Nuclear Safety Rules BST-2.1.1-2010 *Designing, Installation and Operation of Power Supply Systems at Nuclear Power Plants* validated by Order No. 22.3-91 of VATESI Head as of 26 November 2010 (Official Gazette, 2010, No. 141-7239).

Moreover, in 2010 VATESI specialists were drafting the following new legal acts:

- Requirements for Designing Nuclear Power Plants;
- Requirements for Deterministic Safety Analysis;
- Requirements for Probabilistic Safety Assessment;
- Requirements for Content of the Nuclear Power Plant's Safety Analysis Report;
- Requirements for Preparation of Documents Justifying Safety and their Approval by the Regulatory Institution;
- Regulations for Designing, Installation and Operation of the Reactor's Cooling Systems at Nuclear Power Plants;
- Regulations for Designing, Installation and Operation of Instrumentation and Control Systems;
- Regulations for Designing, Installation and Operation of the Nuclear Power Plant's Containment.

It is planned that these legal acts will be reconciled and approved in 2011.

It is worth mentioning that a group of experts formed by the International Atomic Energy Agency visited Lithuania on 24-27 May 2010 by invitation of VATESI. The objective of the visit was to provide recommendations and proposals regarding the nuclear safety regulations and requirements that then were being drafted by VATESI for the assessment of nuclear power plants' sites, their



designing and operation, as well as designing, installation and operation of the reactor's cooling system and power supply system. It should be emphasized that the experts not only acknowledged that the draft documents which were being newly drawn up by VATESI substantially comply with the IAEA safety standards, but also provided valuable proposals on their improvement. VATESI will upgrade the drafted documents and, if necessary, will arrange similar missions in the future.



**The IAEA experts and VATESI specialists  
who took part in the mission arranged on 24-27 May 2010**

### ***The nuclear power plant site evaluation***

With regard to the worldwide practice of construction of nuclear power plants (hereinafter – the “NPP”), the first stage of the NPP’s lifetime is the selection of the construction site and its evaluation in terms of safety.

According to Article 12 of the Law on the Nuclear Power Plant, the construction site of the new nuclear power plant has to be selected by taking into consideration the IAEA recommendations. With regard to these provisions, VATESI prepared and approved the *General Requirements for Evaluation of a Nuclear Power Plant Site* (Official Gazette, 2010, No. 91-4845). This legal act was drawn up on the basis of the IAEA safety requirements and the best practice of other countries. During its preparation, consultations with the specialists of the Lithuanian Geological Survey, Fire Safety and Rescue Department under the Ministry of the Interior were held.

The evaluation of the NPP site in terms of safety as a potential separate stage of the implementation of the NPP project has been provided for in the draft Law on Nuclear Safety submitted to the Seimas. Whereas the NPP site evaluation comprises many areas – nuclear safety, meteorology, hydrology, geology, aviation, and emergency preparedness – the draft Law provides for collaboration among VATESI and the Civil Aviation Authority, Lithuanian Geological Survey, Lithuanian Hydro Meteorological Service, Fire Safety and Rescue Department under the Ministry of the Interior.



### In the course of the NPP site evaluation it has to be justified that:

- No natural hazards or hazards caused by human activity (tectonic, seismologic hazards, floodings, extreme meteorological phenomena, accidental aircraft crash, etc.) will occur in the planned NPP site that could not be reasonably taken into account in the design-basis of the planned to be constructed NPP;
- During NPP operation or in the event of the accidents foreseen in the design of NPP, their effects on the population will be lower than the legally permissible ones;
- It will be possible to properly respond to emergency situations, including nuclear accidents, and to protect the population from the hazardous impacts;
- It will be possible to assure physical protection of the NPP and the territory adjacent to its site where the NPP construction and the related works are projected;
- Ultimate heat sink will be available in all cases.

The acceptability of the NPP site has to be justified by considering all these aspects, if necessary, by indicating the possible corrective measures that will have to be implemented in the course of designing or operating the NPP. The results of the NPP site evaluation have to be described in the Site Evaluation Report.

*Visagino Atominė Elektrinė UAB* (VAE UAB) started site evaluation activities in terms of nuclear safety in 2008. At the end of 2010, nearly all works have been completed.

In 2009-2010, nine consultations were held between VATESI and VAE UAB on the evaluation of the NPP sites. On 8-12 November 2010, the IAEA mission at VAE UAB was arranged the main objective thereof was to review the geological aspects of the NPP site evaluation. The representatives of VATESI and Lithuanian Geological Survey also took part in the mission.

At the end of 2010, VATESI approved the list of events requiring thorough analysis, which was submitted to VATESI by VAE UAB in accordance with the *General Requirements for Evaluation of the Nuclear Power Plant Site*. The list includes the credible natural events and those that can be caused by human activity; all of them will have to be comprehensively analyzed in the NPP Site Evaluation Report. The analysis and approval of the NPP Site Evaluation Report will be one of the most important VATESI assignments in 2011.

### Training of specialists and qualification improvement

Nuclear energy is a complicated field of research and technology demanding high competence, special knowledge and experience that have to be continuously updated and where all developments have to be closely followed, hence one of the priority goals of VATESI – to have highly qualified and equipped with special knowledge employees. This goal has become even more important after the decision to construct the new nuclear power plant was made.



To accomplish fluent and high quality safety surveillance and assessment during the licensing process of the new nuclear power plant, it is necessary to properly prepare the legal framework regulating nuclear safety that will be followed by VATESI specialists in evaluating the documents justifying nuclear safety in the course of the site evaluation of the new nuclear power plant, as well as in the processes of designing, construction and operation of the power plant and when conducting verifications and inspections. To draw up this legal framework, specialists of various fields, 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 are required.

In 2010, with regard to the economic situation in Lithuania, the number of the VATESI job positions did not grow, and in 2010 there were seventy job positions at the inspectorate. Sixty eight employees were working at VATESI as of late 2010, 59 of them were civil servants. In 2010, VATESI hired 6 persons, and the employment contracts were also terminated with 6 employees. Five VATESI employees of those working in the field of nuclear energy have got a qualification degree of the Doctor of Science, 37 – the Master's Degree, and 5 – the Bachelor's Degree.

With regard to the already being implemented and planned to be implemented VATESI goals and the related demand to maintain the highly qualified staff, VATESI pays major attention to the training and qualification improvement of its employees. In 2010, sixty employees (86 percent of all VATESI employees) were improving their qualification – 2 of them participated in the introductory workshops of civil servants, 59 employees took part in the training events aimed at the development of competences related to the implementation of the VATESI program for the accomplishment of its strategic goals – *Public and Internal Administration of Nuclear Safety*.

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 both by independently studying the information and by taking part in various seminars and training courses: on February 1–5 they participated in the IAEA regional seminar *Analysis of Severe Accidents and Accident Management* (Armenia), on March 9-10 – in the international conference *Challenges in Constructing Nuclear Power Plants* (the UK), on May 31-June 4 – in the technical meeting arranged by the IAEA *Safety Culture Prior to Starting Operation of New NPPs – Sharing Experience and Lessons Learned* (Austria), on June 20-27 – in the train-



ing courses *Safety Perspectives of Nuclear Reactors* (the US), on July 24-August 1 – in the training courses *Licensing and Supervision by the Regulatory Institution in Implementing the Project of a New Nuclear Power Plant* (South Korea), in the seminar *Experience in Supervising Construction and Regulation in Nuclear Power Plants* (Finland), on October 18-22 – in the IAEA workshop *Accomplishments and Challenges in the Development of Level II Probabilistic Safety Analysis Methodology and its Application in Nuclear Power Plants and in Preparing Management Programs of Beyond-Design Basis Accidents* (Russia), December 6-11 – in the workshop *Quality Assurance of New Safety Measures in Nuclear Reactors* (Slovenia) and other events. VATESI specialists disseminate the acquired knowledge at the arranged in-service seminars. This information is very beneficial in developing legal framework on nuclear safety.

### Cooperation between VATESI and Visagino Atominė Elektrinė UAB

In 2010, VATESI and *Visagino Atominė Elektrinė UAB* (hereinafter – the “VAE UAB”) held meetings aimed at exchanging information about the progress reached in the project of the new nuclear power plant and the nuclear safety requirements set forth in the legal acts regulating nuclear safety. During the meetings, the issues of safety assessment were discussed and settled.

VAE UAB, performing the preparatory works for the project of Visaginas Nuclear Power Plant, as early as in December 2008 had addressed VATESI with a request to be provided with consultations and clarifications on the issues of the already effective and being drawn up requirements on nuclear safety, and the licensing procedure of the new nuclear power plant. VATESI together with VAE UAB worked out the consultation scheme and defined the consultation subjects. After the adjustments in this scheme introduced in 2010, the number of the consultation subjects reached 18. In accordance with the consultation scheme, VATESI specialists provide consultations to VAE UAB on the issues of preparation of the legal acts regulating nuclear safety, nuclear safety (evaluation of construction sites, quality management system and safety culture, classification of structures, systems and components, operation, safety assessment), transportation of nuclear materials, management of radioactive waste, physical protection, accounting for and control of nuclear materials. In 2010, the focus of attention was given to the issues of the evaluation of the construction sites with regard to the IAEA recommendations. To discuss various aspects of the evaluation of the construction sites (VATESI requirements for the evaluation of the construction site, preparation of the list of initiating events for comprehensive analysis, parameters and criteria to be used during the site assessment, implementation of recommendations from the IAEA missions, the scope of the Site Evaluation Report and schedule for its submission to VATESI, involvement of other institutions in the process of reviewing the report), the meetings of specialists were held during which the analyzed issues were executed in seven written memorandums.

In 2010, three meetings of VATESI and VAE UAB representatives with the participation of top managers of both organizations were arranged, where decisions on unanimous positions and actions to be followed with regard to the issues discussed during consultations were made.



# SYSTEM OF NUCLEAR SAFETY REGULATION AND SUPERVISION

## Preparation of mandatory technical documents on nuclear safety

### *Setting nuclear safety requirements*

Nuclear safety requirements are set forth by the Laws of the Republic of Lithuania, Resolutions of the Government of the Republic of Lithuania and other secondary legislation.

The main legal act regulating the use of nuclear energy in Lithuania is the Law on Nuclear Energy of the Republic of Lithuania passed in 1996. Other laws that are directly related to the safe use of nuclear energy are: the Law on Radioactive Waste Management of the Republic of Lithuania, the Law on Radiation Protection of the Republic of Lithuania, the Law Concerning Control of Import, Transit and Export of Strategic Goods and Technologies of the Republic of Lithuania, the Civil Protection Law of the Republic of Lithuania, the Law on Construction of the Republic of Lithuania, etc. After Lithuania started planning and performing the preparatory works for decommissioning of *Ignalina Nuclear Power Plant*, the following laws were passed: the Law on Decommissioning of Unit 1 of the State Enterprise *Ignalina Nuclear Power Plant* of the Republic of Lithuania, the Law on the State Enterprise *Ignalina Nuclear Power Plant* Decommissioning Fund of the Republic of Lithuania, the Law on Additional Employment and Social Guarantees for the Employees of the State Enterprise *Ignalina Nuclear Power Plant* of the Republic of Lithuania.

In accordance with the Law on Nuclear Energy of the Republic of Lithuania and VATESI Statute, VATESI in its legal acts sets forth the requirements for nuclear safety and radiation protection, safety of radioactive waste management, physical protection along with the procedure for drawing up these requirements.

On 15 June 2009, by the Order of VATESI Head the Nuclear Safety Requirements BSR-1.1.1-2009 *Description of Procedure for Preparation of Nuclear Safety Mandatory Technical Documents* were validated, wherein the system of mandatory technical documents in nuclear safety along with the procedure for their preparation, execution and validation were defined as well. This legal act embedded the system of mandatory technical documents on nuclear safety consisting of:

- Nuclear safety requirements;
- Nuclear safety regulations;
- Standards;
- Mandatory technical documents of the licensee.



From the date of coming into validity of the above mentioned legal act, VATESI legal acts are respectively attributed either to the nuclear safety requirements or to the nuclear safety regulations. In accordance with the *Description of Procedure for Preparation of Nuclear Safety Mandatory Technical Documents*, the assessment of the impact of all drafted nuclear safety requirements and regulations has to be carried out.

### ***The Program for Upgrading Nuclear Safety Mandatory Technical Documents for 2010- 2014 and the Plan for Preparation and Review of Nuclear Safety Mandatory Technical Documents for 2010***

In accordance with Order No. 22.3-80 of VATESI Head as of 26 August 2009 Re: *Setting-up the Working Group Coordinating Preparation of VATESI Legal Acts*, the working group coordinating preparation of the legal acts was established at VATESI. This group, acting in line with the provisions of Chapter IV of the *Rules for Preparation of Nuclear Safety Requirements and Regulations (KU-II-03)* approved by Order No. 22.3-79 of VATESI Head as of 26 August 2009, prepared a five-year VATESI *Program for Upgrading Nuclear Safety Mandatory Technical Documents (2010-2014) and the Plan for Preparation and Review of Nuclear Safety Mandatory Technical Documents for the Year 2010* (approved by Order No. 22.3-136 of VATESI Head as of 31 December 2009). These documents together with their respective amendments are placed on the VATESI website.

### ***Implementation of the Plan for Preparation and Review of Nuclear Safety Mandatory Technical Documents for 2010***

*The Plan for Preparation and Review of Nuclear Safety Mandatory Technical Documents for the Year 2010* (hereinafter – the “Plan”) comprised 79 legal acts that were planned to be reviewed, and if necessary, had to be amended or their wording had to be revised, as well as those that were planned to be newly drawn-up.

Thirty two legal acts were either approved or reviewed by the respective VATESI division, however it was decided that their amendment is not expedient. In 2010, fifty legal acts were submitted for reconciliation with other institutions, VATESI divisions, were under preparation or their drafting had not been started (they were transferred to the Plan for the year 2011).

In all, 82 legal acts were reviewed in 2010, because upon the review of some legal acts included in the Plan for the year 2010, other legal acts that originally were not listed in the Plan had to be upgraded or withdrawn. The legal acts that were upgraded in addition or were withdrawn as no longer valid were as follows: Order No. 7 of VATESI Head as of 18 February 1999 Re: *Approval of the requirements for the quality assurance system in nuclear power plants and other nuclear facilities* (Official Gazette, 1999, No. 20-573); Order No. 56 of VATESI Head as of 29 December 2001 Re: *Approval of the requirements for the installation and operation of the emergency power supply systems in nuclear facilities* (Of-



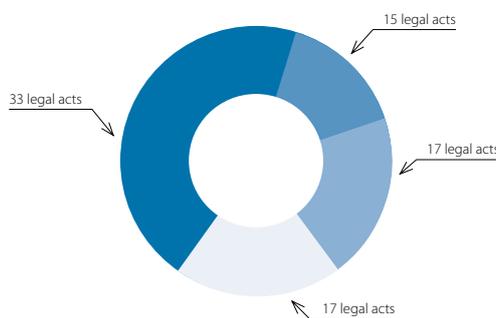
ficial Gazette, 2002, Nr. 4-160); Order No. 22.3-38 of VATESI Head as of 19 June 2007 Re: *Approval of general requirements for inspections conducted by VATESI* (Official Gazette, 2007, No. 71-2822; 2010, No. 58-2869).

**In all, in 2010 at VATESI:**

- 15 legal acts were approved (including the newly drawn, updated and the withdrawn ones);
- 17 legal acts were reviewed by the divisions, but were not amended (it as not necessary to do so);

**Transferred to the Plan for the year 2011:**

- 17 legal acts that were submitted for reconciliation with other institutions;
- 33 legal acts that were under preparation were submitted for reconciliation with other VATESI divisions, as well as those the preparation thereof was not started.



**The status of legal acts in 2010**

- Approved (including the newly drawn, updated and withdrawn legal acts)
- Reviewed, but not amended legal acts
- Legal acts transferred to the Plan for the year 2011 that were submitted for reconciliation with other institutions
- Legal acts transferred to the Plan for the year 2011 that were under preparation, were submitted for reconciliation with other VATESI divisions, as well as those the preparation thereof was not started

***The list of legal acts regulating VATESI activities and enforcing the requirements for the supervision area assigned to VATESI***

In accordance with Item 1, paragraph 2 of Article 36<sup>5</sup> of the Law on Public Administration of the Republic of Lithuania, the list of the legal acts regulating VATESI activities and enforcing the requirements for the supervision area assigned to VATESI was approved by Order No. 22.3-98 of VATESI Head as of 30 November 2010. This list is considered to be a public consultation (in the meaning prescribed by paragraph 2 of Article 36<sup>3</sup> of the Law on Public Administration of the Republic of Lithuania) and is publicly accessible on the VATESI website. The list is immediately updated when the effective legal acts are withdrawn or the new ones are validated.

***Issuing licences and permits***

The use of nuclear energy, as well as the use, storage and transportation of nuclear and other radioactive materials are strictly regulated by the legal acts of the Republic of Lithuania to assure that the risks posed to the public and the



environment would be minimized as much as possible. These risks have to be fully assessed in the course of designing, constructing a nuclear facility, performing modifications of the existing facility, during its operation or decommissioning, during storage or transportation of nuclear or other radioactive materials, and they have to be reduced to the minimum by the pre-planned measures. Risky operations are not allowed, if the risks have not been properly assessed, appropriate safety measures have not been projected and their implementations has not been assured.

Another fundamental reason for regulation of this activity – possible use of nuclear energy for terror purposes. In this case, regulation is aimed at preventing possible acts of terror and illicit trafficking of nuclear and radioactive materials.

Licensing is one of the main elements of the regulation, supervision and control system over operations in nuclear energy or other activity related to nuclear 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 (Official Gazette, 1996, No. 119-2771) is assessed. In the course of licensing, the safety of a nuclear facility, organizational structure of the applicant, qualification of personnel, documents of quality assurance during the licensed activity 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 licence;
- Issuance of the licence (provided that an affirmative decision has been made);
- Supervision of compliance with the licence conditions;
- Termination of the licence validity.

When an application is accepted, the documents deemed necessary for the assessment of safety of the activity for which it is requested to issue the licence are identified.

During the review and assessment of the application documents and inspection of the applicant, the safety of operations is assessed in the following aspects:

- Whether the nuclear facility will comply with the safety requirements set for this facility. These requirements, depending on the type of the licensed activity, cover the principal requirements of nuclear safety and physical protection (e.g. the sufficiency of implementation of the defense in depth principle, operational experience feedback), the requirements for the plant (e.g. the



equipment qualification and ageing analysis, its control), the requirements for the specific systems of the facility (e.g. the specific requirements for the reactor's core, cooling system, accident confinement systems, the peculiarities of safety engineering ), requirements for the construction design, etc.

- Whether the activity related to the nuclear facility or nuclear materials will comply with the safety requirements set for this activity: whether the applicant has established an organizational structure, implemented an efficient quality management system and has sufficient resources for the implementation of this system;
- Whether the applicant has obtained permits from other institutions prescribed by the Law on Nuclear Energy evidencing that he has complied with their requirements for the safe use of nuclear facilities and nuclear materials.

**In 2010, three applications for issuing the licence were examined.**

**Applications assessed by VATESI in 2010 for issuing a licence**

Date of submission of an application	Applicant	Type of licensed activity	Comments
September 2008	State Company Ignalina Nuclear Power Plant	To construct a very low level short-lived radioactive waste storage facility	Licence No. 1/2010 issued in March 2010
July 2010	State Company Ignalina Nuclear Power Plant	To construct solid radioactive waste retrieval and conditioning facility	Submission and assessment of the application documents will be continued in 2011
September 2010	State Company Ignalina Nuclear Power Plant	To operate a very low level short-lived radioactive waste storage facility	Submission and assessment of the application documents will be continued in 2011

The decision on issuing the licence is made on the basis of the results of the review and assessment of the documents and the inspection of the applicant. VATESI decisions on issuing the licence are executed by the Orders of VATESI Head.

**In 2010, one licence was issued.**

**Licences issued by VATESI in 2010**

Licence No.	Licensee	Licensed activity
1/2010	State Company Ignalina Nuclear Power Plant	To construct a very low level short-lived radioactive waste storage facility



By fulfilling the assigned functions and with an aim to evaluate the compliance of the performed activity with the set requirements, in 2010 VATESI specialists assessed the documents justifying safety (for more information refer to Chapters Finally shut-down Ignalina NPP and Management of nuclear fuel and radioactive waste) and conducted inspections and technical checks (for more information refer to Chapter Inspections). Subject to the results of the safety assessment, inspections, technical checks, analytical works, the decisions were made on the compliance of the nuclear facilities with safety requirements, acceptability of the proposed safety system modifications or the requirements for upgrading the performed activity were set.

**Licences issued by VATESI whereby VATESI was supervising the licensed activities in 2010**

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 an interim spent nuclear fuel storage facility (SNFSF) of dry type at Ignalina NPP
3.	1/2004	Lietuvos Geležinkeliai AB	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 a 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.	1/2008	State Company <i>Ignalina Nuclear Power Plant</i>	Designing a solid radioactive waste retrieval and conditioning facility
8.	2/2008	State Company <i>Ignalina Nuclear Power Plant</i>	Designing a very low level short-lived radioactive waste storage facility and a repository
9.	1/2009	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of solid radioactive waste management facilities
10.	2/2009	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of an interim spent nuclear fuel storage facility
11.	1/2010	State Company <i>Ignalina Nuclear Power Plant</i>	Construction of a very low level short-lived radioactive waste storage facility



By exercising the right prescribed to the inspectorate by the Law on Nuclear Energy, VATESI sets forth the conditions of the licence validity. In the course of the licensed activity, the conditions of the licence validity may be adjusted to satisfy the amended safety requirements or changed parameters of a nuclear facility. In 2010, there were five cases when the conditions of the licence validity were adjusted.

#### Licences adjusted by VATESI in 2010

Licence No.	Date of adjustment	Type of licensed activity	Essence of adjustments
2/2008	5 March 2010	To design very low level short-lived radioactive waste storage facility and repository	The right to design only a repository for very low short-lived level radioactive waste was given
2/2009	13 October 2010	To construct an interim storage facility for spent nuclear fuel	The right to postpone the design preparation for management of damaged and experimental nuclear fuel later beyond the date indicated in the design of the storage facility
12/99(P)	27 October 2010	To operate Ignalina NPP Unit 1	The right was given to implement the equipment dismantling and decontamination project in Ignalina NPP building 117/1
2/2004	9 December 2010	To operate Ignalina NPP Unit 2	The right was given to start decommissioning of the shut-down Ignalina NPP Unit 2 and to start preparations for the dismantling projects
12/99(P)	27 December 2010	To operate Ignalina NPP Unit 1	The right was given to continue the operation of the solid and bituminized radioactive waste storage facilities

In the course of supervising the licensed activity, in the case of flagrant violations of the licence conditions, VATESI may suspend the validity of the licence or to withdraw the licence. In 2010, no flagrant violations of the licence conditions were established.

The licence is withdrawn when a nuclear facility proceeds to another stage of its lifetime (when the type of the licensed activity becomes different) or



when the licensee terminates the licensed activity. In 2010, no licences issued by VATESI were withdrawn, but when the technical design for the construction of a low level radioactive waste storage facility was approved to the State Company *Ignalina Nuclear Power Plant*, the conditions of the licence, which had been issued for designing a low level radioactive waste storage facility and a repository, were adjusted, and the right was given to design only a low level radioactive waste storage facility (Licence No. 2/2008).

Supervision and control over transportation of nuclear materials is carried out in line with the *Regulations for Import, Export, Transit and Transportation of Radioactive Materials, Radioactive Waste and Spent Nuclear Fuel in the Republic of Lithuania* validated by Order No. 1271/22.3-139 as of 24 December 2008 of the Minister of Health of the Republic of Lithuania and VATESI Head (Official Gazette, 2009, No. 3-64; 2010, No. 125-6452). In accordance with the provisions of these Regulations, permits for transportation of fission materials, radioactive waste that have been generated in the course of a nuclear fuel cycle are issued by VATESI. Moreover, applications for transportation of radioactive materials and radioactive waste, which has not been generated in the course of a nuclear fuel cycle but is categorized as nuclear material and permits for transportation thereof have been issued by the Radiation Protection Centre, have to be reconciled with VATESI.

In 2010, VATESI approved all 19 applications that had been submitted by economic operators for obtaining a permit for transportation of radioactive materials and radioactive waste categorized as nuclear material. Thirteen of these applications were submitted with the request to issue permits for import or export of the ionizing radiation sources. These sources of ionizing radiation were transported in the containers the structures whereof contained the nuclear material – depleted uranium. One of the companies got a permit to deliver calibration sources in the container with depleted uranium. Besides, the applications were approved and permits were issued for transportation of the pellets of the confiscated raw nuclear fuel (uranium oxide  $UO_2$ ) and radioactive waste containing plutonium isotope (Pu-239) from the second-hand instruments of dosimetric control and smoke sensors.

### Inspections

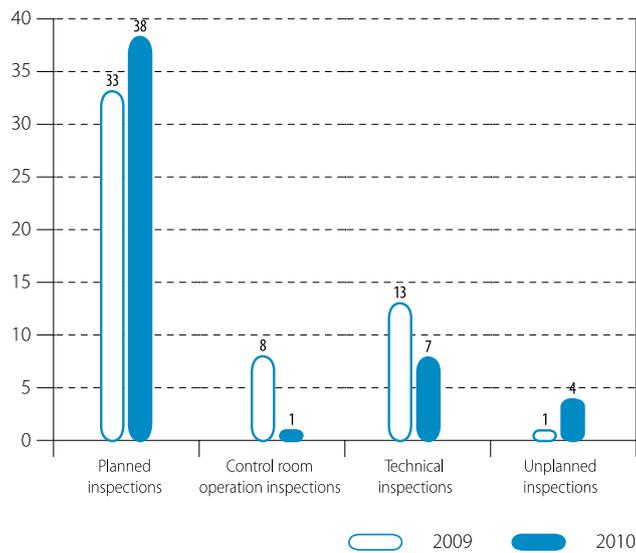
The inspection activities are targeted at assessing the compliance of economic operators supervised by VATESI with the set requirements on nuclear safety, radiation protection and accounting of nuclear materials. Every year VATESI develops a plan of inspections in accordance with the established criteria. In addition to the planned inspections, the technical checks and control room operation inspections as well as unplanned inspections are undertaken. In 2010, VATESI specialists conducted 50 inspections (55 in 2009), including 38 planned inspections, 1 control room operation inspection, 7 technical checks and 4 unplanned inspections.



**Inspection at Ignalina NPP**

Inspections are conducted at all stages of the licensed activity: during the evaluation 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 licensees.

**Inspections conducted by VATESI in 2009-2010**



In 2010, 47 of 50 conducted inspections were performed at Ignalina NPP, 2 – at the State Company Radioactive Waste Management Agency (RATA) and 1 – at Metesta UAB and ORLEAN Lietuva AB.



### *Planned inspections*

Every year, in December, upon having assessed the gained experience of inspection activities, upon having analyzed the experience of organizations operating nuclear facilities, the results of licensing, the results of analysis of the safety upgrading program and other safety-related documents, VATESI specialists project the inspections to be conducted in the coming year. In 2010, forty two inspections were scheduled in VATESI plan of inspections. Thirty eight of them were conducted; two were rescheduled for 2011, and there was no need to conduct 2 inspections. In the course of inspections, the following safety-related areas were examined:

- Training of Ignalina NPP personnel;
- Safety systems and safety-related systems (the emergency cooling system of the reactor's core, back-up power supply system, fire extinguishing systems at Units 1 and 2, back-up control panels, system for reactor cavity overpressure protection, system of regular and back-up power supply for the Unit's auxiliary consumption, system for replenishment of cooling water and its quality control, regulation and control systems, operation of cluster-type control rods, system for calculation of neutron impulses);
- Accounting of and control over nuclear materials;
- Verification of physical inventory;
- Management of design basis and beyond-design basis accidents;
- Management of nuclear fuel;
- Physical protection of nuclear facilities and nuclear materials;
- Environmental monitoring conducted by Ignalina NPP;
- Planning of Ignalina NPP decommissioning projects;
- Implementation of radiation protection program;
- Management of radioactive waste at Ignalina NPP;
- Equipment qualification and ageing management of the safety-related systems;
- Use of imported strategic commodities intended for nuclear purposes;
- Emergency preparedness;
- Operational experience feedback.

The inspection's results are written down in an inspection protocol, and the organization that has been inspected is familiarized with them. Upon having received from VATESI the inspection protocol, 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 to VATESI the documents evidencing that non-compliances were rectified.



### *Technical checks*

Technical checks are the checks conducted by VATESI experts on the technical condition of individual systems, facilities and equipment of a nuclear facility set forth in the special (operation, testing, maintenance, etc.) regulations.

The objective of the checks of the technical condition is to ascertain that the safety-related pressurized components at Ignalina NPP (equipment and pipelines) are manufactured, mounted, installed, maintained and operated in accordance with the requirements of the effective legal acts (regulations) and operation manuals, as well as that they are in good status and it is possible to use them in the course of the start-up – commissioning works and to operate the facility at the set operational parameters (e.g. pressure and temperature). The check of the technical condition comprises the internal and/or external visual inspections of equipment and pipelines, tests, verification of technical parameters conforming compliance of the pressurized components with the safety requirements and other actions to be taken to ascertain their compliance with the safety requirements.

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 pressurized components is to supervise the checks of the technical condition of the safety-related pressurized components and pipelines and to personally evaluate the technical conditions of the NPP components being checked.

Regardless of the fact that the only operated Unit 2 of Ignalina NPP was finally shut down on 31 December 2009, a part of the safety-related technological systems remained in operation. The requirements for their operation and supervision have not become less strict because of the changed operation mode of Ignalina NPP.

In 2010, the specialists of the Surveillance Division of VATESI Nuclear Safety Department conducted 7 technical checks. The results of these checks were executed in accordance with the established procedure by authorizing operation of these systems at the established parameters.



### Upgrading of inspection activities



**Inspection at Ignalina NPP**

VATESI nuclear safety specialists regularly analyze the experience, knowledge and information obtained during inspections, workshops or working meetings, provide proposals on the upgrading of the conducted inspection activities and documents regulating these activities. Measures for training of inspectors (in-service training, training courses) are envisaged in

the IAEA national project for 2008–2011 *Enhancing Capabilities of VATESI and Other Institutions in Licensing a New NPP in Lithuania*. In 2010, 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 competencies in the assessment of the structural integrity of the 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 operating facilities, as well as to get ready for supervising the implementation of the project of the new nuclear power plant. This is especially useful to young inspectors who are joining the ranks of nuclear safety specialists. ■



# Safety of finally shut-down Ignalina Nuclear Power Plant



## Supervision of decommissioning of finally shut-down Unit 1 and Unit 2

### *The main decommissioning works of finally shut-down Unit 1*

In 2010, Ignalina NPP has been further implementing the projects related to decontamination and dismantling of the redundant equipment in Unit 1 of Ignalina NPP. VATESI examined the Technical Design (B9-0 project) and Safety Justification Report, which had been revised in accordance with VATESI comments, for equipment dismantling and decontamination in building 117/1 at Ignalina NPP Unit 1, where the high pressure emergency cooling systems of the reactor core were installed, and approved the Technical Design on 4 May 2010. On 27 October 2010, by Order No. 22.3-76 of VATESI Head, the licence issued for operation of Ignalina NPP Unit 1 was supplemented with the permit to start the works in line with the above mentioned Technical Design and its Safety Justification Report.

On 2 June 2010, the Technical Design for decontamination and dismantling of the equipment in the turbine hall of Ignalina NPP Unit 1 (B9-1 project) was submitted for review and approval by VATESI. The project will consist of the decontamination and dismantling works of the main redundant systems, such as turbine generators, turbine oil equipment, condensate treatment equipment, condensers, separators – reheaters and evaporators, water supply pumps, condensate pumps and heat reduction components, as well as the safety justification of these works. VATESI examined the Technological Design (B9/1 project) and its Safety Justification Report and provided comments on 29 September 2010. On 5 August 2010, the Technical Design (B9-5 project) for decontamination and dismantling of the Ignalina NPP heating equipment and its Safety Justification Report were submitted for approval by VATESI. In the course of normal operation, the building with the heating equipment used the steam supplied from the operating Ignalina NPP power unit and heated water for district heating demands of Ignalina NPP facility, Visaginas city and district. After termination of Ignalina NPP operation, the heat supply was terminated as well, and the heating equipment became unnecessary. On 15 December 2010, upon having examined the documents on decontamination and dismantling of this equipment, VATESI specialists provided their comments.

As of late 2009, after the removal of the last fuel casket from Unit 1 of Ignalina NPP, preparations for decontamination of the *main cooling circuit* (MCC), blasting and cooling systems (BCS), treatment systems, emergency cooling system of the reactor core, internal surfaces of the manifolds and parts of the steam supply pipes were started. This equipment is contaminated with radionuclides most of all. On 15 July 2010, Ignalina NPP submitted for review and approval by VATESI the Technical Design (B12 project) for decontamination of the *main cooling circuit* and the internal surfaces of the systems related to this circuit, as well as its Safety Justification Report. The main objective of this project is to remove the major part of contaminants from the internal surfaces of the



equipment with an aim to reduce the employees' exposure to radiation during the dismantling works in the power units A1 and B1. VATESI specialists, upon having analyzed the above mentioned documents, on 13 August 2010 provided their comments. On 14 September 2010, VATESI, upon having analyzed the responses provided by Ignalina NPP, arranged a meeting to discuss these issues. After the meeting, Ignalina NPP revised the Technical Design B12 and its Safety Justification Report, and on 29 September 2010 submitted them to VATESI. VATESI examined the submitted documents and approved them on 4 October 2010.

### ***The main decommissioning works of finally shut-down Unit 2***

The highest possible level of safety has to be assured throughout all stages of the lifetime of a nuclear power plant – starting from the evaluation of the construction site and preparation of the design and finishing with its decommissioning.



To assure an acceptable level of safety during decommissioning of on 31 December 2009 finally shut-down Ignalina NPP Unit 2 in removing the nuclear fuel from the reactor core and later – from the spent nuclear fuel storage pools, the State Company *Ignalina Nuclear Power Plant* prepared the project for decommissioning of Unit 2 and its safety justification (the Safety Justification Report). These documents describe and justify the configuration of the systems and equipment in the finally shut-down unit, i.e. at what parameters and which systems and equipment will be further operated (including their maintenance) in order to support and appropriately control the reactor's sub-criticality, its cooling and containment of radioactive materials, as well as what systems that are not involved in the safety-related functions could be isolated (and subsequently dismantled) at this stage of decommissioning, and whether any adjustments (modifications) will be necessary. After the fuel is removed from the reactor core, it will be possible to start decontamination of the main circulation circuit and fuel reloading machine along with the fuel retrieval from the spent nuclear fuel storage pools and its transportation to the presently being constructed spent nuclear fuel facility (B1 project). After the completion of these works, it will be possible to decontaminate and dismantle the remaining systems and equipment.



VATESI specialists with the assistance of Lithuanian and foreign countries' experts reviewed and evaluated the project for decommissioning of Unit 2 and its safety justification, and on 8 April 2010 provided their comments. Upon having analyzed the responses provided by Ignalina NPP, on 30 June-1 July VATESI arranged a meeting to discuss these issues. After the meeting, Ignalina NPP revised the decommissioning project of Ignalina NPP Unit 2 and its safety justification and on 2 August 2010 submitted them to VATESI. VATESI examined the submitted documents and approved them on 3 September 2010.

### **Measures for assuring nuclear safety**

#### ***Assurance of safety of the Ignalina NPP 2nd nuclear reactor and spent nuclear fuel storage pools of Ignalina NPP Unit 1 and Unit 2***

At the end of 2009, the removal of nuclear fuel from the reactor core of Ignalina NPP Unit 1 into the spent nuclear fuel storage pools was completed.

At the end of 2009, the reactor of Ignalina NPP Unit 2 was finally shut-down. After the shut-down, 11 fuel assemblies were removed from the reactor core due to various reasons, and, to assure a sufficient level of sub-criticality, 6 fuel assemblies were replaced by additional neutron absorbers. As of late 2010, the reactor core contained 1634 spent nuclear fuel assemblies. Nuclear fuel will be stored in this Unit until sufficient space is provided in the spent nuclear fuel storage pools.

At the end of 2010, Ignalina NPP worked out the program and safety justification report for 500 assemblies of spent fuel removal from the reactor to the spent nuclear fuel storage pools, and submitted these documents for review and approval by VATESI. The inspectorate provided their comments on the submitted documents.

The safety of the fuel assemblies loaded into the spent nuclear fuel storage pools is assured by storing them in accordance with the methods set forth in the NPP design, by maintaining the required cooling and chemical regime. When the operation of the new SNF storage facility of dry type is started, the fuel assemblies will be removed from the pools, placed into special containers and delivered for their storage in this storage facility.





In 2010, the specialists of the Safety Analysis Division of VATESI Nuclear Safety Department conducted inspection on the control of safety-related characteristics of the reactor and the implementation of the modifications related to the control of the reactor core. It was found that the characteristics of Ignalina NPP Unit 2 are registered in accordance with the valid Ignalina NPP regulations and the requirements of the normative documents. No deviations in the characteristics from the set limits were found.

### ***Assurance of structural integrity of the cooling circuit of the nuclear reactor of Ignalina NPP Unit 2 and fuel storage pools of Ignalina NPP Unit 1 and Unit 2***

The State Company *Ignalina Nuclear Power Plant* exercises control over the structural integrity of the pipelines, equipment and technological channels by the existing preventive measures (by monitoring the level of water in the drum-type steam separators, conducting visual inspections, etc.). Presently this structural integrity is up to standard.

In addition to these measures, Ignalina NPP has to undertake additional measures in order to identify in advance the potential defects that might result in the leakage of the coolant. The primary principle of safety assurance is the early prevention of possible failures. Due to the final shut-down of Ignalina NPP Unit 2 at the beginning of January, the current operating conditions of the pipelines, technological channels and equipment (at present the water temperature in the circuit is  $\sim 37^{\circ}\text{C}$ , as compared with  $285^{\circ}\text{C}$  during operation of the power unit, pressure  $\sim 0,3\text{MPa}$ , during operation of the power unit it was  $\sim 8,6\text{MPa}$ ) and the environment, in which they are operated, became more moderate. Ignalina NPP updated and submitted for review and approval by VATESI the revised documents related to the assurance of structural integrity of the reactor's cooling circuit as well as the regulations for control over the condition of the metal parts of the pipelines and safety-related systems, regulations for the technological channels, as well as their safety justifications. After the State Company *Ignalina Nuclear Power Plant* revised these documents with regard to the comments of VATESI specialists, the regulations were approved. However, in 2010 the State Company *Ignalina Nuclear Power Plant* encountered difficulties – in 2010, the financing model of Ignalina NPP was fundamentally changed, and the preparation, review and approval of the technical specifications for the procurement procedures was delayed, hence the agreement with the supplier of the services of the metal parts' operational control has not been signed yet. It is expected that the State Company *Ignalina Nuclear Power Plant* will manage to overcome these difficulties in the first half of 2011. Then the works will be started, and VATESI in its own turn will further supervise the assurance of the Ignalina NPP safety at all stages.



To verify how the structural integrity of the reactor's cooling circuit and the SNF storage pools is maintained by Ignalina NPP, VATESI specialists conduct regular inspections. In 2010, three inspections were conducted, during the inspections it was verified how Ignalina NPP:

- Performed maintenance of the finally shut-down Units 1 and 2, and assured management of the equipment ageing;
- Operated and performed maintenance of the cooling systems of the SNF storage pools;
- Assured the preparedness of the reactor's emergency cooling system to perform its functions.

During these inspections, no non-compliances with the nuclear safety requirements, regulations or other legal acts that could result in the infringement of the safe operation limits and/or conditions were established. For the elimination of other shortcomings, the State Company *Ignalina Nuclear Power Plant* has projected the relevant rectifying measures the implementation thereof will be supervised by analyzing the submitted documents and by performing inspections and technical checks.

### **Maintenance of safety-related systems, management of their ageing and other safety upgrading and assurance measures**

#### ***Assurance of functionality of the accident confinement system***

The accident confinement system (the "ACS") is assigned to the safety-related systems and performs the following functions:

- During operation of a power unit – the confinement of radioactive products in the leak proof chambers when the steam is supplied to the ACS from the over-pressure protection system of the main circulation circuit for the release of steam from the high-speed reduction equipment into the ACS under normal circulation mode during the release of the residual heat.
- During design-basis accidents with the loss of coolant – the confinement of radioactive products in the leak proof chambers in the case of occurrence of any initiating event prescribed by the design basis and demanding to launch the ACS.

In 2009, during the last scheduled routine maintenance, in line with the nuclear safety requirements the Ignalina NPP Commission performed the leakage tests of the ACS of Ignalina NPP Unit 2, which confirmed that the tightness of the ACS at Ignalina NPP complies with the safety levels set forth in the Ignalina NPP design-basis. The results of the tightness tests were submitted for the analysis by VATESI which confirmed that the ACS complies with the Safety Requirements for the Accident Confinement System. Whereas on 31 December 2009, Ignalina NPP Unit 2 was finally shut down, in 2010 the ACS was kept in reserve and its leakage tests were not performed, and Ignalina NPP special-



ists carried out maintenance of the ACS in line with the requirements for the decommissioning project and its safety justification. The specialists of Ignalina NPP conducted monitoring of the water level in the condensation plates and hot condensate chambers and of the water temperature. This assured the operability of the system.

In 2010, the decontamination liquid which was released from the ACS during the decontamination of the main cooling circuit was held back and collected in the special chambers, as it is set in the decommissioning project. During this event the ACS was launched into operation and performed the assigned safety assurance functions.

### ***Monitoring, control and protection systems***

After the final shut-down of Ignalina NPP Unit 2 at the end of 2009, the peculiarities of operation of the monitoring, control and protection systems changed, because from the stage of the operating NPP a move to the stage of decommissioning was made, during which the spent nuclear fuel will be removed from the reactor core, and later – from the spent fuel storage pools as well. Therefore the configuration of the systems, margins and settings of the technological parameters, the conditions of their operation and maintenance significantly changed. The Technological Regulations of Ignalina NPP were revised and agreed with VATESI, the operating instructions for monitoring, control and protection systems were being adjusted as well. Whereas in 2010 both units of Ignalina NPP were finally shut down, the safety class of a certain group of the nuclear power plant's systems and components had to be adjusted as well, therefore in 2010 VATESI specialists were examining the updated lists of the safety-related equipment supervised by the respective division of Ignalina NPP. This work will be continued in 2011. Besides, during the inspection conducted in 2010 the condition of the mentioned systems and the operation procedures were examined. No non-compliances were found.

### ***Maintenance of safety-related systems***

In 2010, the Technological Regulations of Ignalina NPP Units 1 and 2 were revised. The necessity to make the revision resulted from the fundamentally changed operation conditions of the power units. There is no fuel in the reactor of Unit 1: all fuel had been already removed from the reactor core and was loaded into the fuel storage pools. The reactor of Unit 2 will never again be launched into operation and it has entered the phase of fuel removal. After such changes, together with the Technological Regulations, the List of the Safety-Related Systems had to be revised as well, because a part of the designed systems became redundant. This assignment was also completed in 2010. On 6 April VATESI approved the Technological Regulations for Unit 1. On 29 October VATESI approved the Technological Regulations for Unit 2 together with the List of the Safety-Related Systems. In line with the previously validated



yearly plan of inspections and by performing everyday activities, all safety-related systems at Ignalina NPP were verified. No non-compliances that would prevent the safety systems from performing their functions were established. All verifications were documented.

### ***Ageing management of safety-related systems and maintaining their qualified condition***

#### *Ageing management of safety-related structures, systems and components*

In the course of operation of Ignalina NPP, due to the impacts of temperature, pressure, radiation and other operational factors, physical-chemical alterations have been continuously occurring in the safety-related systems and components; this process is characterized as the ageing of constructional and functional properties of the plant. The process that causes changes in the structure of materials and deterioration of their properties due to the processes occurring in these materials is called ageing.

In 2010, after the final shut-down of the Ignalina NPP, according to the program for the ageing management of elements and systems, the *Plan of Measures to be taken for the ageing management of elements and systems after the final shut-down of Ignalina NPP* was worked out and approved. In accordance with the Plan of Measures, all documentation on the ageing management was reviewed and updated, including the ageing management program, ageing management methods, collection and storage of data required for the ageing management and assessing the efficiency of the ageing management, the methodology for evaluation of the technical conditions and the remaining life time, the list of Ignalina NPP safety-related systems and elements with the mandatory ageing management, other documents.

In June 2010, the inspection to verify the maintenance and ageing management of the finally shut-down Ignalina NPP Units 1 and 2 was conducted. During the inspection it was verified how Ignalina NPP, acting in line with the set requirements, was performing the process of the ageing management of the safety-related structures, systems and components of the shut-down power units by using organizational and technical measures in order to timely identify degradation in the condition of the elements to forecast possible deterioration in their condition and anticipate the time when the condition of the relevant component would fail to satisfy the set safety requirements of the nuclear facility. No non-compliances that could impact nuclear safety were established during the inspection.



### *Maintaining the qualified condition of safety-related systems*

The qualification of the 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 lifetime under the designed operating conditions. Although Ignalina NPP is no longer operated, the qualification of the SRS and elements has to be performed as before the shut-down and the qualified condition of the equipment has to be maintained to assure performance of the relevant functions of the equipment.

In 2010, VATESI specialists supervised how Ignalina NPP performed the works for maintaining the qualified condition of the systems. The most important among these is to conduct proper maintenance. Both the condition of the systems and the examined reports allowed drawing a conclusion that the works for maintaining the qualified condition of the systems were properly planned and performed.

### **Safety improvement measures**

Safety upgrading of Ignalina NPP is the main task and an uninterrupted process, therefore the safety improvement works of Ignalina NPP are carried out on a permanent basis with an aim to continuously improve the safety of Units 1 and 2 by upgrading the safety-related systems and procedures with regard to the operational experience of Ignalina NPP and organizations of foreign countries. Works in this area have been done in accordance with a special Ignalina NPP Safety Improvement Program (SIP) coordinated with VATESI.

To make sure that the safety upgrading measures are implemented on time and with adequate quality, VATESI has been supervising the implementation of the Safety Improvement Program by Ignalina NPP. Ignalina NPP, having implemented a SIP measure, informs VATESI about it and submits the documents to confirm the implementation. In 2010, the issues of the implementation of the safety improvement measures were analyzed during the joint meetings of VATESI and Ignalina NPP managers and specialists.

Regardless of the fact that Ignalina NPP Unit 2 was finally shut down on 31<sup>st</sup> of December 2009, Ignalina NPP has been further implementing the SIP measures.

Six safety improvement measures were included in the Safety Improvement Program SIP-3/2010, two of them were to be implemented in 2010, 1 measure will be accomplished by 2012 and 3 measures are being implemented on a permanent basis.

In 2010, VATESI specialists supervised the works undertaken for implementing the following measures: conservation of the fully loaded compartments of the solid radioactive waste storage facility (building 157/1), safety assessment of converting the existing bitumized radioactive waste storage facility (building 158) into the radioactive waste repository, defining the seismic category of



buildings 159B and 151. In addition to that, in 2010, VATESI specialists supervised the works undertaken under the measures implemented on a permanent basis: the measures for reducing the frequency of individual exposure to radiation dose (the implementation of the ALARA principle), managing the ageing of the safety-related systems and supporting the qualified condition of safety-related systems. All measures are being implemented. After the assessment of Ignalina NPP safety improvement program implementation results, the safety level of Ignalina NPP in 2010 was evaluated as being acceptable. The safety improvement works will be also continued in 2011.

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

In accordance with the nuclear safety requirements, the safety assessment of the nuclear facility has to be carried out to justify its safety. One of the fundamental constituent parts of the safety assessment is the deterministic safety analysis. The deterministic safety analysis (DSA) is an engineering and research study whereby the analyses of neutronic, thermal hydraulic, structural integrity, fire hazard and radiological aspects of safety-related constructions, systems and components of a nuclear power plant are conducted by applying verified and validated computer codes. According to the results of the calculations of the deterministic safety analysis, the efficiency of prevention of design-basis and beyond-design-basis accidents and technical and organizational measures for mitigation of their effects are assessed. In the case of breach of the physical barriers of the nuclear facility and possible emission of radionuclides into the atmosphere, the method of deterministic calculations is used to determine whether the risks posed to the environment and people do not exceed the permissible limits.

In 2010, VATESI specialists were analyzing the safety justifications submitted by the State Company *Ignalina Nuclear Power Plant* that had been prepared within the scope of various decommissioning projects, assessed the results of the analysis of the design-basis and beyond-design-basis accidents and the descriptions of the procedures for management of these accidents, supervised compliance with the set requirements, and timely preparation and implementation of the corrective measures. The documents justifying the safety of decontamination and dismantling of the turbine hall equipment of Ignalina NPP Unit 1 (B9-1 project), solid radioactive waste storage and management facility (B2 project), short-lived very low level radioactive waste storage facility (B19-1 project) and repository (B19-2 project), decontamination of main cooling circuit of Ignalina NPP Unit 1 (B12 project) were reviewed, the reports on typical for these nuclear installations design-basis and beyond-design-basis accidents and the descriptions of the procedures for management of such accidents were assessed. Ignalina NPP rectified the established non-compliances in the safety analysis reports of the mentioned projects in line with the comments provided by VATESI.



In 2010, VATESI specialists examined and provided their comments on the documents of the *Emergency Preparedness Plan of the State Company Ignalina Nuclear Power Plant*, related to the evaluation of radiological consequences foreseen in the scenarios of beyond-design-basis accidents (e.g. *Complete loss of power supply for auxiliary consumption of Ignalina NPP Unit, Accident in the spent nuclear fuel pools due to uncompensated loss of water, Accident in the spent nuclear fuel pools when the heat releasing assemblies hit the bottom of the pool resulting in formation of self-criticality, and External Events*). Ignalina NPP, with regard to the VATESI comments, made additional calculations of radiological consequences and respectively adjusted the documents of emergency preparedness.

In accordance with the results of the inspection *Verification of prevention and management process of the design-basis and beyond-design-basis accidents in the spent nuclear fuel pools* conducted in December 2009, in 2010 Ignalina NPP worked out the plan for the elimination of non-compliances and violations. In line with this plan, Ignalina NPP modified the manuals for management of beyond-design-basis accidents. The strategy, which will be implemented in managing very unlikely beyond-design-basis accidents related to the formation of self-criticality in the spent nuclear fuel pools of Ignalina NPP Unit 1 (e.g. in the case of dropping heavy-weight equipment into the pool or the earthquake) and mitigating the effects of these accidents, was set in the modified manuals for management of beyond-design-basis accidents. VATESI specialists reviewed and evaluated the modified manuals for management of beyond-design-basis accidents of the State Company *Ignalina Nuclear Power Plant* and obligated the company till 1 April 2011 to perform the detailed assessment and safety justification of the physical and chemical processes that might occur in the spent nuclear fuel pools while implementing the strategy for management of beyond-design basis accidents, and to prepare a special supporting procedure which would contain a detailed description of the actions to be taken by Ignalina NPP employees in implementing this strategy. In relation to that, the inspection planned in 2010 *Verification of Accident Management Processes at the State Company Ignalina Nuclear Power Plant* was postponed till 2011, when Ignalina NPP will have completed the planned elaboration of the documents for management of beyond-design-basis accidents and these documents will have been reviewed by VATESI.

By getting ready for the construction of the new nuclear power plant in Lithuania, in 2009 VATESI specialists drafted a new legal act the *Requirements for the Deterministic Safety Analysis of Nuclear Power Plants*. The requirements were 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 (IAEA) as well as the best practices of other countries (e.g. with regard to the requirements set by the US Nuclear Regulatory Commission (NRC) for



new nuclear power plants, the results of Generic Design Assessment process of new nuclear power plants conducted by the UK Health and Safety Executive (HSE), the experience gained by Radiation and Nuclear Safety Authority of Finland (STUK) in licensing the new nuclear power plant). These requirements set forth the goals and objectives of the deterministic safety analysis, postulated initiating events and their classification, technical acceptability criteria, requirements for the methods of the analysis, data and assumptions, the requirements for software and numerical evaluation models, documenting the results, quality assurance, independent approval and update of documents. When these requirements are agreed and approved, they will become obligatory to the applicant or the licensee in preparing the nuclear safety and radiation protection justification documents in the designing, construction, operation, decommissioning stages of the new nuclear power plant in accordance with the procedure set forth by the laws or other legal acts. These requirements together with other mandatory technical documents will set forth the system of the state safety regulation and supervision of nuclear facilities in Lithuania.

### **Probabilistic safety analysis**

The probabilistic safety analysis (hereinafter – the “PSA”) applied in the stages of design and operation of a nuclear power plant enables to establish whether the risk posed by the NPP is as low as reasonably achievable by using the respective safety measures and whether these measures are economically justified. The application of the PSA also enables to identify the deficiencies in the NPP design, NPP operation procedures and to project their improvements (organizational and technical measures) to be taken in order to avoid severe accidents or to mitigate the effects thereof.

In 2010, the project for applying the Ignalina NPP probabilistic safety analysis model in VATESI activities was completed. The objective of the project was to apply the existing PSA model of Ignalina NPP in the analysis of unusual events. In cooperation with the Technical Support Organizations (TSO), VATESI procured the software RiskSpectrum RiskWatcher, which is usually used for risk monitoring and is designated to monitor the dynamics of risks during the NPP operation, to model the scenarios of anticipated events and to plan maintenance and testing of the NPP depending on the dynamics of risks. The system of analysis of unusual events, which was developed in the course of operation, enables to assess the risks posed by unusual events and to analyze specific configurations of the NPP systems.

In 2010, the IAEA workshop on *Framework and Techniques for PSA Applications and Risk-Informed Decision Making (RIDM)* was arranged in Kaunas. During the workshop, the PSA experts shared their experience on the PSA application in various countries in making safety-related decisions. The results of the workshop were summarized and will become a part of the document *Integrated Risk-Informed Decision Making* which is being prepared by the IAEA. The knowl-



edge acquired at the workshop will be useful for the specialists of Lithuania in supervising the safety of Ignalina NPP decommissioning works and in getting ready for design and construction of the new nuclear power plant.



**Participants of the IAEA workshop Framework and Techniques for PSA Applications and RIDM arranged in Kaunas in 2010**

### ***Fire hazard analysis at nuclear facilities***

Fires occurring at nuclear facilities, especially at nuclear power plants, can impact the operation capability of the safety-related systems and cause immense unpredictable losses. Therefore the fire hazard analysis (FHA) at these facilities is in the focus of attention worldwide. The main objective of this analysis is to demonstrate that the locations of the safety-related systems and the existing fire safety measures assure nuclear safety and comply with the requirements of the national legal framework, the IAEA recommendations and the best practice of other countries.

The *Requirements on Fire Safety in Safety-Related Systems at Nuclear Facilities* approved by Order No.42 of VATESI Head as of 11 October 2002 prescribe that the fire hazard analysis has to cover the following stages:

- Identification and classification of fire risks zones;
- Identification of the 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 the 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 effects caused by fire.

In 2010, VATESI analyzed and provided comments on the fire hazard analyses (FHA) reports for the very low level radioactive waste storage facility (B19-1) and disposal facility modules, waste retrieval from buildings 155-155/1, 157-157/1, and the sorting and storage facility of very low activity radioactive waste



(B2 project, parts 1, 2). Based on the FHA results, the shortcomings in fire safety of these planned to be constructed nuclear facilities were identified and the rectifying measures were worked out. Whereas in 2011 Ignalina NPP is planning to launch into operation new nuclear facilities and to perform the dismantling works of Ignalina NPP equipment, VATESI, upon having analyzed Ignalina NPP's FHA, provided comments on fire safety assurance by providing sufficient measures and resources. Ignalina NPP specialists took into consideration the comments provided by VATESI and submitted the justifying information that fire safety at Ignalina NPP is directly exercised by the Fire and Rescue Service for the Protection of Visaginas City (VFRS) located in close vicinity to Ignalina NPP. Till the end of 2009, VFRS was financed in accordance with the Agreement concluded between Ignalina NPP and VFRS. After Unit 2 was shut down on 31 December 2009, Ignalina NPP had no financial resources for this purpose; therefore in 2010 the funds for maintaining the Fire and Rescue Service for the Protection of Visaginas City were allocated from the Ignalina NPP Decommissioning Fund.

Fire safety at Ignalina NPP Unit 1 and Unit 2 is implemented either by automated and/or manual means. One of the most effective means of fire safety means is an automated fire safety system designed to detect, liquidate fires and to mitigate their effects. 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 2010, VATESI specialists conducted the 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 (the records of the complex tests of the automated fire extinction system in Unit 1 performed by Ignalina NPP employees were examined), 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, maintenance and operation documents were examined. It was also inspected whether the Technical Fire Safety Commission was set at Ignalina NPP. On the basis of the documents submitted by Ignalina NPP it was established that the list of the commission members was approved in March 2010. During the inspection, the issues analyzed during the Commission's meeting held on 20/04/2010 were examined. VATESI prepared the inspection report with comments and proposals for upgrading this activity, and submitted it to the inspected organization.



### ***Operational experience feedback***

To improve nuclear safety at Ignalina NPP, to prevent possible accidents and safety- significant events, it is necessary to analyze its own operational experience and that of other organizations.

Operational experience covers information about events, accidents and their precursors, defects, near miss events, low level events, their tendencies, weaknesses and good practice, reports on analysis of safety performance indicators, self-assessment reports (reports of quality assurance audits, reports of independent experts and missions, documented good practice, etc.). Other information which when used can improve the safety of the nuclear facility, may be used as well. It includes human activity, organizational and technological issues.

VATESI has a permanent Commission of Unusual Events and Operational Experience (hereinafter - the "Commission"), which analyses the reports on unusual events at Ignalina NPP, other nuclear facilities in Lithuania and the information about unusual events at nuclear power plants worldwide.

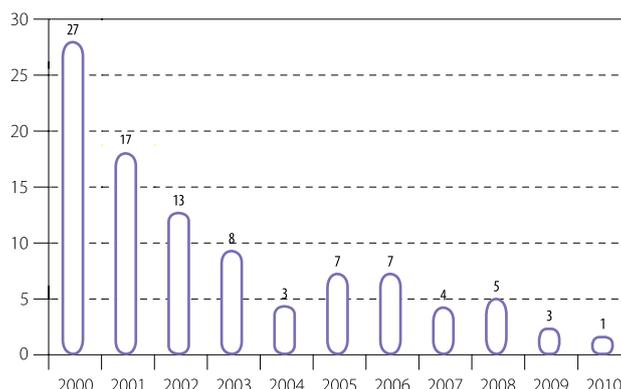
In 2010, eleven meetings of the Commission were arranged whereat the reports of unusual events at Ignalina NPP were analyzed along with the unusual events that occurred at nuclear power plants of other countries and at other nuclear facilities. The results of the analysis performed by the Commission members, conclusions and/or recommendations related to the improvement of safety and lessons learned in other NF were handed over to Ignalina NPP and used for improvement of VATESI regulations.

The Requirements for Reporting of Events at Nuclear Power Plants (BSR-1.8.1-2010) were issued and validated by Order No. 22.3-60 as of 30 July 2010. They set the main event reporting criteria procedure for notification of VATESI, types and content of the event reports. Ignalina NPP worked out and agreed with VATESI the plan of measures that have to be taken in reaching compliance with the new VATESI requirements. In 2010, VATESI supervised the implementation of the measures of the mentioned plan.

In 2010, one reportable event occurred at Ignalina NPP. On 5 October in Unit 1 of Ignalina NPP, while performing the decontamination of the internal surfaces of the blowdown, cooling and treatment systems of the main circulation circuit, leakage occurred in one of the components during which the decontamination leach leaked outside the circuit boundaries. During the event, the level of irradiation of the personnel and the premises did not exceed the set permissible levels, no chemical reagents or substances contaminated with radioactive nuclides penetrated outside the controlled area. The event was rated as level 0 on the International Nuclear Events Scale (INES). VATESI performed a thorough analysis of the documents submitted by Ignalina NPP that were related to the mentioned event. After the event all decontamination works were terminated. To avoid re-occurrence of similar events both in Unit 1 and Unit 2, it will be al-



lowed to perform the decontamination works of the internal surfaces of the blowdown, cooling and treatment systems of the main circulation circuit only after the implementation of the relevant corrective measures.



**Distribution of reportable events at Ignalina NPP in 2000–2010**

With an aim to assess how the operational experience is used by the NF licensee, in 2010 VATESI conducted two inspections. On 16 November 2010, VATESI conducted a special inspection at Ignalina NPP during which it was inspected whether the system of Ignalina NPP operational experience feedback complies with the requirements set by VATESI and the procedures of Ignalina NPP. The attention was focused on the implementation of the new safety performance indicators system. The new safety performance indicators system will be used for safety assessment during decommissioning of Ignalina NPP. No violations or non-compliances were identified during the inspection.

The second inspection was conducted at the RATA on 29 April 2010. During the inspection it was examined how the operational experience of other countries is used by the RATA in performing supervision and safety upgrading works at Maišiagala Radioactive Waste Repository. No violations were established during the inspection, however some non-compliances were identified for the elimination of which the RATA prepared and agreed with VATESI a plan of corrective measures.

### ***Training and qualification assessment of Ignalina NPP employees***

Training and qualification assessment of employees are considered to be the most important elements in assuring nuclear safety. The General Requirements for Personnel Management in the Organizations Operating Nuclear Facilities and Enterprises Rendering Services to Them (VD-E-11-2001), approved by VATESI, provide that the operating organization is obligated to develop the system of the introductory and continuous training and to set the requirements for the qualification and competencies of the employees. In 2010, like every year, the system was supervised, i.e. the specialists of the Surveillance



Division of VATESI Nuclear Safety Department were involved in the work of Ignalina NPP commissions for the assessment of the competences of Ignalina NPP managers and specialists (in 2010 the competences of eight higher and medium level Ignalina NPP specialists were assessed), coordinated the training programs, exam papers and other documents related to the competences of the employees. In addition to that, one regular inspection was conducted in 2010 to inspect the control room personnel (operators) training arrangements at the Ignalina NPP Training Centre. With regard to the results of the conducted inspection and reviewed documents, it can be stated that the personnel training system at Ignalina NPP complies with the nuclear safety requirements. Moreover, VATESI examined and evaluated the measures for the employees' qualification improvement deemed necessary in safety assurance during Ignalina NPP decommissioning process.

With an aim to further improve the system of nuclear safety requirements in accordance with the IAEA safety standards and the good practice of other countries, the requirements related to the training and qualification assessment of employees in the field of nuclear energy were reviewed in 2010. It is being planned to issue the nuclear safety requirements Management of Personnel in the Organizations Performing Licensed Activity in the field of Nuclear Energy that will replace the General Requirements for Personnel Management in the Organizations Operating Nuclear Facilities and Enterprises Rendering Services to Them approved by VATESI in 2001.

### ***Ignalina NPP management system and its improvement measures***

With an aim to meet the requirements of the IAEA standards and Western European Nuclear Regulators Association (WENRA) reference levels for the advanced management systems of the nuclear facility, as well as taking into account the contemporary good practices, the nuclear safety requirements BSR-1.4.1-2010 Requirements for the Management System (hereinafter – the "Requirements") were prepared and approved by Order No. 22.3-56 as of 21 June 2010 of VATESI Head.

By implementing the above mentioned Order of VATESI Head, in 2010 Ignalina NPP performed the assessment of compliance of its management system with the new Requirements. Some non-compliances were identified during this assessment for the elimination thereof Ignalina NPP drew up the plan of corrective measures and in 2010 agreed the plan with VATESI. The plan comprises 54 measures for reaching compliance with the Requirements. In 2010, VATESI was supervising the implementation of the plan of measures.



#### **The meeting of VATESI and Ignalina NPP specialists for implementing the provisions of the draft Management System Requirements**

After the final shut-down of Ignalina NPP Unit 2, in 2010 Ignalina NPP activities passed to another stage – termination of operation and decommissioning, therefore it was necessary to adapt the organizational structure of Ignalina NPP to the new operating conditions. For this purpose Ignalina NPP prepared and submitted for VATESI review the description of the new organizational structure and its safety justification report substantiating the compliance of this modification with the requirements for the assurance of nuclear safety. VATESI also reviewed the documents related to the adjustment of the organizational structure: new job instructions of Ignalina NPP employees, regulations and procedures of new divisions of the organizational structure. At the beginning of 2010, with regard to the results of this examination and the Ignalina NPP plan of measures assuring fluent transition to the new organizational structure at Ignalina NPP that would cause no negative impact to safety, VATESI resolved to approve the modification of Ignalina NPP organizational structure.

On 9 December 2010, VATESI inspected the implementation of the modification of the Ignalina NPP organizational structure. No violations were found during the inspection. During the inspection it was stated that the major part of the activities related to the modification of the Ignalina NPP organizational structure were completed.

Safety culture is an integral part of the management system. In accordance with the requirements for the management system, the safety culture of the organization has to be systematically assessed and sustainably developed. For the quantitative assessment of the safety culture at Ignalina NPP, the system of the safety culture indicators is used. The data of the safety culture indicators enable to evaluate the tendencies in implementing the corrective actions of audits and inspections, the employees' qualification and other. In 2010, VATESI not only performed the assessment of the tendencies in the results of the safety culture indicators but also induced Ignalina NPP to develop the safety culture in the organizational matters: provided comments to Ignalina NPP on the self-assessment methodology of the safety culture, approved the new Ignalina NPP plan of measures for the development of the safety culture for the year 2010 and supervised the accomplishment of the measures provided in this plan.



## Management of nuclear fuel and radioactive waste

### Management of nuclear fuel at Ignalina NPP



In the first quarter of 2010, the last six containers of CONSTOR RBMK-1500 type with the spent nuclear fuel were placed for storage in the interim dry type storage facility of spent nuclear fuel operated in the territory of Ignalina NPP (192 building). At present the mentioned storage facility is almost loaded; it contains 118 containers with the spent nuclear fuel that have been delivered to and are stored in this storage facility (20 containers of CASTOR RBMK type and 98 of CONSTOR RBMK-1500 type) with 51 spent nuclear fuel assemblies releasing heat in each of them. Totally there are 6018 spent nuclear fuel assemblies stored in this storage facility. The initial enrichment of all spent nuclear fuel stored in this facility is 2%  $^{235}\text{U}$ .

At the operated spent nuclear fuel facility, the stored containers are supervised and their periodic checks are performed in accordance with the procedures approved by Ignalina NPP. Ignalina NPP, in line with the nuclear safety requirements BSR3.1.1-2010 General Requirements for the Spent Nuclear Fuel Storage Facility of Dry Type approved by Order No. 22.3-59 as of 21 July 2010 of VATESI Head, periodically submitted reports to VATESI about the ongoing supervision of the storage facility, the results thereof and solving the related issues.

In 2010, the construction works of the new spent nuclear fuel storage facility (hereinafter – the SNF SF) were further continued. In accordance with the Agreement concluded by Ignalina NPP with the Contractor – the German consortium GNS-NUKEM GMBH, the construction works were performed by the Lithuanian subcontractors – Ranga IV UAB, and since July 2010 – by Vetrūna UAB. In accordance with the schedules of the construction works submitted by the consortium, a consortium member NUKEM Technologies Gmbh is going to complete the construction works of the SNF SF in the first quarter of 2011. Another member of the consortium – GNS Gmbh organized the manufacturing of the spent nuclear management equipment for the SNF SF and new containers of the CONSTOR RBMK1500/M2 type. Presently by the order of the German company GNS Gmbh these containers are being manufactured by its subcontractor, the division of Hertel consortium – MAG Grimma factory. At the end of 2010, in the above mentioned factory 75 CONSTOR RBMK1500/M2 type containers were manufactured, which at present are being stored and supervised in the territory of the factory. It is being planned to manufacture



and install the spent nuclear fuel management equipment in the Ignalina NPP SNF SF till the third quarter of 2011.

At the beginning of 2010, VATESI approved the modification of the handling equipment of the spent nuclear fuel containers of the CONSTOR RBMK1500/M2 type in the Ignalina NPP units that is being implemented by Ignalina NPP and was supervising its implementation. In accordance with the above mentioned modification, the following equipment has to be installed in both power units of Ignalina NPP: new shock-absorbers accommodating the CONSTOR RBMK1500/M2 type containers, a new platform for servicing the containers, equipment for handling of the spent nuclear fuel assemblies, as well as the constructional modifications of the existing cranes in Ignalina NPP units. In addition, VATESI examined Ignalina NPP compliance with the conditions of the construction licence No. 2/2009, issued on 2 September 2009 for performance of the SNF SF construction works that are to be fulfilled till the beginning of the SNF SF operation. The conditions stipulated that Ignalina NPP had to prepare and to reconcile with VATESI a separate technical design and the safety justification for handling of the damaged spent fuel assemblies in the Ignalina NPP, in the SNF SF and for their storage.

In March 2010, VATESI specialists conducted a scheduled inspection of the technical supervision of the concrete pouring works of the SNF SF bed plate. During the inspection it was checked how the reinforcement of the bed plate was installed, how the beams and wall bench marks enabling to measure subsidence of the building in the course of construction and operation were mounted. It was also inspected how the lining layer of the bed plate was laid, how the protocols on taking concrete samples in the construction site were executed, along with the data on the changes in the consistence of the concrete, concrete mixture, hardening concrete and the ambient temperature.

In June 2010, VATESI representatives took part in the factory testing of the loading of the trunnions of the Ignalina NPP's container of CONSTOR RBMK 1500/M2 type, in the review of documentation of 8 new containers and their acceptance. The tests on the loading of the trunnions of a randomly chosen container were performed by the consortium member GNS GmbH in the MAG GRIMMA plant owned by the company Hertel (Germany). During the verification, in accordance with the procedures of the tests being performed, VATESI representatives were acquainted with the manufacturing technology of the CONSTOR RBMK 1500/M2 type containers, examined the conditions of their storage in the temporary storage site, they also took part in the loading tests of the container trunnions and their quality control.

In July 2010, VATESI took part in the inspection of the factory tests of the handling equipment of the Ignalina NPP CONSTOR RBMK 1500/M2 type containers to be used in the power units of Ignalina NPP, and their acceptance. The



mentioned tests were carried out by the company GNS GmbH. During the inspection, in line with the procedures of the tests being performed, VATESI representatives were acquainted with such technological processes of the handling equipment of CONSTOR RBMK 1500/M2 type containers as their protective skirt, vacuum drying of the container chamber and its filling with helium, use of traverses for lifting the containers and their cover plates in Ignalina NPP power units. After the factory tests of the containers' handling equipment, the comments and proposals provided by VATESI and Ignalina NPP for the upgrading of the use of the mentioned equipment for handling of the spent nuclear fuel in Ignalina NPP power units were analyzed with the participation of the GNS specialists.

In September 2010, VATESI approved Ignalina NPP decision to change the regularity of testing the leak tightness of 20 CASTOR RBMK type containers stored in the territory of Ignalina NPP, in the operated spent nuclear fuel storage facility. The leak tightness tests of the mentioned containers in the territory of the storage facility will be conducted every 3 years in accordance with the schedule.

In December 2010, VATESI specialists conducted a special inspection of the modification of the spent nuclear fuel handling equipment in Ignalina NPP Unit 1. During the inspection they checked the performance of the equipment dismantling and mounting works, dismantling and erecting works of structures, the adjustments of design solutions related to the modification of the handling equipment of the protective container of the spent nuclear fuel and structures in Ignalina NPP Unit 1. They also examined the plans, schedules and designing-manufacturing documents related to the modification of the structures and equipment. They visited the premises 174, 338/1, 632 of unit 101/1 A where they visually inspected the dismantled equipment and structures or those that are undergoing the dismantling.

In accordance with the schedules for completion of the works in progress submitted by the Contractor – the German consortium GNS-NUKEM GMBH, it is planned to commission the SNF SF till the end of 2011, and the start-up of its operation is scheduled in 2012. All the remaining spent nuclear fuel that has accumulated during operation of both power units of Ignalina NPP will be stored in the CONSTOR RBMK1500/M2 type containers for no less than a fifty-year period from the date of loading of the last container into the SNF SF. During of operation of the SNF SF, 91 spent nuclear fuel assemblies with various level of  $^{235}\text{U}$  initial enrichment will be loaded into each of the CONSTOR RBMK1500/M2 type containers. It is planned to store 201 CONSTOR RBMK1500/M2 type containers in the storage facility. The SNF SF is constructed in the territory of Ignalina NPP, Visaginas municipality.



## Ignalina NPP radioactive waste management facilities

The key principle of radioactive waste management is to manage the radioactive 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 solid 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 implementing a new classification system of radioactive waste, and has to install equipment for conditioning of radioactive waste, radioactive waste storage facilities and 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 2011 are presented in the below Table:

Quantities of waste	Group 1 Combustible	Group 1 Incombustible	Group 2 Combustible	Group 2 Incombustible	Group 3	Total
Accumulated as of 1 January 2011 (m <sup>3</sup> )	11 556	8432	2212	2894	856	25 950

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 the evaporation is filtered through special ion exchange and perlite filters that retain radionuclides. The filters are then cemented and stored in building 158/2.

In 2010, 160 m<sup>3</sup> of bituminized waste was loaded into the radioactive waste storage facility (building 158). Till 2011, 13 863 m<sup>3</sup> of bituminized waste was accumulated in this storage facility. In 2010, 128.93 m<sup>3</sup> of ion exchange resins and perlite was processed in the cementation facility; the total processed quantity was 623.37 m<sup>3</sup>. In 2010, 1346 cemented waste packages (drums) were produced that are stored in the cemented waste storage facility (building 158/2). In all, 6683 cemented waste packages were produced by 2011.

In accordance with the operational licence conditions of Ignalina NPP Unit 1, the operation of solid radioactive waste storage facilities was permitted till 1 January 2011. With an aim to extend the operation of these storage facilities, in September 2009, Ignalina submitted to VATESI the updated safety analysis report for buildings 155, 155/1, 157, 157/1 that was reviewed by VATESI with the assistance of the experts and then approved in December 2010. VATESI adjusted the mentioned conditions of the licence validity by giving consent for further operation of the existing storage facilities.



To manage solid radioactive waste located at Ignalina NPP in line with the most recent requirements, it is necessary to retrieve the waste from the storage facilities, to condition 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 buildings 155 and 155/1 and for a segregation facility for the retrieved waste (B2 project, part 1). VATESI analyzed the submitted documents and in December 2010 informed Ignalina NPP that they did not have any comments on these documents. It is being planned to launch these facilities into operation in 2012-2013.

In July 2010, Ignalina NPP submitted to VATESI for its review the technical design for retrieval of solid radioactive waste from buildings 157 and 157/1 (B2 project, part 2). These documents were reviewed and comments on them were provided.

On 27 August 2009, by Order No. 22.3-82 of VATESI Head the licence was issued to Ignalina NPP for the construction of the solid radioactive waste management facilities. In the solid radioactive waste management facilities all solid radioactive waste that has generated during operation and decommissioning of Ignalina NPP will be managed and stored for a fifty-year period in line with all up-to-date international requirements. The operation of the new waste conditioning facilities should start in 2012-2013 in the existing territory of Ignalina NPP, Drūkšiniai village, Visaginas municipality.

Upon having reviewed all submitted documents necessary for issuing a licence, on 5 March 2010 VATESI issued to Ignalina NPP the licence for the construction of a very low level radioactive waste storage facility. In accordance with the new radioactive waste classification, the waste assigned to class A (with the surface dose rate which is less or equal 0.5 mSv/h, but exceeding the clearance levels prescribed by LAND 34-2008) have to be disposed at a very low level radioactive waste repository. Prior to disposal, this waste will be stored in a very low level radioactive waste storage facility and from here no less than every 2 years it will be delivered to the repository. The storage facility capacity will be approx. 4 000 m<sup>3</sup> of radioactive waste.

In October 2009, Ignalina NPP submitted the technical design and the preliminary safety report for the repository of very low level radioactive waste (project B 19-2). These documents were reviewed by VATESI, and in December 2010 the inspectorate informed Ignalina NPP that they did not have any comments on the documents. It is being planned to launch the repository of very low level radioactive waste into operation in 2012-2013. It will accommodate approx. 60 000 m<sup>3</sup> of radioactive waste.

On the basis of the environmental impact assessment for the construction of the low and intermediate level radioactive waste repository (project B-25), in November 2007 the Government passed Resolution No. 1227 Re: Designing the Low and Intermediate Level Short Lived Radioactive Waste Near-Surface



Repository, whereby the proposal to design the repository in the territory of Stabatiškės village, Visaginas municipality was approved. In December 2008, VATESI approved the technical specification of the low and intermediate level radioactive waste repository. It is being planned to launch the repository into operation in 2015-2016.

### **The closed Maišiagala Radioactive Waste Storage Facility**

Maišiagala Radioactive Waste Storage Facility was constructed in 1963 in Irvinčiai District, Bartku kis forest, at distances of approx. 9 km from Maišiagala town and 40 km from Vilnius. The waste was accumulated in the storage facility till 1989. Maišiagala Radioactive Waste Storage Facility is a vault of with the storage capacity of 200 m<sup>3</sup> where approx. 120 m<sup>3</sup> of radioactive waste generated in industry, medicine, scientific research is stored. The waste to the storage facility was delivered from Lithuania, Grodno and Kaliningrad Regions. After its closure in 1989 and till 2002, the storage facility was supervised by the Institute of Physics. In 2002, the storage facility was taken over by the Radioactive Waste Management Agency (RATA), which since then has been supervising the facility and monitoring the environment. The main objective of the monitoring is to ascertain that the storage facility does not pose hazard to the people and the environment. During the monitoring it is observed whether radionuclides from the storage facility are not spread into the environment.

To improve physical protection of Maišiagala Radioactive Waste Storage Facility, a permanent monitoring system was installed in 2004. When the system is operated, it is possible to monitor the storage facility either from the RATA head office or from Vilnius Chief Police Commissariat, thus in the case of some assault or imminent threat it is possible to react immediately and to take counteractions.

With an aim to evaluate the safety of the storage facility and to license the facility in accordance with the recent requirements, its safety assessment and upgrading was undertaken in 2004-2006. On 26 May 2006 VATESI issued to the RATA a licence for supervision of the closed Maišiagala Radioactive Waste Storage Facility. During the same year, the safety upgrading works were carried out – new safety barriers of the storage facility (a system of soil and two water-resistant membranes) were constructed. These barriers protect the radioactive waste stored in the storage facility from water which could leach the radionuclides from the storage facility.

Ten wells were bored for monitoring of the environment of the storage facility, from which the samples of the ground water are systematically taken. In performing the monitoring of Maišiagala Radioactive Waste Storage Facility it is verified that the radionuclides from the storage facility have not penetrated into the ground water. One of the main indicators of the efficiency of the safety



barriers of the storage facility is the volumic activity of tritium – the most mobile radionuclide – in the water of the monitoring wells. According to the safety monitoring report of Maišiagala storage facility, the maximum volumic activity of tritium was reduced after the safety upgrading works were completed in 2006. Prior to the safety upgrading works, in two wells where the highest volumic activity had been observed, it decreased 3 and 9 times respectively, and even more in some other wells. Depending on the season when the samples are taken, similar decreased volumic activities of tritium are being observed even now. Such results evidence the efficiency of the new barriers.

In the future the waste stored in the storage facility will have to be retrieved, sorted, packed in special packages and disposed in the radioactive waste repository. In accordance with the conditions of the licence issued in 2006, the RATA was obligated no later than by 31 December 2010 to prepare and to submit to VATESI the preliminary plan for decommissioning of Maišiagala storage facility, which had to demonstrate how the retrieval and management of the radioactive waste located in the storage facility was being planned. In the plan the main stages of decommissioning were provided along with the preliminary measures for waste retrieval but the specific commencement date of the works was not indicated because it depends on the date when the repositories will be constructed and launched into operation.



**Maišiagala Radioactive Waste Storage Facility**

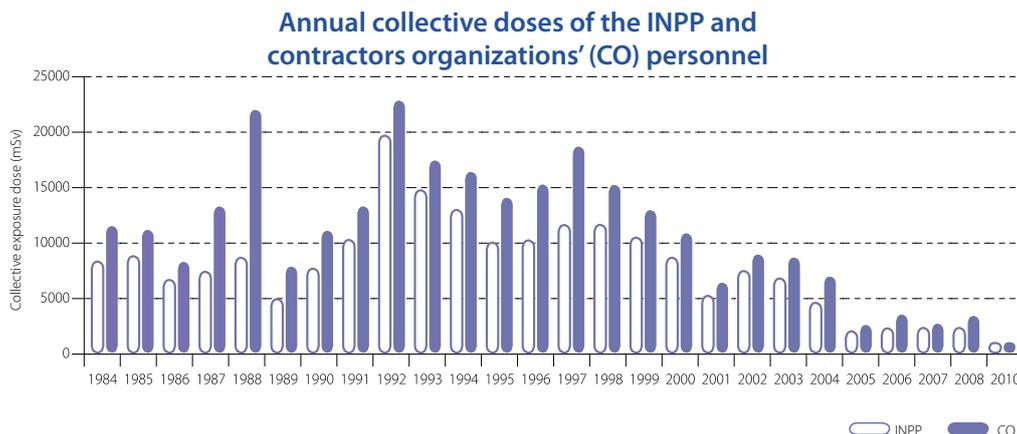


## Radiation protection at nuclear facilities

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 licence 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 the radiation protection is to ensure protection of the population and the environment against hazards that a nuclear installation may pose. The nuclear facility itself must have properties ensuring that the effects of ionizing radiation on the population and the 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 licence conditions and requirements set forth in the safety regulations and standards. 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 very beginning of its operation, Ignalina NPP has been conducting occupational exposure control of its own and contractors organizations' personnel. In 2010, individual dosimetric control was applied to 2 959 persons, among them 1 944 were the Ignalina NPP personnel. Employees of the contractors' organizations, persons on business trips and visitors of Ignalina NPP accounted for the remaining part. Distribution of external exposure collective doses in 1984-2010 is shown in Figure 1.





After Unit 1 was shut down, the collective dose of the personnel exposure has significantly decreased. The biggest collective dose was received during routine maintenance; therefore the duration and scope of the works performed during maintenance are very important. The annual collective dose decreased even more after shut down of Unit 2. In 2010, the annual collective dose of the Ignalina NPP and contractor organizations' personnel equaled 35 % of the planned yearly dose. The average individual dose of the Ignalina NPP and contractors organizations' personnel in 2010 was 0.18 mSv. The highest individual dose received by an employee of Ignalina NPP was 8.87 mSv, whereas the highest individual dose received by an employee of contractors' organizations was 2.95 mSv. Neither of these values exceeded the set limit (20 mSv).

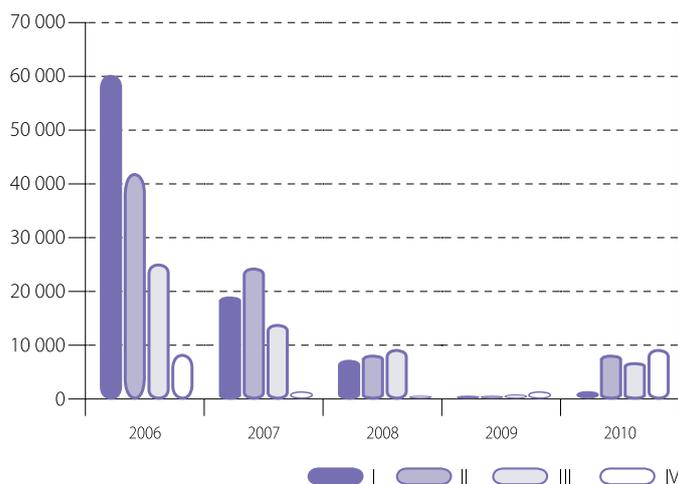
To protect the environment and the population, the activity of emitted radionuclides from Ignalina NPP into the atmosphere and the lake Drūkšiai has been restricted. In the course of radiation monitoring conducted at Ignalina NPP it was established that not only the activity of emitted radionuclides was below the permissible levels, but that they constituted a very small part of these levels as well. In 2010, the emissions of radioactive inert gases into the atmosphere were 0.033%, of radioactive aerosols – 0.00024%, and those of  $^{131}\text{I}$  – 0.063% of the permissible level. The total emission of radionuclides into the lake Drūkšiai was 0.0021% of the set limit. The evaluation of the dose received by the reference group of the residents in 2010 showed that the exposure resulting from emissions into the atmosphere and the lake was 2230 times lower than the permissible marginal value. 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 that had been collected from industrial enterprises, medical and science institutions till 1989 is 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 ( $^3\text{H}$ ) 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 the observation wells of Maišiagala storage facility in 2006–2010 is presented in Figure 2. The data illustrate that the measured values do not exceed the set limits.



### Maximum values of tritium volumic activity in observation wells of Maišiagala waste storage facility in 2006–2010



In 2004-2006, additional protective barriers were installed in Maišiagala storage facility. 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 were regularly taken from these wells and their radionuclide composition was examined. To assess whether toxic materials were not released from the storage facility, the analysis not only of radionuclide composition but also of the chemical compositions of samples was included in the updated monitoring program. After the installation of additional protective barriers, tritium activity in the observation wells significantly decreased. The additional barriers proved to be effective and have reduced emission of radionuclides from the storage facility.



## EMERGENCY PREPAREDNESS

### International cooperation

By implementing the provisions of the Convention on Early Notification of a Nuclear Accident and the Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency, VATESI was closely cooperating with the IAEA and the emergency preparedness divisions of the European Commission.

On 17-18 February 2010, the meeting of the European Union Member States' competent authorities of the European Community Urgent Radiological Information Exchange (ECURIE) was held. At the meeting, the present status of the ECURIE system and its future perspectives were presented, the information about the radiological events disseminated via the ECURIE system in 2008-2010 was provided. The information about the arranged exercises and their results was given, the updated schedules of the exercises were proposed. It was decided to arrange the communication testing exercises after the regular office hours, because according to the statistics the competent authorities encounter difficulties in taking part in the exercises after the business hours. The results of the survey of the European Union Member States regarding the possibilities to use the iodine prophylaxis, the final results of the project for strengthening the emergency preparedness of European countries (EURANOS) were presented. The status of upgrading the European Radiological Data Exchange Platform (EURDEP) and the system for radiological and nuclear information exchange (WebECURIE) was provided. The WebECURIE system should replace the presently used software CoDecS. The new system, which is more flexible and user-friendly and thus it simplifies the procedures of information exchange, will significantly facilitate the exchange of information. However, according to the representatives of the European Commission, access to the system will be held off till 2012. In addition to that, the scheduled events were presented, such as a working group meeting of the EURDEP, emergency preparedness exercises in 2010-2012, and the project for logging to the Response Assistance Network (RANET) by the Member States for support in the case of a nuclear accident or radiological emergency.

In its own turn, the IAEA is getting ready for changing the Early Notification and Assistance Conventions Website (ENAC) that has been used for a long time, and the nuclear events web-based system NEWS. They will be merged into one website USIE for information exchange about nuclear and radiological incidents and accidents, which will be accessible from May 2011. This website is designated to the competent authorities responsible for implementing the provisions of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.



In 2010, information about 3 events was disseminated via the official ECURIE system for information exchange on radiological and nuclear accidents.

On 30 July 2010, Italy disseminated the information about the container with scrap metal emitting high-level ionizing radiation held in Genoa seaport, which came from the United Arab Emirates. According to the preliminary calculations, the activity of its content ranged between 150 and 200 GBQ. All employees who were working in the proximity to the container were examined. The calculated effective dose did not exceed 6% of the permissible yearly dose, which in accordance with the procedure established in the Republic of Italy can not surpass 1 mSv per year. The container was safely isolated and shipment of the cargo back to its owner was initiated.

On 4 August 2010, the information was received from the United Kingdom that in the territory of the nuclear weapons plant, in one of the storage facilities the solvent used in manufacturing weapons caught fire. The notification stated that neither nuclear weapons nor materials were affected by the fire. The territory was isolated, the people were evacuated. The fire was successfully extinguished.

On 7 December 2010, the information was received that on 5 November, during the inspection in the closed iron-work plant in Lublin, inspectors from the National Atomic Energy Agency of Poland established that 7 containers with radioactive cobalt sources (Co-60) were missing. The National Atomic Energy Agency of Poland notified the respective authorities as well as all companies purchasing and processing metal scrap. VATESI subsequently disseminated this information among the relevant institutions in Lithuania.

### **Emergency preparedness of VATESI**

In 2010, the specialists of the VATESI Emergency Response Centre had a possibility to improve their knowledge and skills in two international emergency preparedness exercises, six international communication tests and forty nine VATESI communication tests. Some of the international communication tests were arranged after the regular office hours to ascertain the availability of the authorized institutions and their preparedness to react to emergencies at any time of the day and night.

On July 8, the international ECURIE emergency preparedness 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 prove the capability of specialists in exchanging information and in collaborating in line with the ECURIE agreements.

According to the scenario of the exercise, an accident occurred at Brokdorf Nuclear Power Plant (Germany) resulting in emission of radionuclides into the



environment. In accordance with the performed projections on the transfer of the radionuclides, the radioactive cloud had to reach Lithuania after 30 hours from their emission into the atmosphere. With regard to the scenario, VATESI put the Emergency Response Centre into action and carried out the procedures set forth in the VATESI emergency plan. In Lithuania, the Fire Safety and Rescue Department under the Ministry of the Interior, the Ministry of the Environment, Radiation Protection Centre, and the Lithuanian Hydro Meteorological Service took part in the exercise as well.

During the exercise some shortcomings were identified which will have to be eliminated in accordance with the plan of rectifying measures.



### **ECURIE emergency preparedness exercise of level 3**

On December 21, the ConvEx-2b international exercise was arranged by the IAEA the objective thereof was to assess the competence of the competent authorities in using the ENAC information exchange system. During the exercise of this type, the competent authorities 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 of the limited time period given to perform the tasks.

### **Emergency preparedness at nuclear facilities**

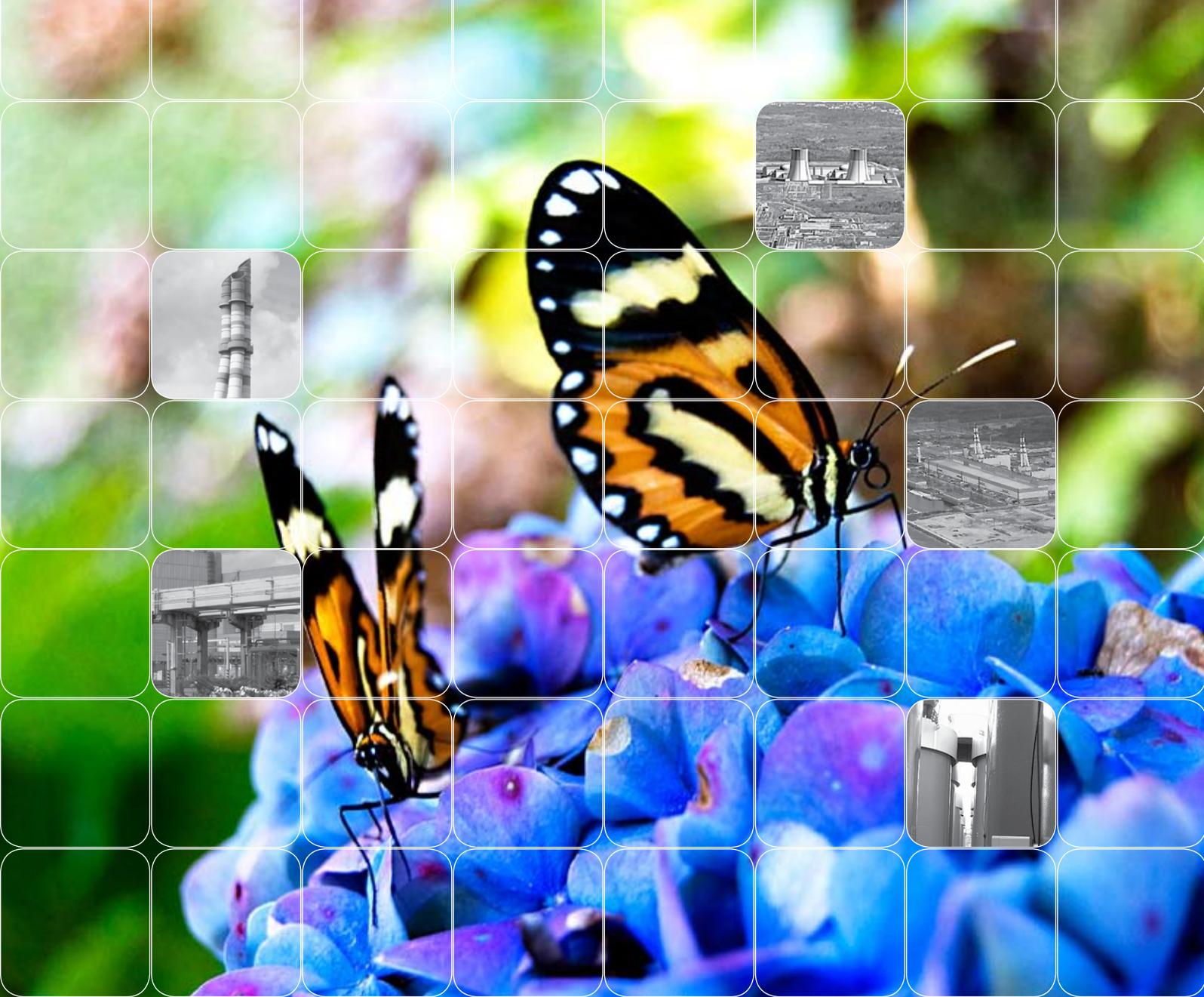
On 19 August 2010, Ignalina NPP submitted to VATESI a new version of the Emergency Preparedness Plan, which had been worked out with regard to the process of Ignalina NPP decommissioning and construction of new facilities in its territory. VATESI specialists analyzed the Plan by taking into consideration the national and international requirements on nuclear safety, radiation and physical protection, and provided their comments. The plan was also submitted to the Ministry of Energy, Fire Safety and Rescue Department under the Ministry of the Interior, Radiation Protection Centre and Visaginas Municipality for review and approval by them. After Ignalina NPP provides answers to all comments and agrees them with VATESI and other institutions, the Emergency Preparedness Plan will be approved by the General Manager of Ignalina NPP.



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On 16 December 2010, the inspection of emergency preparedness was conducted at Ignalina NPP with an aim to check how the NPP is getting ready for implementing the measures of the new Ignalina NPP Emergency Preparedness Plan, how the plan of corrective measures from the previously conducted inspections of Ignalina NPP emergency preparedness were being implemented, inspected the control centre protected by the Emergency Preparedness Organization. In addition, during the inspection the condition of the control centre protected by the Emergency Preparedness Organization along with the supplies of necessary personal protective means and dosimeters assigned for the personnel of the Emergency Preparedness Organization were verified. During the inspection, the responsible representatives of Ignalina NPP presented the preliminary program for training of the personnel and the scenario of the full scale exercise. The Inspection Commission brought to Ignalina NPP's attention that the new version of the Emergency Preparedness Plan will have to be continuously reviewed and updated with regard to the process of decommissioning and new facilities which will be launched into operation in the territory of Ignalina NPP.

No violations were identified during the inspection, however some non-compliances were found that will have to be rectified by Ignalina NPP. ■



Control over the use of nuclear energy  
only for peaceful purposes



### Accounting and control of the small quantities of nuclear materials

Starting from 1 January 2008, after Lithuania's transition from the Bilateral Agreement with the IAEA and its Additional Protocol to the Trilateral Safeguards Agreement (with the IAEA and Euratom) and the implementation of its Additional Protocol, instead of a previously used single material balance area (MBA) – WLTC thereto all nuclear materials in the territory of Lithuania (excluding the nuclear fuel) had been assigned, the European Commission had to assign individual MBA codes to each institution having nuclear materials in its disposition. In 2008-2009 twelve new MBAs, and in 2010 two new MBAs were established in Lithuania.

At the beginning of 2010, three users of small quantities of nuclear materials remained in the WLTC area: Kaunas University Hospital, Šiauliai County Hospital and Ignalina NPP (small quantities that do not belong to nuclear fuel). Their reports on accounting of nuclear materials to the European Commission, which subsequently prepares and forwards these reports to the IAEA, were submitted by VATESI. In January, Šiauliai County Hospital handed over all nuclear materials kept in its disposition for final disposal. In August, a separate MBA code – WLTQ was assigned for accounting of small quantities of nuclear materials at Ignalina NPP. It is being planned that in the future in the WLTC area there will be no users, permanently keeping small quantities of nuclear materials in their disposition.

On 20 March 2010, VATESI conducted inspections at ORLEN Lietuva AB and Metesta UAB. During the inspections for verification of physical inventory and assessment of the accounting system of nuclear materials, no violations or non-compliances were found at ORLEN Lietuva AB and Metesta UAB.

On 29-30 June 2010, the inspection in the WLTC MBA was jointly conducted by the European Commission and the IAEA, and on July 1 the joint inspection was conducted by VATESI, the European Commission and the IAEA in the WLTR MBA assigned to the Radioactive Waste Management Agency. No violations were identified during these inspections.

### Accounting and control of nuclear fuel

In the first quarter of 2010, loading of the spent nuclear fuel from the spent nuclear fuel ponds in the power units to the CONSTOR type containers was completed. In April, the last container was delivered to the spent nuclear fuel storage facility (SNF SF), and the storage facility became fully stocked. Participation in these works accounted for the major part of works performed in Lithuania by the inspectors delegated by the IAEA and European Commission; therefore till a new storage facility is launched into operation, the number of their man days used for inspection activities in Lithuania will be decreasing.



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 2010. 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.

In August 2010, an unannounced inspection was conducted at Ignalina NPP and the SNF SF by the IAEA with the presence of inspectors delegated by the European Commission. The results of the inspection revealed that Ignalina NPP properly conducted the accounting of fuel assemblies and correctly declared their number.

Data on the inspection activities by the IAEA, the European Commission and VATESI as well as on the accounting of nuclear materials in 2010 are summarized in the Tables below along with the comparative data from the two preceding years.

**Summary of the IAEA, EC and VATESI inspection activities in Lithuania in 2008-2010**

Year	2008	2009	2010
Total number of IAEA inspectors and technicians' man days in Lithuania	206	156	85
Number of EC inspectors' man days in Lithuania	47	86	78
Number of man days spent on site by VATESI inspectors engaged in the area of safeguards	15	18	22
Number of IAEA inspectors authorized to conduct inspections in Lithuania	350	335	315
Number of EC inspectors authorized to conduct inspections in Lithuania	184	188	183
Number of VATESI inspectors engaged in the area of safeguards.	2	2	2

**Data of accounting of nuclear materials in 2008-2010**

Year	2008	2009	2010
Amount of depleted uranium (t)	31	31,2	32,4
Amount of enriched uranium (t)	2349	2368	2368
Amount of U <sup>235</sup> (t)	27,6	27	27
Amount of plutonium (t)	8,3	8,6	8,6



### Application of safeguards

Application of safeguards covers a wide range of issues from the technical ones related to measurement of nuclear substances, inspections of nuclear installations to the legal and political issues related to the implementation of international commitments.

In the IAEA Safeguards Implementation Report for 2009 issued in Quarter II 2010, for a seventh 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 using nuclear energy according to the Agreement on Application of IAEA Safeguards and its Protocol Additional.

The Additional Protocol provides that every year an updated declaration for the previous calendar year must be submitted to the IAEA. According to the Additional Protocol to the Trilateral Safeguards Agreement (among the EU Member States, EURATOM and the IAEA) applicable in the European Union for non-nuclear weapons states, which has been valid in Lithuania since 1 January 2008, the respective member state and the European Commission bear individual responsibility for furnishing certain information. Part of the information is under the shared responsibility. VATESI, in accordance with the competence of the state, collected and summarized 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 Additional Protocol, quarterly reports were also sent on Lithuania's export of nuclear equipment and technologies under control.

In December, in accordance with the Additional Protocol, the IAEA inspectors asked for additional access to the Ignalina NPP site to ascertain that no undeclared activities related to the use of nuclear materials were taking place at the site.

The conclusions on the application of safeguards in the year 2010 will be issued by the IAEA in the first half of 2011.

### Control over illicit trafficking of nuclear materials

In 2010, 194 notifications were received from the IAEA Illicit Trafficking Database of Nuclear and Radioactive Materials (hereinafter – the "ITDB") about illegal events involving nuclear and other radioactive materials worldwide. Nineteen of these events involved nuclear materials. According to the data as of October 2010, 111 states were participating in the ITDB program.

In 2010, in Lithuania, four events were recorded the information whereof was submitted to the ITDB.



In August and September months, in Zarasai District, 10 smoke detectors containing plutonium were found. The detectors were collected and handled by the Radioactive Waste Management Agency (RATA), and handed over for storage in the Ignalina NPP radioactive waste storage facility.

In July and September months, in Klaipėda seaport, two events when increased ionizing radiation was emitted by the scrap metal were identified. In the same way as in the case with the smoke detectors, the parts contaminated with radionuclides were handled by the RATA specialists and handed over for storage at Ignalina NPP.

### Control over dual-use nuclear goods

When Lithuania became a member of the European Union, it was integrated into the European Union's and international system of Nonproliferation Export Control Regimes. Lithuania became a member of the Nuclear Suppliers Group (NSG) in 2004. The conditions for handing over the 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, VATESI together with the Ministry of Economy issues to the country – supplier of the imported dual-use nuclear goods the state assurance for the use of these goods for peaceful purposes. Since 2005, VATESI has been conducting yearly inspections on the use of imported dual-use nuclear goods.

As of late 2010, the inspection was conducted at Ignalina NPP to ascertain that con-compliances related to the internal control of dual-use nuclear goods at the NPP, which had been identified during the inspection conducted in 2009, have been rectified. Besides, the attention was focused on the threat of proliferation of nuclear strategic goods during decommissioning of Ignalina NPP.

In VATESI opinion, in the course of dismantling Ignalina NPP equipment, it should be assessed whether the equipment is not assigned to the dual-use nuclear goods. Such assessment is important not only in the cases when Ignalina NPP resolves to export the second-hand equipment, but also for its selling in Lithuania for advising the buyers about the strategic importance of the goods or their parts in the case of their export. Taking into consideration that the scope of decommissioning and dismantling works will be growing in the future, recommendations were provided to Ignalina NPP to take measures for the assurance of such control. ■



Physical protection of nuclear materials  
and nuclear facilities



## Physical protection of Ignalina NPP after the final shut-down of the nuclear reactor of Unit 2

While both nuclear reactors had been in operation, the vital and extremely vital equipment had been identified and the top-level requirements for the physical protection had been set. In 2010, the nuclear power plant moved into a new stage, i.e. no fuel was left in the first nuclear reactor and Unit 2 ceased generating electricity. Besides, during decommissioning other facilities have been planned that may become vital in terms of physical protection. Therefore after the final shut-down of the nuclear power plant it was necessary to update the already performed analysis for identifying the inner and vital areas and to identify new areas for the planned to be constructed facilities. In 2010, the analyses for identifying the protection areas at Ignalina NPP site (for the stage of final shut-down and fuel removal) and for identifying the inner and vital areas of Ignalina NPP solid radioactive waste retrieval facility (B2) were performed. The performed analyses revealed that after the final shut-down of both power units, in the site of the nuclear power plant there still remains quite a long list of vital and extremely vital equipment, the physical protection thereof has to be assured.

### Inspection activities in the area of physical protection

In 2010, three inspections in the field of physical protection were conducted at the nuclear facilities of Lithuania: the inspection of the detection and assessment measures in the physical protection system of the closed Maišiagala Radioactive Waste Storage Facility, the inspection of assuring the physical protection of the spent nuclear fuel during its transportation outside the Ignalina NPP protected area, the inspection of ensuring the security of the hardware and computer networks used in the Ignalina NPP physical protection system against hacking and other unauthorized actions.

In the course of planning the inspections, the results from the previously conducted inspections and the shortcomings identified during these inspections were taken into account (the inspection of the detection and assessment measures in the physical protection system of the closed Maišiagala Radioactive Waste Storage Facility); the Ignalina NPP decommissioning works (the inspection of assuring the physical protection of the spent nuclear fuel during its transportation outside Ignalina NPP protected area); events in nuclear facilities of foreign countries caused by internet hackers or by using malicious software (viruses, worms and Trojan horses) (the inspection of ensuring the security of the hardware and computer networks used in the Ignalina NPP physical protection system).

The aim of the inspection of the detection and assessment measures in the physical protection system of the closed Maišiagala Radioactive Waste Storage Facility was to verify proper functioning of the technical measures for physical protection of the storage facility and their capability to detect an intruder under complicated winter conditions.



On 14 April 2010, the transportation of the last CONSTOR type container with the spent nuclear fuel for its interim storage in the SNF SF was arranged. During the transportation, VATESI inspectors conducted the inspection of assuring physical protection of the spent nuclear fuel during its transportation outside the Ignalina NPP protected area. One of the primary objectives of this inspection was to evaluate whether the existing or planned to be implemented technical and organizational protection measures will be sufficient to assure the physical protection of the spent nuclear fuel during its delivery to the new spent nuclear fuel facility.



#### **Transportation of the CONSTOR-type container with the spent nuclear fuel**

In 2009, after the amended Requirements for Physical Protection of Nuclear Facilities and Nuclear Materials, approved by VATESI Head, came into force, the security regulation of the information and data related to physical protection, including the security of computer and information systems, became more stringent. On the basis of these amendments, the inspection of ensuring the security of the hardware and computer networks used in the Ignalina NPP physical protection system against hacking and other unauthorized actions was conducted. During the inspection it was ascertained that the technical and organizational measures, which had been implemented at Ignalina NPP, ensure the resistance of the computers and information systems of the physical protection system to accidental events or unauthorized actions which would put at risk the confidentiality, integrity of and accessibility to the compiled, stored, processed and transmitted information (or data).

In accordance with the established procedure, after each inspection the inspection protocols were provided to the inspected organization defining the identified violations and non-compliances. The inspected organization was obligated to rectify these shortcomings. The shortcomings established during the physical protection inspections conducted in 2010 cause no threat to the safe decommissioning of Ignalina NPP and safe operation of other nuclear facilities.

In 2009 VATESI had conducted the inspection of the security exercises which had been organized by the Ignalina NPP Security Unit (hereinafter – the “INPP SU”) under the State Border Guard Service, during which the identified short-



comings had been documented and the INPP SU had been advised to rectify them. In 2010, the INPP SU invited VATESI specialists to survey the arranged security exercises that were organized upon having rectified the shortcomings identified during the previous inspection. VATESI representatives surveyed one table exercise and one tactical exercise organized by INPP SU. The scenarios of both exercises were prepared with regard to the design-basis threat established by the State Security Department. Thus it was ascertained that all shortcomings had been eliminated.

### Identification of the design-basis threat

In accordance with the Law on Nuclear Energy, Article 50, Paragraph 4, the design-basis threat at nuclear facilities, which is necessary to enable the operating organization to get properly prepared for and to prevent possible offence, has to be defined to each nuclear facility. Therefore in 2010 Ignalina NPP addressed the State Security Department regarding the design-basis threat to the being constructed or planned to be constructed nuclear facilities in Ignalina NPP: interim spent nuclear fuel facility (site B1), retrieval facility of solid radioactive waste (site B2), solid radioactive waste management and storage facility (site B3,4), short-lived very low level radioactive waste buffer-type repository (site B19-1), short-lived very low level radioactive waste repository (site B19-2), low and medium level radioactive waste surface dumping facility (site B25). In addition to that, in 2010 the design-basis threats defined in the earlier years to Ignalina NPP, SNF SF and the planned to be constructed Visaginas NPP were re-estimated and the design-basis threat was defined for the closed Maišiagala Radioactive Waste Storage Facility.

VATESI is one of the institutions involved in defining the design-basis threat, thus with regard to the characteristics of the facilities and within the area of its competence the inspectorate provided consultations to the State Security Department of the Republic of Lithuania which bears responsibility for defining the design-basis threat.

It is worth mentioning that in 2010 the debate on the Law Amending the Law on Nuclear Energy of the Republic of Lithuania was started at the Seimas of the Republic of Lithuania, and according to this Law the functions of defining the design-basis threat will be transferred to VATESI.

### International cooperation in the area of physical protection

On 30 August – 3 September 2010, the IAEA and VATESI together with VAE UAB arranged in Vilnius the regional training course Security of Computer Systems in Nuclear Facilities. The main objective of the training was to point out the potential problems of computer security in assuring physical protection of nuclear facilities, and to share the international expertise in solving them.



The training courses were attended by representatives from Lithuania (Ignalina NPP, VAE, SSD and VATESI), Estonia, Finland, Germany and Sweden. Lecturers who were invited to deliver lectures in the training courses were experts from the US, Finland, the IAEA and the Organization for Security and Co-Operation in Europe (OSCE).



**Participants of the training courses Security of Computer Systems in Nuclear Facilities**

Although physical protection is an internal concern of a country, in 2010, with an aim to provide assistance to the countries in implementing international covenants for strengthening the physical protection regime, the international community together with the IAEA was actively preparing the recommendations for physical protection of nuclear facilities, nuclear and other radioactive materials as well as the guidelines for the implementation of these recommendations. Such top-level documents as the Nuclear Security Objectives and Fundamental Principles, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities, INFCIRC/225/Rev.5, Nuclear Security Recommendations on Radioactive Material and Associated Facilities, as well as the Nuclear Security Recommendations on Nuclear and other Radioactive Material out of Regulatory Control were being drawn up.

VATESI specialists took part in the meetings arranged by the IAEA for review of these documents and within their competence provided comments.

In 2010, VATESI specialists took part in various qualification improvement courses: the courses for training of nuclear inspectors arranged by the US NRC, training in safety culture and the train the trainers course arranged by the IAEA for training the physical protection lecturers.



## 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.



In 2010, VATESI together with the Ministry of the Environment, Radiation Protection Centre, Fire Safety and Rescue Department under the Ministry of the Interior, Ignalina NPP, VAE UAB were preparing the fifth report of the Republic of Lithuania regarding the implementation of the provisions of the Convention on Nuclear Safety. The report was submitted to the IAEA in August 2010. Besides, the reports of other countries were analyzed; the questions on these reports were prepared along with the responses to the questions received on the report of Lithuania. Part of the questions addressed to Lithuania concerned Ignalina NPP which had been the main source of electricity supply in the country and was finally shut down in 2009. The questions were mostly related to the assurance of safety in performing decommissioning works of the nuclear power plant, exchange of experience in this field.

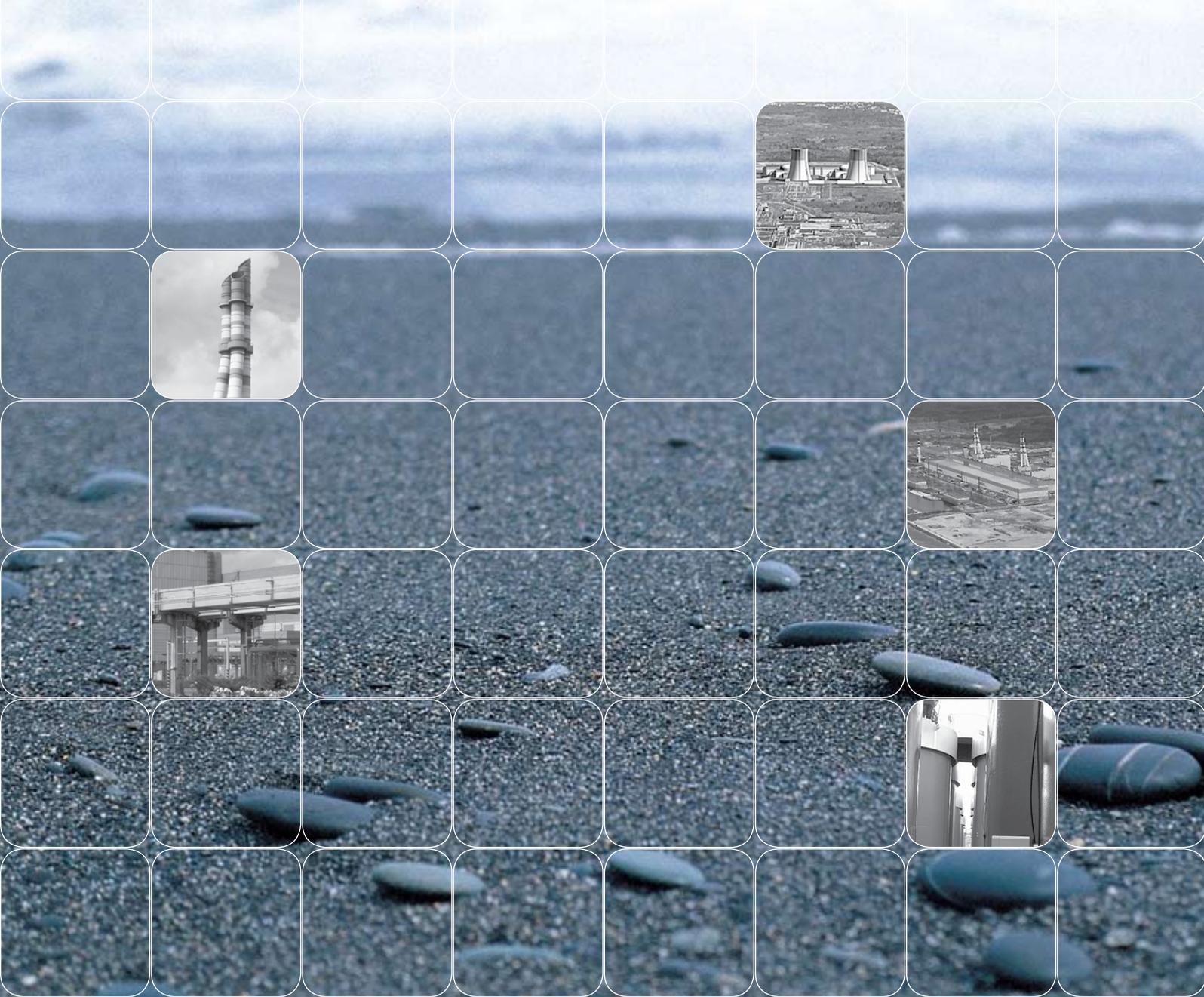
With regard to the made decision to construct a new nuclear power plant in Lithuania together with our counterparts from neighboring countries – Latvia, Estonia and Poland, quite many questions were received on the subject. In addition to that, another field that was of interest to other countries – prepa-



ration of the nuclear safety requirements and regulations for the new NPP by assuring their compliance with the IAEA recommendation and other globally accepted international standards.

Among the questions that were brought up by VATESI a group of questions related to the planned construction of nuclear power plants in the Kaliningrad Region and Belarus should be mentioned. One of the outstanding issues is to ensure that the procedures set forth in the Espoo Convention (the UN Convention on Environmental Impact Assessment in a Transboundary Context) would be met and the clarifications of the issues raised by Lithuania on the evaluation of the sites of the planned nuclear power plants and their design would be received.

The fifth review meeting of the contracting parties will be held on 4-14 April 2011 in Vienna (Austria). ■



International cooperation



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

All Member States of the European Union that are operating nuclear facilities follow the main internationally acknowledged principles of nuclear safety, 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 Regulators 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 above mentioned areas.

By following the principle of continuous improvement of nuclear safety, ENSREG is seeking to accomplish the following goals: to search out how to assure and further improve the safety of nuclear facilities, the safety of radioactive waste and spent nuclear fuel, how to assure and further improve the funding of decommissioning activities as well as management of radioactive waste and spent nuclear fuel.

The EU Member States are represented at ENSREG by senior officials and experts from their national regulatory institutions supervising nuclear safety and nuclear waste safety. In 2010, Lithuania at the ENSREG group was represented by VATESI Deputy Head, acting in the capacity of VATESI Head. In 2010, three ENSREG meetings were held where the issues of implementing the ENSREG working program were discussed.

### **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 experts to the first two working groups.



### ***ENSREG Working Group on Nuclear Safety Improvement***

On 25 June 2009, the Council Directive 2009/71/EURATOM establishing a Community framework for safety of nuclear facilities (hereinafter – the “Directive”) was passed. The main objective of the Directive is to secure the continuous improvement of nuclear safety and its regulation and to ensure that the Member States provide for appropriate national arrangements for the assurance of high level of nuclear safety to protect workers and the general public against the dangers arising from ionizing radiation caused by nuclear installations. The Directive requires the Member States to transpose the provisions of the Directive into their respective national legal frameworks by 22 July 2011. ENSREG resolved that for the fluent implementation of the Directive it is necessary to provide methodological assistance to the Member States in drawing up the national reports in accordance with paragraph 9(3) of the Directive and to define the format and structure of these reports; to draw the guidelines for the self-assessments to be conducted by the Member States and the peer review of their national framework, the schedules thereof and to plan the resources deemed necessary for these purposes.

These provisions were included into the Working Program of the Working Group on Nuclear Safety (WGNS) that with regard to its elaborations proposed by WGNS was approved by ENSREG in January 2010. For the implementation of the revised program three WGNS task forces were established.

In 2010, by preparing the guidelines to the Member States on the format and structure of the national reports to be submitted in accordance with paragraph 9(1) of the Directive, WGNS was analyzing possible alternatives and drafting proposals. The assignment will be continued in 2011 in order to define the principles of drawing up the reports and their detailed structure.

WGNS, upon having assessed the provisions of the Directive on sharing the lessons learned from the review of the Nuclear Safety Convention and the results of the Integrated Regulatory Review Service (IRRS) missions, drew up the instruction for identification of common problems of the EU Member States and the respective model of the learning process.

In 2010, on the basis of the information submitted by the Member States, WGNS drew up a preliminary ten-year schedule for the nuclear safety regulatory institutions’ self-assessment and its peer review. For this purpose the draft Memorandum of Understanding was discussed with the IAEA defining the practical aspects of the IAEA IRRS missions for independent appraisals at the nuclear safety regulatory institutions. It is being planned to approve the mentioned Memorandum at one of the ENSREG meetings to be held in 2011. To carry out the missions, additional financial and human resources will be needed; therefore the possibility to set an expert pool from the EU Member States was discussed as well. In 2010, four meetings of this working group were held. The goals set by the working group were essentially accomplished – the drafted documents were submitted for approval by ENSREG.



### ***ENSREG Working Group on 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 during 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.

At the end of 2009, a new assignment was given to the Working Group – to prepare the draft of the Directive on Radioactive Waste Management. The members of the Working Group at the meetings held in January and February as well as by the electronic communication means till the end of March prepared and submitted to the ENSREG members their proposals on the content of the European Council Directive on the Sustainable Management of Radioactive Waste and Spent Nuclear Fuel. On 4 November 2010, the European Commission, with reference to the ENSREG proposals, the already adopted Directive on Nuclear Safety, other Directives prepared and submitted for comments the draft Directive on Management of Radioactive Waste and Spent Nuclear Fuel.

The Directive aims at establishing a Community framework for the safe and responsible management of radioactive waste and spent nuclear. This would assure that the Member States will implement the relevant national measures for the safe management of radioactive waste and spent nuclear fuel for protecting the employees and the population from hazardous effects of ionizing radiation, along with more efficient dissemination of information to the general public. The Directive will be applicable to all radioactive waste and spent nuclear fuel generated in nuclear energy or otherwise by using the sources of ionizing radiation for peaceful purposes, as well as in all stages of radioactive waste and spent nuclear fuel management from the point when it is generated till the disposal to the radioactive waste repositories. The Directive will set forth the general principles for the management of radioactive waste and spent nuclear fuel, the requirements for the national standards of radioactive waste and spent nuclear management, including the legal framework, regulation, allocation of responsibility, adopting the national policy and the program. The Directive calls for establishment an independent competent regulatory institution; sets the primary responsibility of the owners and licensees for the safe management of radioactive waste and spent nuclear fuel, the regular assessment of the performed operations and facilities; it demands that the li-



censee would allocate sufficient financial and human resources for management of radioactive waste and nuclear fuel deemed necessary to perform his liabilities. One of the novelties is the requirement to assure dissemination of information about the radioactive waste and spent nuclear fuel management and, in particular about the licensing process of repositories to the general public. The Directive provides that a Member State will have to regularly report about the implementation of the provisions of the Directive. It is expected that the European Council will approve the Directive in 2011, and a uniform legal framework on the nuclear safety and management of radioactive waste will be established in the European Communities. The provisions of the Directive will have to be transposed to the national legal framework within two years from its publication in the Official Journal of the European Union.

### **Participation in the activities of Western European Nuclear Regulators' Association (WENRA)**

Western European Nuclear Regulators Association (WENRA) was established in 1999 by the initiative of the EU Member States and Switzerland. The main goal of the organization is to develop the common approach of the participating countries towards nuclear safety. At present the 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 at the Association, and the observer rights are held by the representatives of Armenia, Austria, Ireland, Luxembourg, Norway, Poland, Russia and the Ukraine. During WENRA meetings, the representatives of the regulatory institutions discuss the issues of nuclear safety regulation and supervision; they exchange information important in terms of safety, share experience, and envisage the trends of safety improvement.

Three working groups are functioning in WENRA – the Reactor Harmonization Working Group (RHWG), the Working Group on Waste and Decommissioning (WGWD) which both were joined by Lithuania in 2004, and the WENRA Working Group on Inspection of Components and Structures (WIG) established in 2010.

### **Activity of WENRA Reactor Harmonization Working Group (RHWG)**

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

Currently the representatives of nuclear safety regulatory institutions or delegated by them from 18 countries are the active participants of WENRA RHWG activities. Every country participating in the activity of WENRA, including VATESI which is representing Lithuania, in 2006-2008 were conducting in their respective countries the comparative study of their national legal framework regulat-

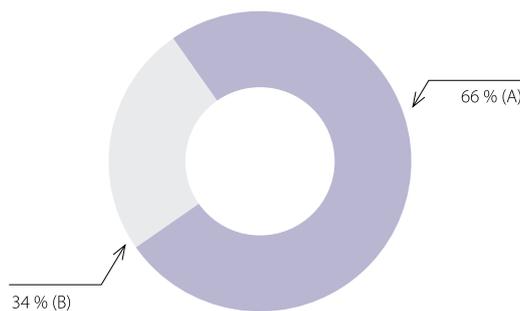


ing nuclear safety with the WENRA safety reference levels. The comparison of its mandatory technical documents with these reference levels was also conducted by Ignalina NPP. Each country, by taking into consideration the results of the comparative study and WENRA RHWG recommendations, drew up its own national action plan for removal of non-compliances in the respective country by the year 2010 by transposing them to the national legal acts and /or by including them into mandatory technical documents of a licensee. In all, the safety reference levels cover 18 safety areas of nuclear reactors. With regard to the final version of safety reference levels, prepared by WENRA RHWG in January 2008, where 295 safety reference levels were included, 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 – to the mandatory technical documents of Ignalina NPP.

As of late 2010, 73 safety reference levels were transposed to the legal acts regulating nuclear safety, and 48 – to the Ignalina NPP mandatory technical documents. It was decided that the remaining 28 WENRA RHWG safety reference levels will not be implemented due to the final shut-down of Ignalina NPP.

The results of Lithuania in transposing the WENRA RHWG safety reference levels to the legal framework are provided below, where A – practical implementation fully complies with the safety reference levels, B – recommended safety reference levels are planned to be transposed into the legal framework.

#### *Results of reaching compliance with WENRA RHWG safety reference levels*



The safety reference levels have been developed for the presently operated nuclear power plants. With an aim to harmonize these requirements for new nuclear power plants, in 2008-2009, WENRA RHWG discussed the targeted qualitative and quantitative safety objectives. As yet it has not been planned to establish the specific safety reference levels for new nuclear reactors. Presently RHWG is actively working on preparation of the general positions on the individual safety problems – the operation of nuclear power plants after the expiration of their designed life-time (this concerns the operating nuclear power plants), the main requirements for the assessment of the impact of the aircraft crash, application of the “defense in depth” principle in designing new



nuclear power plants, assessment of severe accidents, etc. VATESI, by drawing up the legal acts for nuclear safety regulation in licensing the new nuclear power plant, will take into consideration both the qualitative and the quantitative safety objectives.

### ***Activity of WENRA Working Group on Inspection of Components and Structures***

WENRA Working Group on Inspection of Components and Structures (WIG) was established in March 2010 with an aim to analyze the practices in designing, quality assurance and regulation of new and already operated NPP structures and components, to identify the best practice examples and to prepare proposals for the harmonization actions. Twelve WENRA member countries – Spain, Belgium, Switzerland, Bulgaria, France, Lithuania, Finland, the United Kingdom, Slovakia, Sweden, Poland (with the rights of an observer) and Hungary (presented the report, but not participated in the group meetings) – are represented in WIG by the representatives of their regulatory institutions. It is expected that later on other WENRA member countries will join WIG as well.

The first WIG meeting was held in September 2010 in Helsinki. At the meeting the objectives of the working group were discussed and planned, the reports on the regulatory and supervisory practices prepared by the member countries were reviewed, the differences and similarities in the practice of this activity were discussed.

The second meeting of the working group has been scheduled for the year 2011, where the draft study report of this working group will be discussed and further trends in the activity of this working group will be defined.

### ***WENRA program for harmonization of safety requirements: Activity of 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 met by the WENRA member countries. If necessary, the national requirements will be amended. The safety reference levels are being worked out with regard to the already existing legal frameworks and international recommendations.

As of late 2005, WGWD prepared two reports where 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 analyzed the legal frameworks of their respective countries and their practical implementation, and compared these in terms of compliance with the safety reference levels set 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.

In 2010, two meetings of WGWD were arranged. One of them was held in Liverpool on April 20-22, another – in Bonn on November 22-26. At the meetings in Liverpool and Bonn, the drawn documents on safety reference levels during operation of radioactive waste storage facility and decommissioning were discussed and the amendments to these documents were proposed. However, special attention was given to the being drafted new safety reference levels for radioactive waste disposal. To set 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 prepared the safety reference levels for radioactive waste disposal related to such areas as the responsibility, organizational structure of the licensee, safety management and characterization of the construction site of the disposal facility.

At the meetings to be arranged in the nearest future the newly prepared safety reference levels for disposal of radioactive waste will be discussed – the definitions of the safety reference levels will be agreed upon and revised with regard to the practice of the previously prepared documents and the specifics of radioactive waste disposal.

### **Activities in implementing the provisions of the Espoo Convention**

The designing, construction and operation of new nuclear power plants have to be carried out abiding by all international requirements on nuclear safety, radiation protection and environmental protection, and during the assessment of their impact on other countries – by the Convention on Environmental Impact Assessment in a Transboundary Context (hereinafter - the "Espoo Convention"). In 2010, VATESI along with other institutions taking part in the environmental impact assessment, examined the Environmental Impact Assessment Reports of the nuclear power plants planned to be constructed in Belarus and the Kaliningrad Region of the Russian Federation, provided their comments and remarks on these reports.

In September 2009, the Ministry of Natural Resources and Environment of the Republic of Belarus in line with the provisions of the Espoo Convention submitted to the Ministry of the Environment a notification regarding the launched environmental impact assessment (hereinafter – the "EIA") of the planned to be constructed new nuclear power plant and the EIA documents. VATESI special-



ists started the review of these documents and as early as in October submitted 31 questions to the Ministry of the Environment. While examining the information provided in the preliminary Environmental Impact Assessment Report of the planned to be constructed nuclear power plant, VATESI specialists brought to attention and raised the issues related to selection of the sites acceptable for the construction of nuclear power plants, radioactive waste management, assessment of hazards and radiological effects on the population of Lithuania, organization of emergency preparedness. The Ministry of the Environment, with regard to the comments provided by the state and higher education institutions and upon having summarized them, submitted to the Ministry of Natural Resources and Environment of the Republic of Belarus 39 comments and proposals on the EIA documents. Moreover, the Belarusian counterparts were informed that the final position of Lithuania will be submitted only after the public debate on the EIA Report in Lithuania. In Lithuania, the public debate on the environmental impact assessment of the nuclear power plant planned to be constructed in Belarus was held at the beginning of March 2010, and, apart from the representatives of the Republic of Belarus, it was attended by nearly 80 representatives of the public, non-governmental organizations, higher education and science institutions, including VATESI. Later, when the Ministry of the Environment was preparing the position of Lithuania regarding the environmental impact assessment of the nuclear power plant planned to be constructed in Belarus, VATESI specialists were also actively involved in its preparation, provided their remarks and comments. In the opinion of Lithuania, the environmental impact assessment of the planned nuclear power plant was not sufficiently comprehensive – the EIA Report was limited to the analysis of the single site in Astravets, and this does not comply with the provisions of the Espoo Convention demanding for the comparison of the alternative technologies and sites. In accordance with the provisions of the Convention, the alternatives should be thoroughly assessed in order to make the most favorable decision in terms of the environmental protection and socioeconomics. The position of Lithuania disapproved of the construction of the nuclear power plant in the Astravets (Grodno District) site that is remote at 23 km distance from the border of Lithuania and only some 50 km from the capital of Lithuania Vilnius with the population exceeding half a million people.

Belarus failed to provide answers to all Lithuania's comments and remarks that had been submitted already in 2009. When the answers of Belarus to the submitted remarks and comments were received in February 2010 and were analyzed, it turned out that more than a half of the questions remained unanswered or were not answered in full. At the end of March, the comments on the responses of the Belarusian specialists to VATESI remarks and comments were submitted to the Ministry of the Environment which handed them over to the entities who had prepared the EIA Report. At the same time VATESI proposed to solve the mentioned issues during further consultations that are obligatory according to the provisions of the Espoo Convention.



A bilateral meeting on the construction of the new nuclear power plant in Belarus was held in June. VATESI representatives within the delegation of the Republic of Lithuania went to Minsk to voice an official position on the nuclear power plant planned to be constructed in Astravets District. During the meeting, the specialist of Belarus provided a lot of supplementary information regarding the assessment of the effects of operation of the future nuclear power plant and the assessment results, including the effects for Lithuania. Whereas at the meeting there was no possibility to evaluate the received information in full, Lithuania refused to acknowledge this meeting as consultations held under the framework of the Espoo Convention, because the requirements of the Convention on timely provision of thorough information as well as other procedures laid down in the Convention were not complied with, and requested to officially send the additional assessments in writing. When this information is received, VATESI specialists will also take part in the analysis of these assessments and express their opinion. The EIA process will be completed when all explanations are received from Belarus.

Russia, although being a signatory to the Espoo Convention, has not ratified the document. Lithuania has been continuously making efforts to ascertain that the provisions of this convention would be abided by. Besides, the State Nuclear Energy Corporation, constructing the nuclear power plant and responsible for the project has voluntarily assumed obligations to perform the entire process of construction of the Baltic Nuclear Power Plant in accordance with the provisions of the Espoo Convention.

At the end of 2009, Russia provided the environmental impact assessment documents of the nuclear power plant planned to be constructed in the Kaliningrad Region. Upon having examined the EIA Report for the Baltic Nuclear Power Plant, VATESI informed the Ministry of Foreign Affairs that this report is not sufficiently thorough, and in January 2010 submitted 21 questions which subsequently were handed over to the entities who had prepared the EIA documents. In the EIA Report the criteria on the basis of which the priority is given to the Neman site (10-12 km to the south from the Lithuanian – Latvian border) are not clear, the seismic events in the site have not been analyzed, the information as to how the projected radiation exposure doses affecting local and neighboring countries' population during the NPP operation and in the case of severe accidents would be evaluated was not sufficient, the information about the alert notification and information dissemination to the neighboring countries, the plans for management of emergency situations and cooperation with the institutions of the neighboring countries were not provided.

The answers that were given by Russia in the summer of 2010 did not clarify our questions, therefore the questions were repeatedly sent to the Russian counterpart regarding the project being implemented by them for the construction of the nuclear power plant and the environmental impact assessment actions that will have to be taken, along with the request to provide additional



information and clarification of the specific issues. The criticism expressed to the Russian counterpart was mainly related to the unclear criteria of the site selection, non-compliance with the Espoo Convention, the works that were started without having agreed the environmental impact assessment with the neighboring countries. The general public of Lithuania has to be fully informed about the criteria of the site selection, the standards according to which the NPP will be constructed and operated, as well as the scope and legal status of the emergency protection planning zones that also cover a part of the territory of the Republic of Lithuania.

The works aimed to reconcile with Lithuania the environmental impact assessment of the nuclear power plant planned to be constructed in the Kaliningrad Region of Russia have not been completed yet, the approval in accordance with the Espoo Convention (public hearing in Lithuania and consultations among countries) so far has not been finalized.

VATESI is ready to take part in the environmental impact assessment of the power plants of the neighboring countries and is giving particular attention to this activity. It is beyond doubt that such large facilities as the nuclear power plants can make a transboundary impact, therefore it should be strictly demanded that their environmental impact assessment would be carried out in accordance with all international covenants. The construction of nuclear power plants in the neighboring countries is a sensitive issue to Lithuania, therefore the implementation of their construction and operation in a safe manner must be pursued.

### **Participation in the activities of the European Clearinghouse for Operational Experience Feedback**

In 2008, nuclear safety regulatory institutions from seven European countries signed a Declaration of Intention of Multi-partner Collaboration Arrangements for European Clearinghouse on NPP OEF (hereinafter – the “EU Clearinghouse”). The operating agent of the project is the Institute of Energy, established in Peten (the Netherlands), one of the seven institutes of the Joint Research Centre (JRC).

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 2010, at the annual meeting of the European Clearinghouse for Operational Experience Feedback the review of the above mentioned Declaration and the reorganization of the EU Clearinghouse by establishing two supervisory bodies – the Steering Committee and the Technical Board – were initiated.

In the activities of the Steering Committee the representatives of Finland, Hungary, Lithuania, the Netherlands, Rumania, Slovenia and Switzerland are involved along with the representatives of nine other countries that are participating by the observer rights. At the meetings of the Steering Committee, Lithuania is represented by VATESI Deputy Head acting in the capacity of VATESI Head. In 2010, by participating in the activities of the Steering Committee VATESI submitted its proposals on the activities of the European Clearinghouse for Operational Experience Feedback.

In 2010, the activity of the EU Clearinghouse was focused on the topical operational experience studies on the following issues: the external events, events related to the NPP construction and commissioning, loss of safety-important equipment due to the generator's high voltage surge, events related to fires, events related to ageing of the NPP structures and components, events related to the NPP modifications, supply of the NPP components, decommissioning events. When the topical studies on the mentioned subjects are issued by the EU Clearinghouse, VATESI is going to examine them and, if necessary, to prepare recommendations on improvement the activities of its own and/or the State Company *Ignalina Nuclear Power Plant*.

In 2010, the EU Clearinghouse issued four online info sheets, where the summarized expedient information about the incidents related to nuclear power that occurred in the world during the previous quarter is presented. The experts of the EU Clearinghouse provided assistance to the regulatory institutions of the project counterparts by performing independent surveys of the assessment reports on unusual events at NPPs. Subsequently these reports were presented to the IAEA/NEA IRS database.

In 2010, the EU Clearinghouse conducted a survey with an aim to clarify how the countries participating in the European Clearinghouse project are using their operational experience feedback and what methods of assessment are being applied. VATESI prepared the relevant information about the use of operational experience feedback within the inspectorate and at the NPP as well as the methods and tools used by Ignalina NPP for the analysis of events.



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

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

In 2010, 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, Including Water-Cooled Water-Moderated Power Reactor Components and Piping;
- 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 2010, while engaged in the above projects, Lithuania's representatives participated in 31 events outside the country, including 17 working meetings, 8 training courses, and 6 technical meetings. Thirty six specialists from Ignalina NPP, VAE UAB, VATESI and the Technical Support Organizations 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 assessment. In addition to that, they established business contacts with their foreign counterparts.



### **In 2010, two events arranged by the IAEA were held in Lithuania:**

- On 19-23 April, a working meeting Application of Probabilistic Safety Analysis and Decision Making on the Basis of Risk Assessment (under the framework of RER/9/095) was arranged in Kaunas;
- On 30 August-3 September, training courses Computer Security in Nuclear Facilities (under the framework of RER/9/102) took place in Vilnius.

These two events were attended by the specialists from Lithuania, Armenia, Bulgaria, Czech Republic, Estonia, the US, the United Kingdom, Croatia, Romania, Russia, Slovakia, Sweden, 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 2011, among them – numerous meetings, courses and consultations that are important to Lithuanian specialists.

### *The IAEA national project for Lithuania*

In 2010, the implementation of the national project by the IAEA Enhancing Capabilities of VATESI and Other Institutions in Licensing 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 2010, approx. USD 180 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.

In 2010, under the framework of LIT/9/009 project, two missions by the IAEA experts were organized. On 24-27 May 2010, the mission of the IAEA experts evaluated the nuclear safety requirements and regulations that are being prepared in order to get ready for the construction of the new nuclear power plant, and on 8-12 November 2010, the IAEA experts reviewed the technical description of the potential construction sites of the new nuclear power plant where the regional geology, seismic risk, geotechnical and hydro geological factors had been assessed. The specialists of VATESI, the Environmental Protection Agency and VAE UAB participated in in-service trainings, working meetings, seminars and training courses on the outstanding issues of licensing and safety assessment of the new NPP, gained experience deemed necessary in preparing for the construction of the new nuclear power plant, improved qualification and enhanced their knowledge in the field of nuclear technologies.



### The EU support projects for VATESI

In 2010, VATESI was working on a single EU support project – Technical Assistance to VATESI in the Field of Decommissioning (Stage 5), No. VAT.05, financed by the funds from Ignalina Program.

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 2010, the Financing and Administration Agreement for the period of 2010-2012 of the project Improvement of Qualification of Specialists of the State Nuclear Power Safety Inspectorate financed from the European Union structural support funds and prepared under the framework of the facility VP1-4.1-VRM-03-V Qualification Improvement of Employees of Governmental Institutions and Offices was signed but the activities under the Agreement were not started in 2010, because the draft Law on Nuclear Safety of the Republic of Lithuania and other relevant laws which would fundamentally improve the system of administrative sanctions applied for breaching the legal norms of nuclear safety had not been adopted as planned. Without the adoption of the relevant laws, it was not possible to determine the real demand for the training, the content of the training programs and training materials based on which the training will be provided and to start the training process. If the relevant training programs and materials were prepared under the presently effective legal acts defining the system of administrative sanctions imposed for breaching the legal norms of nuclear safety, the succession of the project would not be assured. It is being planned to commence the activities of the project in 2011.



## 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, the Technical Support Organizations 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 in the area of nuclear safety and regulation;
- Coordinating bilateral and multilateral projects of VATESI.

In 2010, experts from the German State Nuclear Reactor Safety Consulting Association (GRS), the French Institute of Nuclear Safety and Radiation Protection (IRSN), other organizations, as well as from the Nuclear Regulatory Commission (the USA) participated in the activities of the VATESI ICG.



The ninth ICG meeting was held on 14 April 2010. At the meeting Michail Demčenko, Deputy Head of VATESI, was elected the ICG Chairman, and Michel Chouha, IRSN expert, was elected the ICG Vice-chairman. During the meeting, the reorganization of nuclear safety regulatory infrastructure in Lithuania, preparation for the construction of the new nuclear

power plant, safety issues related to the changing activities of Ignalina NPP from operation to decommissioning were discussed. The experience in outstanding nuclear regulation in other countries was exchanged along with the opinions on the EU assistance in nuclear safety to the East European countries planning to construct nuclear power plants. ■



## LIST OF ABBREVIATIONS

**A1** – a nuclear reactor with the main circulation circuit and the main auxiliary systems for the reactor is located in the building A

**ACS** – accident confinement system

**AFES** – automated fire extinction system

**ANA** – additional neutron absorbers

**B1** – a primary water treatment system of the cooling system and demineralized water treatment equipment are located in the building B

**B19-1** – project for very low activity radioactive waste storage facilities

**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

**B34** – project for solid radioactive waste treatment and storage facilities

**B9-2** – nuclear reactor's gas circuit dismantling and decontamination project

**BDBA MM** – Manual for Management of Beyond-Design-Basis Accidents

**CF UGC** – capability factor to use gross capacity

**CNS** – Convention of Nuclear Safety

**DSA** – deterministic safety analysis

**EC** – European Commission

**ECCS** - emergency core cooling system

**ECOEF** – European Clearinghouse for Operational Experience Feedback

**ECURIE** –European Community Urgent Radiological Information Exchange

**EIA** – environmental impact assessment

**ENAC** – Emergency Notification and Assistance Convention of the IAEA

**ENSREG** – European Nuclear Safety Regulatory Group

**ESMTC** – Research Centre of Electromagnetic Compatibility

**EU** – European Union

**EURATOM** – European Atomic Energy Community

**FASR** – fast-acting scram rods

**FI** – Institute of Physics



**FRA** – fire risk analysis

**GRS** – German State Nuclear Reactor Safety Consulting Association (Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH)

**GWh** – gigawatt hour

**HLG** – high level group

**IAEA** – International Atomic Energy Agency

**ICG** – International Cooperation Group on Nuclear Safety of VATESI

**Ignalina NPP** – *Ignalina Nuclear Power Plant*

**ISNF SF** – interim spent nuclear fuel storage facility

**INES** – International Nuclear and Radiological Event Scale

**IRRS** – Integrated Regulatory Review Service

**IRRT** – International Regulatory Review Team

**IRSN** – French Institute for Radiological Protection and Nuclear Safety

**JRC** – Joint Research Centre

**Kcal** – kilo calorie

**KTU** – Kaunas University of Technology

**KWh** – kilowatt hour

**LEI** – Lithuanian Energy Institute

**LNEP (LEI)** – LEI Laboratory of Nuclear Engineering Problems

**LRTM (LE)** – LEI Laboratory of Research and Testing of Materials

**MBZ** – material balance zone

**MPa** – megapascal

**mSv** – millisievert (unit of doze equivalent) millisievert (exposure measurement unit)

**MW** – megawatt

**MWd/HRE** – megawatt per day/heat releasing element

**NI** – nuclear installation

**NISL (LEI)** – LEI Nuclear Installations Safety Laboratory



- NPP** – nuclear power plant
- NRC** – the US Nuclear Regulatory Commission
- NSG** – Nuclear Suppliers’ Group
- OECD** – Organization for Economic Cooperation and Development
- OO** – operating organization
- OSART** – Operational Safety Review Team under the International Atomic Energy Agency
- PSA** – probabilistic safety analysis
- QAS** – quality assurance system
- RATA** – Radioactive Waste Management Agency
- RBMK** – high power channel-type reactor
- RHWG** – WENRA Reactor Harmonization Working Group
- SBEOI** – Symptom-Based Emergency Operating Instructions
- SIIT** – the State Institute of Information Technologies
- SPNFA** – spent nuclear fuel assembly releasing heat
- SNFSF** – dry type storage facility for spent nuclear fuel
- SAM** – scheduled annual maintenance
- SRS** – safety-related systems
- SSM** – Swedish Radiation Safety Authority
- STD** – standard technical documents
- SIP** – safety improvement program
- TSO** – technical support organizations
- VAE** – Visagino Atominė Elektrinė UAB
- VATESI** – State Nuclear Power Safety Inspectorate
- VG TU** – 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 2010

**The present Report compiled by VATESI specialists:** Michailas Demčenko, Jolanta Tumasaitė, Lina Vaitkienė, Ovidijus Šeštokas, Zofija Adomaitienė, Sigita Šlepavičius, Ugnė Adomaitytė, Evaldas Kimtys, Kristina Palevičienė, Birutė Purlienė, Kristina Ramonienė, Stasys Stasiūnas, Rolandas Čiučelis, Vidas Paulikas, Saulius Stravinskas, Vytenis Barkauskas, Gintas Pliuškevičius, Kęstutis Sabas, Rimantas Semėnas, Nerijus Rakštikas, Liubovė Alejeva, Vida Jakimavičienė, Emilius Vanagas, Vladislavas Legenis, Nerijus Bucevičius, Eva Krištapovičiūtė, Rimantas Daubaras, Marius Pareigis, Darius Lukauskas, Sigizmundas Styro, Žybartas Patašius, Marius Gutaravičius, Algirdas Vinskas, Audrius Pašiškevičius, Emilis Baškys, Marius Davainis, Daiva Čelutkaitė, Jurgita Jarmalavičiūtė, Renaldas Sabas, Marius Urvakis, Dainius Brandišauskas, Kristina Tumosenė, Jūratė Prokopovič.

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**On the cover** Rolandas Čiučelis,  
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## Operating units of nuclear power plants in Europe



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