



REPUBLIC OF LITHUANIA

**IMPLEMENTATION OF PLAN
OF STRENGTHENING NUCLEAR SAFETY
IN LITHUANIA**

(Follow-up of the “stress tests” performed in European Union)

Final Report

Vilnius 2018

This report prepared by the State Nuclear Power Safety Inspectorate (VATESI).

The Final Report of Implementation of Plan of Strengthening Nuclear Safety in Lithuania is available in pdf format at the State Nuclear Power Safety Inspectorate website: www.vatesi.lt.

All information and data used in the report are as of May 16th, 2018 unless explicitly specified otherwise.

Implementation of Plan of Strengthening Nuclear Safety in Lithuania
Final Report

Publisher

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List of Abbreviations

ENSREG	European Nuclear Safety Regulators Group
EPREV	International Atomic Energy Agency service on Emergency Preparedness Review
EPA	Environmental Protection Agency under the Ministry of the Environment
CNS	Convention on Nuclear Safety
FRD	The Fire and Rescue Department under the Ministry of the Interior
IAEA	International Atomic Energy Agency
Ignalina NPP	State Enterprise Ignalina Nuclear Power Plant
MoH	Ministry of Health of the Republic of Lithuania
MoE	Ministry of Energy of Republic of Lithuania
NPP	Nuclear Power Plant
RPC	Radiation Protection Centre under the Ministry of Health
VATESI	Lithuanian acronym for “State Nuclear Power Safety Inspectorate”
WENRA	Western European Nuclear Regulators Association

Introduction

In the aftermath of the nuclear accident that occurred at the Fukushima Daiichi nuclear power plant in Japan on 11 March 2011, the European Council decided that all European Union nuclear power plants should be reviewed on the basis of a comprehensive and transparent risk and safety assessment (“stress tests”). The European Union countries together with Switzerland and Ukraine that operate nuclear power plants or spent fuel storage facilities produced national „stress tests“ reports. The national „stress tests“ reports in 2011 were submitted and in 2012 peer reviewed through a process organised and overseen by ENSREG [1]. The European Union countries and the European Commission as ENSREG have endorsed the conclusions from the “stress tests” and their peer review results [2] and concluded that follow-up activities would occur through an Action Plan [3]. The ENSREG developed an Action Plan and requested that all countries develop and make public their National Action Plans associated with post-Fukushima lessons learned and „stress tests” peer review recommendations and suggestions.

Following the ENSREG Action Plan, the European Union countries, participated in the „stress tests“, were obligated to produce National Action Plans (hereafter – NAcPs) and to submit them to ENSREG. The ENSREG organized a NAcPs Workshops, which were held in Brussels on 22-26 April 2013 and 20-24 April 2015, to discuss and review the contents and status of implementation of NAcPs. All countries participated in the NAcPs Workshops committed to continue implementation of their NAcPs until all activities and measures had been finalised [3]. Following the ENSREG statement on the progress in the implementation of post-Fukushima NAcPs, which was published after 2015 ENSREG NAcPs Workshop, a status report from each participating country on the implementation of the NAcPs had to be updated and published periodically to ensure a transparent monitoring with the aim of publishing a report on the implementation in 2017 [10].

In accordance with ENSREG Action Plan recommendations, the Plan of Strengthening Nuclear Safety in Lithuania (National Action Plan) (hereafter – the Lithuanian NAcP) was developed by VATESI in January 2013 and revised in March 2015. The Lithuanian NAcP provides general information about the nuclear safety in Lithuania and activities and corresponding measures taken to improve the nuclear safety in the light of Fukushima accident lessons learned. The Lithuanian NAcP is available on VATESI website [6].

The Lithuanian NAcP Final Report is prepared after publication of two Status Reports of Lithuanian NAcP. The 1st Lithuanian NAcP Status Report was issued in December 2014 and the 2nd in January 2018. The Lithuanian NAcP Status Reports were prepared in order to reflect progress on implementation of measures of the Lithuanian NAcP, as well as emphasize and justify main changes in the Lithuanian NAcP since it was developed in January 2013 and presented during ENSREG NAcPs Workshops in 2013 and 2015. The Lithuanian NAcP Final Report is prepared considering the ENSREG terms of reference [7, 8] and includes only relevant technical details, which are necessary for clarification and justification of changes of measures of the Lithuanian NAcP. The main information and the basis of the safety relevance of all measures are provided in the Lithuanian NAcP.

1. Status of the National Action Plan

All measures of the Lithuanian NAcP have been implemented. The progress of measures implementation is described in Table 1.

1.1. Response/clarification on issues identified in the rapporteur’s report from the ENSREG National Action Plans Workshops in 2013 and 2015

2013 ENSREG NAcPs Workshop

The conclusions related with Lithuanian NAcP from 2013 workshop [4]:

“The Lithuanian NAcP informs comprehensively and well understandably on how the safety of the Ignalina NPP, which is shut down, and the spent fuel storage facilities, including all spent nuclear fuel handling processes, in the country is going to be improved in the aftermath of Fukushima according to the national assessments, the recommendations and suggestions of the European Stress Tests and the conclusions of the CNS process. The NAcP is transparent and accessible on the regulator’s website. The NAcP follows the structure of the ENSREG guidance. The items, that are relevant for Lithuania, which does not have operating nuclear power plants, are grouped in several subjects. Therefore, it is not always clear how specific ENSREG recommendations and suggestions have been addressed. The NAcP does not directly reply to comments related with the possible practical improvements of the spent fuel pools safety formulated by the Peer Review team in the Peer Review country report. During the workshop, Lithuania provided explanations on this issue, as well as how other ENSREG recommendations and suggestions have been addressed.”

No additional response or clarification needed in this Status Report.

2015 ENSREG NAcPs Workshop

The rapporteur’s conclusions related with Lithuanian NAcP from 2015 workshop [5]:

“The Lithuanian NAcP informs comprehensively and well understandably on how the safety of the Ignalina NPP, which is shut down, and the spent fuel storage facilities, including all spent nuclear fuel handling processes, in the country is going to be improved in the aftermath of Fukushima according to the national assessments, the recommendations and suggestions of the European Stress Tests and the conclusions of the CNS process.

The NAcP is transparent and accessible on the regulator’s website.

The NAcP follows the structure of the ENSREG guidance. The items, that are relevant for Lithuania, which does not have operating nuclear power plants, are grouped in several subjects. Therefore, it is not always clear how specific ENSREG recommendations and suggestions have been addressed.

The NAcP does not directly reply to comments related with the possible practical improvements of the spent fuel pools safety formulated by the Peer Review team in the Peer Review country

report. During the workshop, Lithuania provided explanations on this issue, as well as how other ENSREG recommendations and suggestions have been addressed.

In 2013 almost all actions were planned to be implemented by the end of 2013 or were already implemented. Most actions demand additional studies and assessments, several imply procedural revisions and review of regulations, while some demand hardware modifications, such as new measurement systems for the spent fuel pools. In 2015 some significant delays have appeared in the measure implementation. On the 14 measures, 6 measures are still ongoing and should be completed mainly in 2016-2017. In particular two measures have been postponed by 4 years, to 2017, in relation with the updated planning for the dry storage facility.

The construction of a new nuclear power plant on the site of Visaginas is considered as a challenge for Lithuania. Lessons from Fukushima will be taken into account for this new unit.”

The development of Visaginas NPP project is currently suspended. Issues that are mentioned in the rapporteur’s conclusions are reflected in in Table 1.

1.2. Progress on implementation and update of the National Action Plan since it was developed

The Lithuanian NAcP includes 14 measures and all of them are implemented. The main changes during the implementation of measures of the Lithuanian NAcP are explained in Chapter 1.3. and in Table 1 (see comments).

1.3. Main changes in the National Action Plan since the 2013 and 2015 NAcP Workshops with justification

1.3.1 Additional measures

No additional measures were added to the Lithuanian NAcP since it was developed.

1.3.2 Measures removed or modified

After 2013 ENSREG NAcPs Workshop:

The measures No. 1 and 2 of the Lithuanian NAcP were modified in order to reflect WENRA Safety Reference Levels for Existing Reactors, which were updated by WENRA on 24th September 2014 in relation to lessons learned from TEPCO Fukushima Dai-ichi accident [9]. The measures No. 3 of the Lithuanian NAcP was modified taking into account the results of the IAEA EPREV mission that was conducted in Lithuania during 1-11 October 2012.

After 2015 ENSREG NAcPs Workshop:

No measures were removed from or modified in the Lithuanian NAcP.

1.3.3 Changes in the schedule

After 2013 ENSREG NAcPs Workshop:

The deadlines of measures No. 1, 2, 4, 5 and 13 were changed. The deadlines of measures No. 1 and 2 were changed in order to reflect WENRA statement [9]. The deadlines of measures No. 4 and 5 were changed in order to reflect updated schedule of the Ignalina NPP Interim Spent Fuel Storage Facility (ISFSF) construction project. The deadline of measure No. 13 was changed in order to reflect Ignalina NPP delay that appeared due to hardware procurement difficulties.

After 2015 ENSREG NAcPs Workshop:

The deadline of measures No. 1 and 2 were corrected in order to reflect actual status of WENRA guidances on the subject of natural hazards (Issue T) and progress of implementation of these measures.

1.4 Technical basis leading to the main changes identified in the National Action Plan

The technical basis leading to the main changes is explained in Chapter 1.3 and in Table 1 (see comments).

1.5 Nationally identified good practices and challenges during implementation

The Lithuanina NAcP was implemented in proper way.

2. Conclusions

All measures of the Lithuanian NAcP, which includes 14 measures, have been completed. The last two Lithuanian NAcP measures, which were indicated as in progress after issue of Lithuanian NAcP Status Report in January 2018, have been completed as of 20 March 2018. These measures were related with review of WENRA documents – WENRA Safety Reference Levels for existing reactors, published in 2014, and WENRA specific guides related with natural hazards analysis, published in 2016, and consequent transfer of provisions still relevant to Ignalina NPP under decommissioning to national legislation. In 2017, VATESI completed review of the above mentioned WENRA documents, identified relevant provisions and prepared amendments to Nuclear Safety Requirements BSR-2.1.2-2010 “General Regulations on Safety of NPPs with RBMK-1500 Reactors”, which were approved on 20 March, 2018.

Table 1. Summary of measures of the Plan of Strengthening Nuclear Safety in Lithuania (National Action Plan)

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
1.	Natural hazards	<p>Measure: To consider the necessity of revision of the national nuclear safety regulations applied to the identification of natural hazards, their assessment and the corresponding assessment for “cliff-edge” (margins) effects in compliance with planned WENRA guidance when it will be issued.</p> <p>Comments: The measure is included in the NAcP in accordance with WENRA statement [9]. In 2015, WENRA published guidance (Guidance Head Document) on the subject of natural hazards (Issue T), and in 2016 – the hazard specific annexes (Seismic Events, External Flooding, Extreme Weather Conditions) of the Guidance Head Document. In beginning of 2017, VATESI completed review of WENRA Safety Reference Levels (SRLs) for Existing Reactors (2014) including above-mentioned WENRA documents, and developed the plan for transferring of SRLs to VATESI nuclear safety requirements. According to this plan, the Nuclear Safety Requirements BSR-2.1.2-2010 “General Regulations on Ensuring of Safety of Nuclear Power Plants with RBMK-1500 Type Reactors” (hereinafter - BSR-2.1.2-2010) were reviewed and draft of amended BSR-2.1.2-2010 was prepared. The draft of amended BSR-2.1.2-2010 includes SRLs of Issue T, which are still relevant to finally shutdown Ignalina NPP. On 20 March 2018 VATESI has been published BSR-2.1.2-2010 which transfer all SRLs foreseen in VATESI plan.</p>	<p>ENSREG Peer Review Report</p> <p>WENRA guidance</p>	<p>Implemented / 2018</p>	<p>VATESI</p>

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
2.	General	Measure: To carry out review of WENRA Safety Reference Levels for Existing Reactors, which were updated on 24 th September 2014 in relation to lessons learned from TEPCO Fukushima Dai-ichi accident, and if necessary:	ENSREG Peer Review Report, WENRA Safety Reference Levels for Existing Reactors	Implemented / 2018	VATESI
2.1	- update of existing or develop of new national nuclear safety regulations applied to finally shutdown Ignalina NPP;				
2.2	- as much as it is applicable, update of existing or develop of new national nuclear safety regulations applied to new NPP.				
	Comments: In beginning of 2017, VATESI completed review of WENRA Safety Reference Levels (SRLs) for Existing Reactors (2014) and developed the plan for transferring of SRLs to VATESI nuclear safety requirements (also see measure No. 1). According to this plan, the Nuclear Safety Requirements BSR-2.1.2-2010 “General Regulations on Ensuring of Safety of Nuclear Power Plants with RBMK-1500 Type Reactors” were reviewed and draft of amended BSR-2.1.2-2010 was prepared. The draft of amended BSR-2.1.2-2010 includes SRLs, which are still relevant to finally shutdown Ignalina NPP. On 20 March 2018 VATESI has been published BSR-2.1.2-2010 which transfer all SRLs foreseen in VATESI plan. As currently development of new NPP project is suspended, development of VATESI nuclear safety requirements and rules applied to new NPP was suspended as well.				

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
3.	Emergency preparedness/ Severe accident management	Measure: To implement the following actions of EPREV Action Plan:	EPREV review mission report	Implemented /	
3.1		- in connection with revised emergency classes of Ignalina NPP, to carry out renew of the “State residents protection plan in case of nuclear accident”;		2016	VATESI
3.2		- to conduct a joint Radiation Protection Centre (RPC) under the Ministry of Health (MoH), Environmental Protection Agency (EPA) under the Ministry of the Environment, VATESI and Ignalina NPP table-top exercise to test collaboration abilities for predictions on radiological consequences, including dose projection and formulating recommendations for residents, in case of nuclear accident;		2015	RPC, EPA, VATESI, Ignalina NPP
3.3		- to conduct a joint Fire and Rescue Department (FRD) under the Ministry of Interior, VATESI, RPC and MoH table-top exercise to test effectiveness of public information system in case of radiological accident.		2016	FRD, VATESI, RPC, MoH
		Comments: The measures linked to the results of the EPREV mission and related to emergency preparedness for responding to a nuclear or radiological accident have been included in the NAcP after approval of the measures of improvements among all Lithuanian institutions involved in this mission.			

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
		<p>Measure 3.1:</p> <p>In 2016, VATESI carried out review of the State residents protection plan in case of nuclear accident and submitted to FRD the suggestions linked to revised emergency classes of Ignalina NPP in accordance with EPREV mission recommendations. VATESI suggestions were included in the updated plan prepared by FRD. The draft of plan is submitted to Government of Republic of Lithuania for approval.</p> <p>Measure 3.2:</p> <p>In 2015, RSC has organized table-top exercise “Capabilities of co-operation between state institutions for prediction of radiation exposure doses and formulating recommendations for residents”. Representatives from VATESI, Ignalina NPP, EPA, FRD and other concerned state institutions participated in this exercise. Several recommendations for improvement of prediction of radiation exposure doses and formulating recommendations for residents in case of nuclear or radiological accident were identified during this exercise. The report of table-top exercise was prepared and submitted to state institutions that participated in exercise.</p> <p>Measure 3.3:</p> <p>In 2016, FRD has organized table-top exercise “Preparedness of state institutions to inform residents in case of nuclear or radiological accident”. Representatives from VATESI, RPC, MoH and MoE participated in this exercise. Several recommendations for improvement of informing of residents in case of nuclear or radiological accident were identified during this exercise. The report of table-</p>			

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
		top exercise was prepared and submitted to state institutions that participated in exercise.			
4.	Natural hazards	<p>Measure: To evaluate the spent fuel cask tip-over in case of earthquake during transportation and to assess radiological impact on the environment, personnel and population.</p> <p>Comments: Initially the action was planned to be finished in 2013. The date of implementation of the action is revised taking into account updated schedule of the Ignalina NPP Interim Spent Fuel Storage Facility (ISFSF) construction project. In 2016, before start of operation of the ISFSF, Ignalina NPP developed the report on the spent fuel cask tip-over accident. The postulated initial event of cask tip-over during transportation was analysed, and radiological consequences of this event were assessed. The results of analysis revealed that after cask tip-over the primary lid of cask will remain in place and retain the fuel bundles. In case of the most conservative scenario, due to release of the gases through the sealing ring of cask primary lid, worker situated close to the cask (5 m) at the moment of the accident will be affected by emergency radiation exposure in total of 7 mSv (the maximum acceptable level for worker – 50 mSv). VATESI carried out review and assessment of the report submitted by Ignalina NPP and approved them.</p>	National final report on “stress tests”	Implemented / 2017 (initial deadline 2013)	Ignalina NPP

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
5.	Natural hazards	<p>Measure: To consider the necessity of improvement of emergency preparedness procedures or updating those after confirmation of the calculation results of the spent fuel cask tip-over during transportation.</p> <p>Comments: Taking into account, recommendations provided in the report on the spent fuel cask tip-over accident (see measure No. 4), Ignalina NPP has updated relevant emergency preparedness procedures. In 2017, Ignalina NPP has conducted emergency preparedness training on management of the spent fuel cask tip-over accident and mitigation of their consequences. VATESI carried out review and assessment of updated Ignalina NPP emergency preparedness procedures and approved them.</p>	National final report on “stress tests”	Implemented / 2017 (initial deadline 2013)	Ignalina NPP
6.	Natural hazards	<p>Measure: To assess the robustness and availability of accident management centre of organization of emergency preparedness against an earthquake. If needed, to develop measures to improve the robustness of accident management centre.</p> <p>Comments: Ignalina NPP has performed the assessment of the robustness and availability of accident management centre (AMC) of organization of emergency preparedness in case of earthquake and has prepared the report of the assessment. The seismic analysis, including specific calculations were carried out for the assessment of the robustness and availability of AMC. The model of AMC was developed and computer code (SCAD) was used for calculation of seismic impact. The results of the calculations confirmed the robustness and</p>	National final report on “stress tests”	Implemented/ 2014	Ignalina NPP

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
		availability of the AMC in case of earthquake with peak ground acceleration 0,13g. VATESI performed review and approved this report.			
7.	Natural hazards	<p>Measure: To consider the possibility of the seismic warning and monitoring system application for formalization of the emergency preparedness announcement criterion and to include this criterion in the operational manual of the seismic warning and monitoring system.</p> <p>Comments: Ignalina NPP has performed assessment of the data, which generates the seismic warning and monitoring system and determined the new criterion for formalization of the emergency preparedness announcement. The new criterion have been included in the operational manual of the seismic warning and monitoring system of Ignalina NPP. VATESI carried out the review of documents submitted by the Ignalina NPP, which are related with implementation of this action, and has approved them.</p>	National final report on “stress tests”	Implemented/ 2012	Ignalina NPP
8.	Natural hazards	<p>Measure: To provide data transfer of the seismic warning and monitoring system to the computer information system of organization of emergency preparedness, i.e. to the accident management centre, technical support organization and emergency control room and to update corresponding procedures of organization of emergency preparedness.</p> <p>Comments: Ignalina NPP has installed necessary hardware options, which ensure data transfer of the seismic warning and monitoring system to the computer information system of organization of emergency preparedness.</p>	National final report on “stress tests”	Implemented/ 2013	Ignalina NPP

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
		Relevant emergency preparedness procedures have been updated by Ignalina NPP and approved by VATESI.			
9.	Natural hazards	<p>Measure: To assess the possibilities of the emergency removal and repair works by organization of emergency preparedness for beyond design-basis emergency scenarios related to the level of earthquake above maximal calculated earthquake and resulting in the cracks or collapse of the construction structures of the operating spent fuel interim storage facility and new spent fuel interim storage facility, including casks blockage by debris, as well as cracks or collapse of the construction structures of the “hot cell” of the new spent fuel interim storage facility during the works with spent nuclear fuel in the “hot cell”.</p> <p>Comments: Ignalina NPP has performed the assessment of the issues specified in this action and has prepared the report. In the light of this report's findings, relevant emergency preparedness procedures of Ignalina NPP have been updated and approved by VATESI.</p>	National final report on “stress tests”	Implemented/ 2013	Ignalina NPP
10.	Design issues	<p>Measure: To provide the power supply of water temperature and level instrumentation in the storage pools of both units from diesel generator No. 7 of unit 2 or from the mobile diesel generator connected to Unit 2.</p> <p>Comments: Ignalina NPP has implemented the modification of the emergency power supply system, including installation of special power sockets for mobile diesel generator in different places of Unit 2 building. The relevant operation documentation and emergency preparedness procedures of Ignalina NPP have been updated and approved by VATESI.</p>	National final report on “stress tests”	Implemented/ 2011	Ignalina NPP

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
11.	Design issues	<p>Measure: To provide the diesel fuel supply for assuring long-term operation of emergency diesel generators.</p> <p>Comments: Ignalina NPP has assessed the time of operation of the emergency diesel generators. According to the results of the assesment demand for extra fuel will occure after more than 5 days of nonstop emergency diesel generator operation. Ignalina NPP signed a contract with a fuel supply company for supply of additional fuel in January 2012.</p>	National final report on “stress tests”	Implemented/ 2012	Ignalina NPP
12.	Design issues	<p>Measure: To evaluate the capacity for work of water temperature and level instrumentation in the spent fuel storage pools as well as radiation detectors in the spent fuel storage pools halls of both units in conditions of beyond design-basis accident. If needed, to develop the appropriate improvement measures.</p> <p>Comments: Ignalina NPP has performed the evaluation of the equipment performance in conditions of beyond design-basis accident and prepared the corresponding report. Taking into account results of this evaluation, relevant severe accidents management guidelines of Ignalina NPP have been updated and approved by VATESI.</p>	National final report on “stress tests”	Implemented/ 2013	Ignalina NPP
13.	Design issues	<p>Measure: The special sub-module of the plant computer information system will be developed to provide information about the water temperature and level measurements in spent fuel storage pools as well as radiation level in the spent fuel storage pools halls from both units during and after beyond design-basis accident. The data of water temperature and level measurements in the spent fuel storage pools, radiation level measurements in the spent fuel storage pools halls</p>	National final report on “stress tests”	Implemented / 2015 (initial deadline 2013)	Ignalina NPP

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
		<p>will be transferred to the computer information system of organization of emergency preparedness, i.e. to the accident management centre and technical support organization. The data of water temperature and level measurements in the spent fuel storage pools will be transferred to the VATESI.</p> <p>Comments: Ignalina NPP has implemented the modification of the plant main computer information system and developed special algorithm, which is dedicated to display data of water temperature and level in the spent fuel storage pools measurements as well as radiation level measurements in the spent fuel storage pools halls in case of beyond design-basis accident. The necessary hardware options (for design basis accidents only) have been installed as well, which allows the transmission of the data of water temperature and level in the spent fuel storage pools measurements as well as radiation level measurements in the spent fuel storage pools halls to the computer information system of Ignalina NPP organization of emergency preparedness. The implemented modification includes the transmission of data of water temperature in the accident management centre of VATESI as well. Works related to installation of the new water level measuring equipment for beyond design-basis accident conditions were completed in end of 2015. VATESI carried out review and assessment of the documents submitted by Ignalina NPP relating to the implementation of the modification and approved them.</p>			

No.	Topic	Measure/Comments	Basis	Status/ Deadline	Responsibility
14.	General	<p>Measure: To examine existing documents concerning the spent fuel storage pools safety. To review management procedures and manuals of beyond design-basis accidents in the spent fuel storage pools. To evaluate planned and implemented modifications related with the spent fuel storage pools safety. To determine additional measures if needed.</p> <p>Comments: Ignalina NPP carried out the assessment of the existing documents, planned and implemented modifications, emergency preparedness exercises results and plans and other aspects related to the spent fuel storage pools safety. The results of performed assessment concluded that current and implemented technical and organizational measures of the Ignalina NPP ensure the high nuclear safety level of the spent fuel storage pools in stage of final shutdown of Ignalina NPP. VATESI carried out review and assessment of the documents submitted by Ignalina NPP relating to the implementation of the action and approved them.</p>	ENSREG Country Peer Review Report	Implemented/ 2013	Ignalina NPP

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