

Energy Sector of the Republic of Lithuania



Brussels, June 2013

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1. Introduction

Lithuania faces numerous challenges in the energy sector. After the shutdown of the Ignalina Nuclear Power Plant, the country's energy sector became greatly dependent on imports of electricity and fossil fuels. Isolation from EU energy systems further complicates the situation: the lack of electricity and gas interconnections with Continental Western Europe makes Lithuania dependent on a sole external energy supplier.

The government's strategic goal, as outlined in the National Energy Independence Strategy adopted in 2012, is for Lithuania to become an integral part of the EU energy systems. To this end, the key intermediate step is twofold: to ensure competitive markets in all domestic energy systems and to construct the necessary infrastructure. Implementation of strategic gas and electricity projects will, therefore, have to be accompanied with full implementation and enforcement of the rules of the EU's third energy package.

The EU's goal to create a single European energy market by the end of 2014, and to eliminate energy islands by the end of 2015, resonates with Lithuania's strategic objective of ensuring energy independence by 2020, through diversification of supply sources and routes. At present, Lithuania's energy dependence leads to a high level of political insecurity. Diversification of both domestic and external energy sources and routes will not only result in more consumer-friendly prices, but will also bring significant benefits to the entire Baltic region. The LitPol Link high voltage power transmission interconnection, the NordBalt power transmission cable between the Baltic region and Scandinavia, and the Lithuania-Poland gas pipeline, are all indispensable infrastructure projects designed to connect Lithuania, Latvia, and Estonia, with other EU countries.

Sustainable development of renewable energy sources is also one of the government's priorities which focuses on both local energy resources and biomass production. At present, the country relies on energy-generating raw materials imported from Russia, but is investing in renewable energy sources, from biomass to wind and geothermal, to regain energy independence. The strategy seeks to promote competitiveness and best prices in renewable energy production markets, in order to attract businesses to these areas.

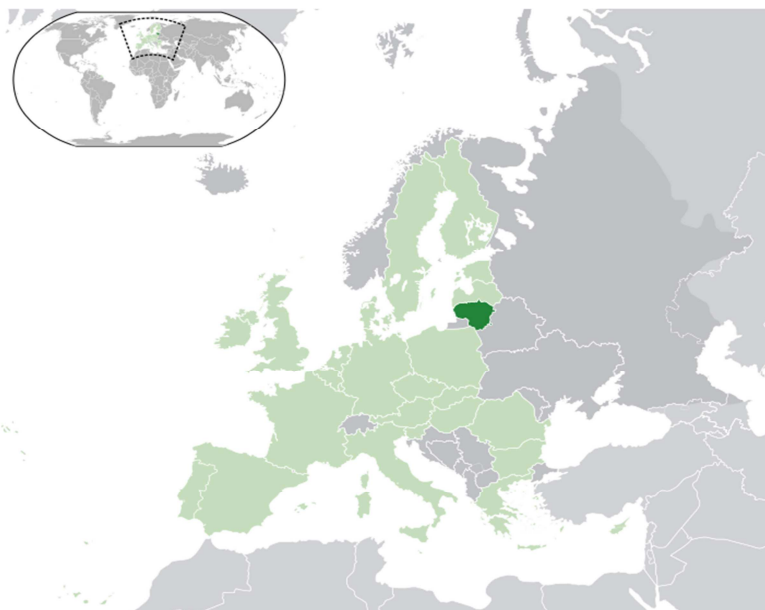
Another field in which foreign investment possibilities look promising, could be shale gas exploration and extraction. Shale gas resources are projected to contribute, from 20 to 40 years (according to different sources), in the country's future energy-mix. In line with the policy to reduce energy prices, the government has made a commitment to start exploration of shale gas, and possibly to make future decisions about its extraction.

In the vicinity of the now-defunct Ignalina NPP, Lithuania, together with Estonia and Latvia, is considering the construction of a new regional nuclear power plant, Visaginas NPP, which would operate in the joint Nordic/Baltic electricity market. In January 2013, a special Working Group was established by the Lithuanian Prime Minister, to prepare proposals regarding cost effective and consumer-friendly self-provision with electricity and other energy sources for elaboration of an update to the National Energy Independence Strategy. The Working Group was asked to evaluate two different scenarios of energy supply system improvement: the nuclear-free scenario and the scenario with the construction of the Visaginas NPP. The diversified self-sufficient energy supply scenario was identified as the most economical one, offering the lowest price to consumers. Safe nuclear energy development has been identified as a potentially integral part of the Lithuanian energy supply mix, enabling the Visaginas NPP project to be continued. At present, the economic prospects of the regional Visaginas NPP project are still being assessed.

Lithuania will hold the Presidency of the Council of the European Union from the 1st of July until the 31st December, 2013. Energy will be one of the key priorities during this period. The main goals of Lithuania, together with the other two 'Trio' countries, Ireland and Greece, is to work towards full completion of the internal energy market by 2014, and to ensure that no Member State remains isolated from the European electricity networks after 2015. The priorities are Security of Supply, along with Safety and Sustainability of energy production and use, whilst taking into account the EU's energy policy interrelationship with competitiveness, growth and employment, in line with the European Council conclusions of the 22nd May, 2013.

2. Politics, geography, and macroeconomic data

The Republic of Lithuania is a country in Northern Europe and the largest of the three Baltic States. Situated along the south-eastern shore of the Baltic Sea, it borders Latvia to the north, Belarus to the east and south, Poland to the south, and Kaliningrad Oblast (a Russian enclave) to the south-west.



Lithuania has an estimated population of 3 million¹, as of 2012, with its capital and largest city being Vilnius. On the 11th March, 1990, the year before the break-up of the former Soviet Union, Lithuania became the first Soviet republic to declare its independence.

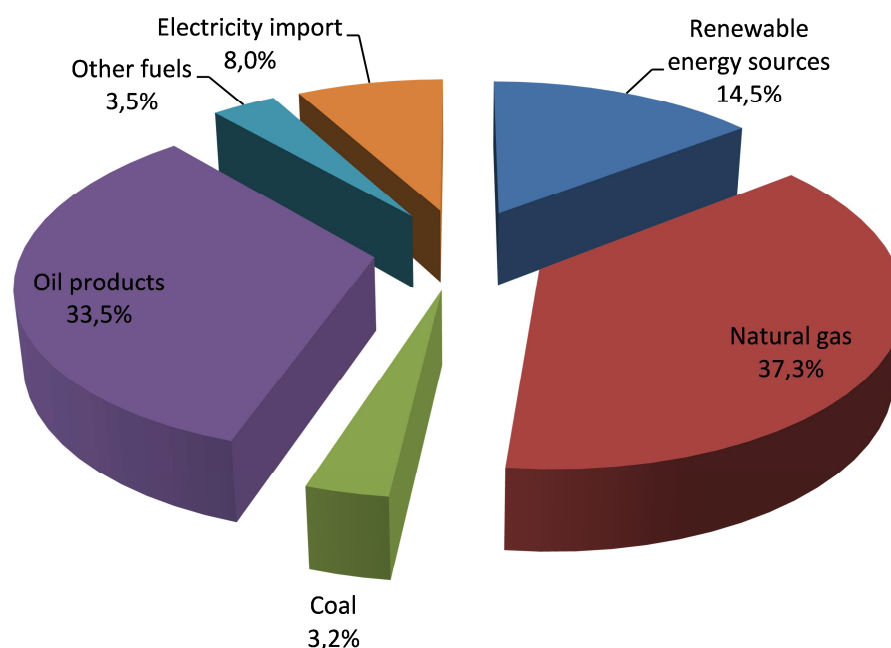
Prior to the global economic recession of 2008–2010, and now in its aftermath, Lithuania was one of the fastest growing economies in the European Union. Lithuania is a member of the European Union, NATO, the Council of Europe, and many other international organisations. Lithuania is also a full member of the Schengen Agreement. The United Nations Human Development Index lists Lithuania as a 'Very High Human Development' country.

¹ <http://db1.stat.gov.lt/statbank/>

The Republic of Lithuania is a parliamentary republic, with some attributes of a semi-presidential system. The Lithuanian Head of State is the President, elected directly for a five-year term, and serving a maximum of two consecutive terms. The main Presidential policy functions, include foreign affairs and national security. The President is also Commander-in-Chief of the military, whilst, with the approval of the parliamentary body, the Seimas, he/she also appoints the Prime Minister, and, on the latter's nomination, the rest of the cabinet, as well as a number of other top civil servants and judges for all courts.

3. Current energy overview

After the shutdown of the Ignalina Nuclear Power Plant (NPP), local electricity generation capacities are being developed and the electricity sector is being restructured in order to ensure competitive and continuous electricity supply. Before the closure of the Ignalina nuclear NPP, nuclear power was the leading source of primary energy for Lithuania, covering around 30% of consumption. Lithuania's total primary energy consumption in 2010, reveals that natural gas and oil had the highest share at 38% each, followed by biomass, hydropower, and coal (Graph no. 1).

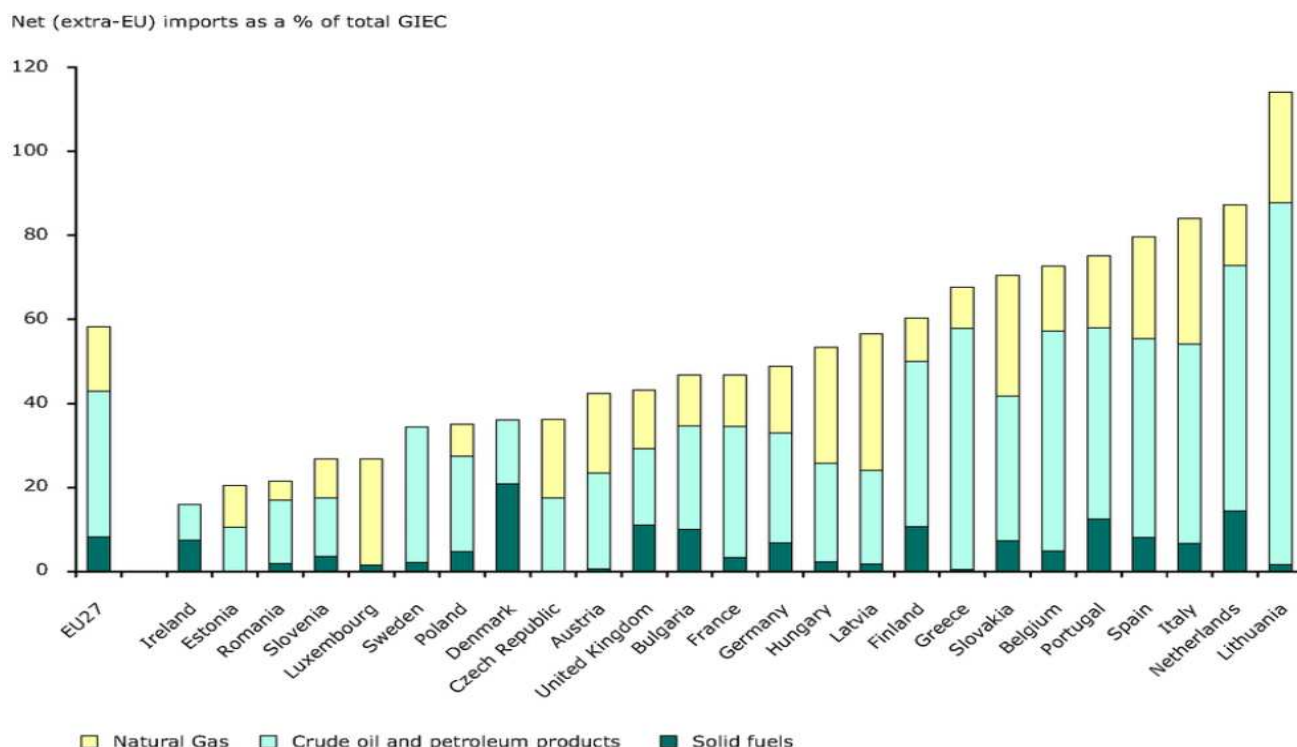


Graph no. 1 Structure of primary energy consumption in Lithuania in 2011
Source: Central and Eastern European Shale Gas Outlook 2012, KPMG

Currently, a new electricity generation capacity is operational in Elektrėnai; the internal electricity transmission and distribution network is being strengthened; construction of electricity links with Sweden and Poland, as well as implementation of the LNG terminal is in progress. The power

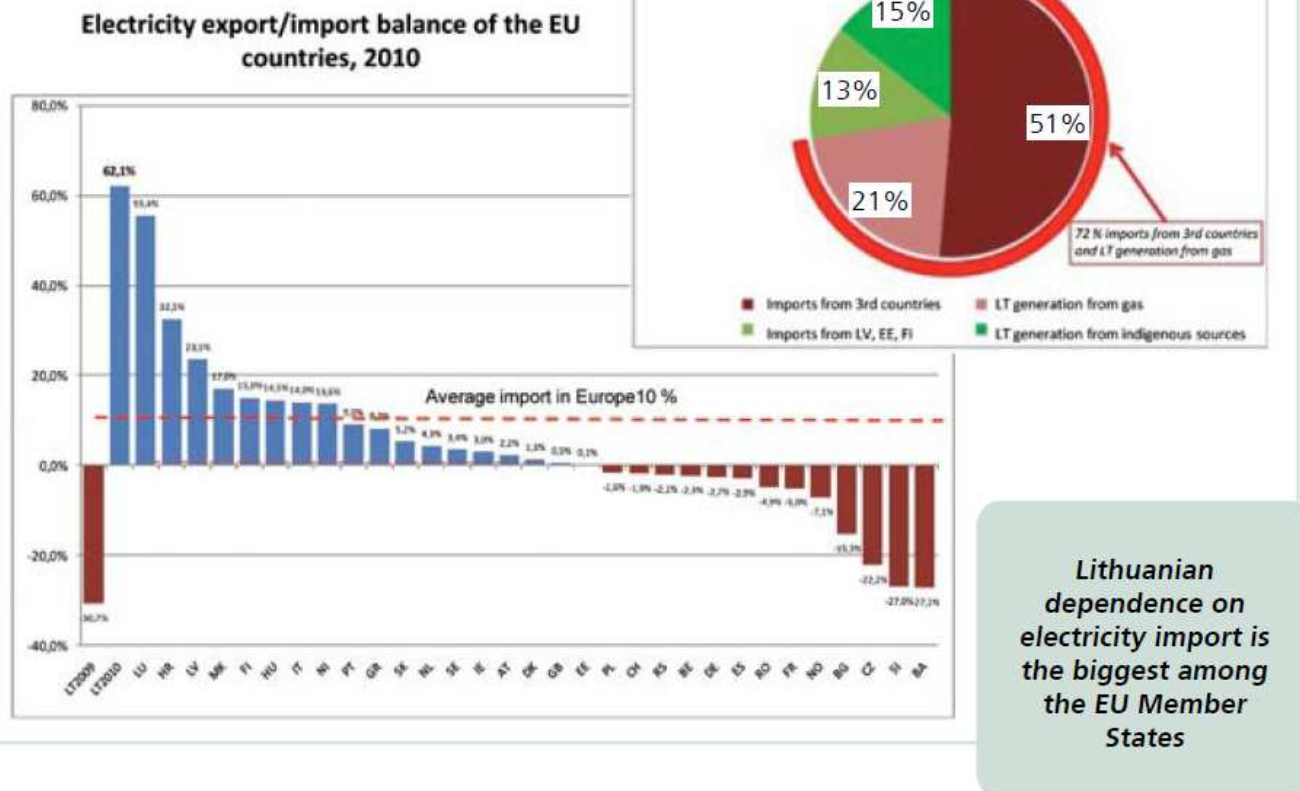
exchange has been established, and work on the creation of an energy sources exchange is also progressing. Despite the successful initiation of these projects and measures, consumers still cannot buy electricity at competitive prices, which are set according to market principles.

After the shutdown of the Ignalina NPP, Lithuania's energy sector became highly dependent on the import of electricity and fossil fuels, compared to other EU member States (see Graph no. 2).



Graph no. 2 EU27 Member State net (Extra-EU27) imports of natural gas, oil and solid fuels as a % of total Gross Inland Energy Consumption, 2009
Source: European Environmental Agency

The fact that Lithuania is isolated from EU energy systems complicates the situation: there are no electricity and gas interconnections with Continental Western Europe and, therefore, the country is dependent on a sole external energy supplier. Lithuanian dependence on electricity imports is the highest among EU Member States, with the country importing more than half of its consumed electricity from its neighbours, with most of the remainder of its electricity and heat being generated by using gas supplied by a single source (Graph no. 3). Lithuanian energy consumers are vulnerable to electricity or gas supply interruptions and large fluctuations of fossil fuel prices.

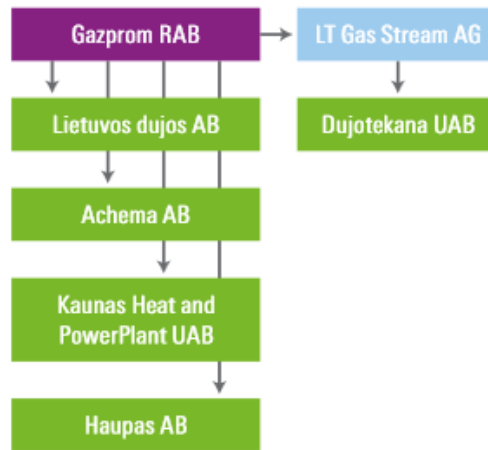


Graph no. 3 Lithuanian dependence on electricity imports.
Source: National Energy Independence Strategy.

Natural gas imports from Russia, via Belarus, cover 100% of domestic consumption (Graph no. 4). Gas supply is not diversified and an alternative emergency gas supply is not guaranteed, due to lack of access to foreign markets. The imports are subject to long-term agreements with the sole gas supplier, Gazprom, with only a part of the supply being delivered through a Lithuanian intermediary (Graph no. 5).

Category	Bcm
Production	0
Import	3.07
Apparent consumption	(3.07)
Import/consumption ratio	100%

Graph no. 4 Gas flows of Lithuania, 2010.
Source: U.S. Energy Information Administration, December 2011



Graph no. 5 Lithuanian natural gas imports by control structure (2011).

Source: Report of natural gas monitoring 2011, Q2, National Control Commission for Prices and Energy.

Gas imports reach the Lithuanian transmission system at one entry point at the Belarusian border. The emergency interconnection with Latvia could be used in the event of disruptions or a large increase in demand (Graph no. 6).

The Company's Natural Gas Transmission and Distribution System



Graph no. 6 Natural Gas Transmission and Distribution System in Lithuania.

Source: Lietuvos Dujos Natural Gas Transmission and Distribution System

Unconventional gas resources are under exploration and shale gas exploration is one of the strategic initiatives. The exact amount of Lithuanian shale gas resources is still to be ascertained. The US Energy Information Administration estimates from April 2011, point to around 120 Bcm of shale gas reserves in the south-western part of the country. According to the Lithuanian Geological Survey, domestic shale gas deposits are located at a depth of around 2,000 metres, which makes them relatively more easily accessible in comparison to Polish estimated reserves. In May 2013, Parliament passed the legislative amendments which establish a legislative framework for exploration and extraction of shale gas, thus, paving the way for the launch of exploration. Regulatory changes related to exploration and extraction activities are currently underway in several EU Member States (see Graph no. 7).



Graph no. 7 Regulatory changes related to exploration of shale gas in the EU.
 Source: IEA, KPMG, The Economist

Given Lithuania's current annual gas consumption of around 3.5 Bcm of gas, the perspective of extraction of 120 Bcm of unconventional gas, would be able to cover demand for up to 40 years. Natural gas consumption is expected to reach 4.71 Bcm by 2030. (see Graph no. 8).



Graph no. 8 Forecasted natural gas consumption in Lithuania.
Source: Datamonitor, 2010, Central and Eastern European Shale Gas Outlook, 2012

Competitiveness and sustainability:

The country's energy market, pursuant to the 3rd EU energy package, is moving towards a competitive system, through implementation of ownership unbundling in the electricity and gas sectors, to boost competition and bring about more transparency. A new electricity generation capacity is operational in Elektrėnai; the internal electricity transmission and distribution network is being strengthened; construction of electricity links with Sweden and Poland, as well as implementation of the LNG terminal is in progress. The power exchange has been established, and the work on creation of an energy sources exchange is also progressing. Despite the successful adoption of these projects and measures, consumers still cannot buy electricity at competitive prices, which are set according to market principles.

3.1 Energy production and strategic principles for the energy sector up to 2020

Until 2020, the country's highest priority is to move towards energy independence through diversification. It will offer an opportunity to freely choose the type of energy resources and the sources of their supply, including local production, so that they meet the State's energy security needs and the Lithuanian consumers' interests.

The structural changes in the energy-mix, through a gradual decrease of dependence on fossil fuels, and alternatives to a single external energy supplier, will establish the country's energy security and the sustainable development of the energy sector.

Energy independence could be achieved by:

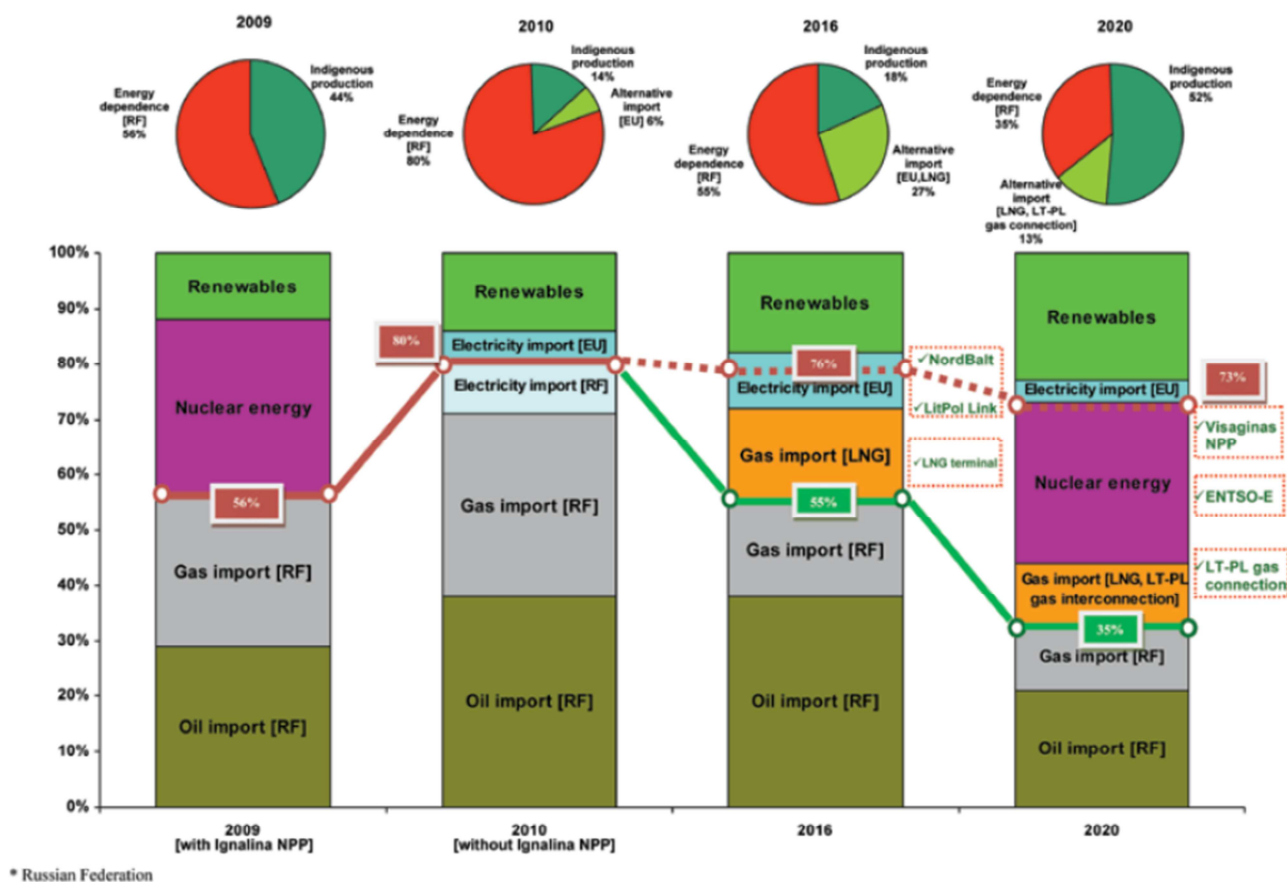
- enhancing competitive local energy generation, including potential implementation of the new regional nuclear power plant project;
- providing an alternative supply of energy sources;
- encouraging the development of renewable energy sources and enhancing energy efficiency.

The implementation of strategic projects required for the achievement of energy independence will guarantee that by 2020, more than 80% of the energy-mix, which is currently imported from a single supplier, will be replaced by a well-balanced structure of energy resources (see Graph no. 9). In 2020, at least half of the required energy is expected to be generated locally (with the focus on nuclear power and renewable energy sources), while the rest of the energy will be imported from different sources. New electricity generation capacities, as well as electricity and gas connections with EU networks, will ensure that internal energy demand is covered, and will allow Lithuania to benefit from participation in the joint EU energy market.

The country's transition to energy independence based on market conditions and competition is to be attained through the following main projects, as outlined in the National Energy Independence Strategy:

- 1) Natural gas sector - completion of the LNG terminal and expansion of the internal gas pipeline transmission network;
- 2) Electricity sector - potential construction of new regional electricity links to Sweden (NordBalt) and Poland (LitPol Link); implementation of a functional, regional electricity market; a synchronous interconnection with the European Continental Network of ENTSO-E; and an increase in generation from renewable energy sources. A decision about the construction of Visaginas NPP is expected to be confirmed, after additional consultations with regional partners and Hitachi.
- 3) Introducing market conditions in the energy sector – re-organisation of the energy sector, including electricity, natural gas and heat sectors, according to the provisions of the EU's third energy package².

² The 3rd EU energy package includes: Regulation (EC) No. 713/2009 of the European Parliament and of the Council of 13 July, 2009, establishing an Agency for the Co-operation of Energy Regulators; Regulation (EC) No. 714/2009 of the European Parliament and of the Council on conditions for access to the network for cross-border



Graph no. 9 Lithuanian Primary Energy-Mix: Reducing Energy Dependence on Single External Energy Supplier.
 Source: National Energy Independence Strategy.

3.2 Recent elaboration of the National Energy Independence Strategy

In October 2012, concurrent with the Parliamentary elections, an advisory non-binding referendum regarding the development of a new nuclear power plant project in Lithuania was held, with 63% of voters being negative about the Visaginas NPP project's prospects. As it was a consultative referendum, its results were not binding in Parliament. In this regard, the Parliament adopted a resolution, pursuant to which the Government formed a Special Working Group to review the National Energy Independence Strategy and perform a comprehensive analysis on the

exchanges in electricity and repealing Regulation (EC) No. 1228/2003; Regulation (EC) No. 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission 2009/73/EC of the European Parliament and of the Council concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

Visaginas NPP project, in order to prepare an economically optimal and favourable energy supply strategy for power consumers.

Based on recommendations from over 20 institutions, the Working Group set out to analyse the development of the Lithuanian energy system in the long-term perspective. Importantly, in order to evaluate the rationale of the construction of Visaginas NPP, the role of this nuclear power plant was assessed, taking into consideration existing and future interconnections with other Baltic States, Scandinavian countries, Poland, and the 3rd countries.

The Lithuanian Energy Institute (LEI), identified two key scenarios for the future energy system in Lithuania:

- 'flexible nuclear-free';
- 'Visaginas NPP construction'.

The LEI assessed that under favourable electricity import conditions (if the electricity price remains within conservatively forecasted limits and there is no significant increase of import prices caused by technical or geopolitical interruptions), the 'flexible nuclear-free' scenario would have more advantages.

However, whilst conducting its assessments, the Lithuanian Energy Strategy Working Group also took other vital qualitative and quantitative criteria into consideration (e.g. dependence on imported energy resources, and especially electricity imports (60-70%, while 2/3 were from one supplier), possibilities of RES development in Lithuania, and the adequacy of the Baltic States energy system).

Networks of the Working Group concluded that opting for a balanced and diversified energy self-provision scenario would be the most economically-grounded choice, as it would offer the lowest price to consumers. The scenario is based on development of renewable energy sources and combined heat and power energy, by using local energy resources for energy generation, electricity generation from diversified sources of gas supply, safe nuclear energy development, and diversified electricity imports.

Identifying nuclear energy development as potentially an integral part of the Lithuanian energy-mix, the Working Group also noted that the Visaginas NPP project could be continued, following these conditions:

- project implementation costs, responsibilities and risks should be legally shared among Regional Partners;
- maximum project financing at the lowest costs from international financial institutions and export credit agencies should be ensured, to secure the competitiveness of electricity generated by Visaginas NPP;
- public awareness of the project has to be ensured and only the most modern and practically-tested nuclear technologies used.

The Government of Lithuania approved these conclusions of the Working Group, and assigned it to frame an action plan for the implementation of the provided conditions regarding the Visaginas NPP, in order to be able to decide on further project development proposals up to the 1st of October, 2013.

Consequently, the Baltic Prime Ministers on the 30th May, 2013, agreed that, in order to take further decisions on the Visaginas NPP project, it was crucial, that all potential investors would jointly address the economic viability of the project. The fulfilment of these issues is currently being discussed among Regional Partners and a Strategic Investor – Hitachi.

4. Electricity

4.1 Unbundling

In January, 2012, the Lithuanian Parliament adopted a new version of the Law on Electricity which was drawn up to implement, *inter alia*, the EU Directive concerning common rules for the internal electricity market.

The Law provides for unbundling of the electricity transmission activity from electricity generation and supply activities. The Ownership Unbundling model, consisting of a full separation of transmission from generation and supply, and the elimination of common shareholders between generation/supply and transmission activities, was used for unbundling of the State-owned Transmission System Operator (Litgrid AB). There is one major DSO - AB LESTO - and five local

distribution systems. Both Litgrid AB and AB LESTO were given extra time to complete their unbundling: up to the 31st October, 2012, and the 30th June, 2012, respectively.

The National Control Commission for Prices and Energy (hereinafter referred to as the NCC) is responsible for controlling the unbundling activities. Once supplied with data on the progress on the implementation of Electricity Law, it notifies the European Commission, in line with the established requirements.

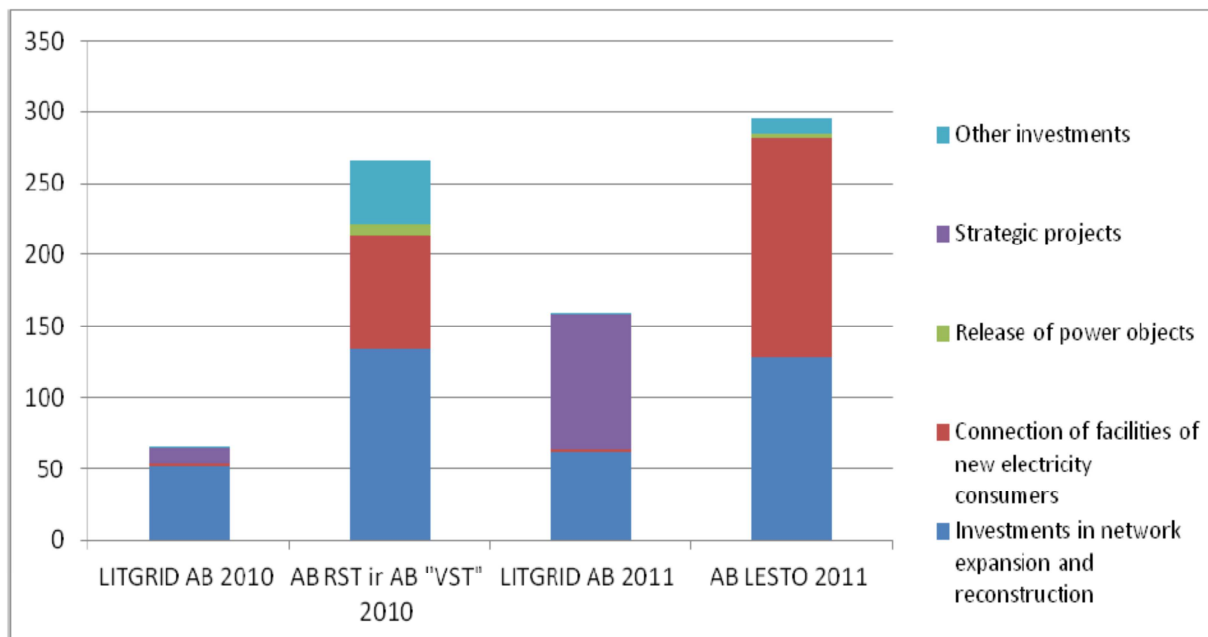
4.2 Security of Supply and strategic investment

Ensuring security of supply is a great challenge for the Lithuanian electricity sector. With decommissioning of Unit II of the Ignalina Nuclear Power Plant at the end of 2009, the country lost the generation capacity, which met approximately 80% of total electricity demand. Although most of the 2012 electricity imports came from Russia (63%), Lithuania also imports electricity from Estonia (about 26%), Latvia (7%), and Belarus (nearly 4%).

In light of this dependence, the country's plans to construct interconnections with Sweden and Poland, to build a new regional nuclear power plant, and create a common power electricity market of the Baltic States are the most urgent projects. A project of power interconnection with Poland (LitPol Link) was submitted to the European Commission for financing in July, 2012. Implementation of the above-mentioned projects would end the current isolation of the Lithuanian electricity power system.

Total domestic investment of Litgrid AB and the DSOs amounted to LTL 455 million [approx. EUR³ 131,8 million] in 2011, out of which LTL 94.1 million [approx. EUR 27,25 million] was invested into strategic projects. Total investment grew by 37%, compared to 2010, with the development and modernisation of networks and sub-stations, as well as connection of new users, being the priority areas. (Graph no. 10).

³ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL for 2011 = 3,4528

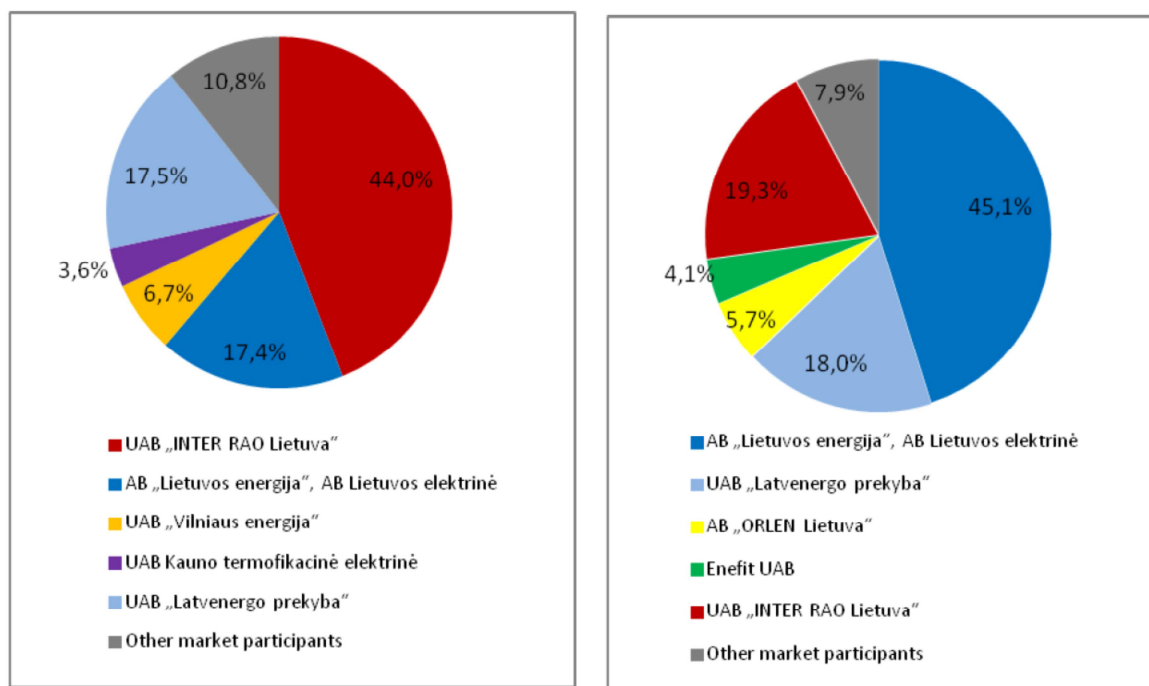


Graph no. 10 Investments of the Transmission System Operator and distribution grid operators in 2011, [million LTL].
Source: Annual Report on Electricity and Natural Gas Markets of the Republic of Lithuania to the European Commission, 2012

4.3 Competition and electricity market structure

In a report on the Lithuanian energy market in 2011, accompanying the Communication on the state of play of the internal energy market, the Commission points to a high concentration of the electricity market and very limited competition. The Law on Electricity stipulates that, from 2013, the agreements on electricity supply based on regulated public prices, apply only with household users, who had not selected an independent electricity supplier. All the commercial users, purchase electricity on the power market based on Nord Pool Spot Exchange prices, or bilaterally agreed contractual prices. Since Lithuania joined Nord Pool Spot in June, 2012, the electricity trading is based on the Nord Pool Spot model, taking place on the Lithuanian electricity market and through bilateral exchanges between producers, importers, and suppliers. This might enhance competition at the wholesale level: however, Lithuania should continue phasing out price regulation, and work in the BEMIP towards the creation of a Baltic regional electricity market, the Commission recommends.

Compared to the 2010 data, changes in the sales market were not substantial in 2011. With regards to the structure of buy-outs, Lietuvos Energija AB lost 37% of the market, whereas the share of Latvenergo Prekyba UAB grew by 13%, and that of INTER RAO Lietuva UAB increased by up to 19% (see Graph no. 11).



**Graph no. 11 Left panel - Structure of Exchange sales in 2011, [%]
and right panel - Structure of Exchange buys in 2011, [%].
Source: Annual Report on Electricity and Natural Gas Markets
of the Republic of Lithuania to the European Commission, 2012.**

In spite of increased competition in the wholesale electricity market, compared to 2010, one major player, covering almost 50% of the value, remained both in the sales and purchases structure: with further markets opening and consequent removal of public regulated prices, competition should increase in the future. However, alternative suppliers will not be available in the Baltic regional market, until the start of electricity trading with Nordic and the Western European countries.

In 2011, LESTO AB remained the main supplier in the retail electricity market; however, the overall concentration of the market decreased. The average electricity price sold to end users by independent suppliers grew by 12%, compared to 2010.

4.4 Synchronous operation with the European continental network

In line with the National Energy Independence Strategy, efforts are being pursued to connect the country's power system for the synchronous operation with the grids of the European continental network (ECN). The strategic projects of electricity links with Poland and Sweden, necessary for the integration of the power systems, are being carried out - in parallel with efforts to integrate the Lithuanian electricity market into the common Nordic market, - and subsequently, into a single European electricity market.

In February 2012, the European Commission was authorised to negotiate (on behalf of the Baltic States) with Russia and Belarus over the control of the Baltic energy systems, as well as their compatibility with the 3rd EU Energy Package. At the same time, this is an important step towards the interconnection of the Lithuanian Power System into the European Systems. The Feasibility Study, co-financed from the trans-European energy networks (TEN-E) funds, for projects of common interest, has been initiated to evaluate the interconnection options, which are scheduled to be presented at the end of 2013.

In the coming years, the BEMIP projects list will be complemented with the projects for synchronous interconnection to the ECN, and an agreement between the EU, Russia and Belarus concerning de-synchronisation of the Baltic States' power systems from the IPS/UPS, is expected to be concluded. Compliance with the technical and infrastructure ENTSO-E requirements is expected to be reached by 2018, after which the testing process of the isolated operation of power systems of the Baltic States is to be finalised by 2020.

4.5 Legislation implementing the Law on Electricity

The NCC has now expanded its functions and is responsible for developing legislation implementing the new Electricity law. In March 2012, the NCC approved the *Description of Terms and Procedure of Submission of Documents for Appointing the Transmission System Operator for the electricity system and information services*.

The NCC also develops the rules of unbundling the accounting of electricity undertakings, and in March 2012, it opened public consultations with the market players, concerning a future accounting model for the electricity sector. Since Nord Pool Spot started its operations in Lithuania in June 2012, the *Electricity Market Price Caps Setting Methodology* and the

Description of Supervision Procedure for Regulated Activities of Energy Undertakings documents were revised respectively.

Furthermore, the *Description of Principles for Setting State Regulated Prices in the Electricity Sector* was published for public consultation in June, 2012. During the same month, the NCC approved of the *Market Research Rules* serving as the basis for setting the price of services sold by key market players, and to recalibrate system services for 2013.

Once the European Commission adopts legislation implementing the Regulation on wholesale energy market integrity and transparency (REMIT), the NCC will approve the *Procedure of Market Participant Registration* and establish and administer the *National Register of Market Participants*.

When the Law on Renewable Energy Sources came into force in May 2011, the NCC revised several implementing acts such as *The Tariff Setting Methodology for Electricity Generated Using Renewable Energy Sources*, which provides for purchasing tariffs and maximum tariffs to be set in line with the principles of cost-effectiveness, technological upgrading and generating minimum financial burden for users. *Regulations of Auctions for Distributing Incentive Quotas*, the *Model Form of the Letter of Intent to Connect Electricity Generation Devices to the Distribution Grid*, the *Description of Requirements for the Procedure of Electricity Grid Use* and other legal acts will contribute to the transparent and competitive development of RES use.

4.6 Strategic projects in the electricity sector

Lithuania has a relatively old electricity grid with no interconnections with Continental Europe and Scandinavia. The interconnections are essential for Lithuania, in order to increase its energy independence, and to benefit from a single EU energy market. However, the new estimates of the special Working Group show that while nuclear energy development would give Lithuania greatest energy security, there would be no energy deficit in Lithuania in a nuclear-free scenario, either. This latter scenario would entail rapid RES development, whereby total power generated by wind and combined heat and power plants, would reach 1200 MW in 2025, supplemented by a launch of a new 450 MW capacity unit from 2025, after decommissioning old units of the Lithuanian Power Plant in 2018.

The major goal for Lithuania is connection to the European Continental Network (ECN) for synchronous operation. Lithuania will connect its power system to the ECN for synchronous operation, before the expected commissioning of the new nuclear power plant in Visaginas. The main task is to achieve political agreement on connection to the ECN, and to fulfil technical requirements, such as building necessary infrastructure and determining operational capability in fully isolated mode. At present, the Lithuanian electricity system is well connected with the grids of Latvia and Estonia, and there is no need to strengthen internal East-West connections. In order to strengthen the internal network, needed for a stable synchronous operation with the ECN, priority will be given to transmission lines going from the North to the South. Transmission lines: Klaipėda–Telšiai, and Kruonis–Alytus will be built, and a transformer station and other network re-construction projects will be undertaken. By the start-up of the new nuclear power plant, the Kruonis–Visaginas transmission line is expected to be built. Total price for the internal network strengthening is 300 to 700 million LTL (approx. 86,9 to 202,7 million EUR)⁴.

Lit-Pol Link (Lithuania-Poland interconnections): The cross-border power link between Lithuania and Poland is of primary importance to eliminate the isolation of the Lithuanian electricity sector, connect to the ECN, and integrate into the European energy market.

The LitPol Link company, established in May 2008, is the co-ordinator of the preparatory works for the construction of the interconnection. LitPol Link's shareholders, Litgrid AB and PSE Operator S.A., are the national transmission system operators, both with a 50% stake in the project. The aim of the LitPol Link is to design a technical project for the power interconnection between the two countries, set the route line, prepare the Environmental Impact Assessment (EIA), deal with land ownership issues, obtain required permits, and complete other preparatory works vital for the investment project.

The LitPol Link co-ordinates work projects related to the construction of the interconnection between Poland and Lithuania, consisting of a 400 kV overhead double-circuit transmission line, Alytus-Ełk, with the modern sub-station in Alytus. The interconnection will be built in 2 stages. In the first stage, by 2015, the link will have the capacity of 500 MW, and will later reach the capacity of 1,000 MW by 2020. Total cost of the line will be an estimated LTL 950 million (approx.

275,1 million EUR)⁴. It is also necessary to build other electricity links between Lithuania and Poland, to enable connection to the synchronous European continental network. When all conditions for connecting to the ECN are fulfilled, the converter station in Alytus will be transformed to operate asynchronously with the Russian IPS/UPS electricity system (using the Alytus-Hrodno line). The delays in plans for additional interconnections with Poland will most likely postpone the synchronous connection with the ECN beyond 2020.

In April 2013, Litgrid AB announced an international tender for the construction of the overhead line from Alytus to the Polish border. In May 2013, Litgrid and Pöyry, an international consulting and engineering company, signed a contract for provision of technical and consultancy services to support the project. The scope of the agreement includes technical consultations in terms of implementation of the contract for the design and construction of the first High-Voltage Direct Current (HVDC) back-to-back converter in Alytus, signed between Litgrid and ABB AB (Sweden), earlier in 2013.

Integration into the Nordic market (including the NordBalt construction): The NordBalt electricity line will be built by the end of 2015. It will allow for connection to the Scandinavian electricity network, in order to trade electricity with the Nordic countries, and to access cheaper balancing reserves. NordBalt will enable the technical integration of the Lithuanian power system into the common market of the Baltic Sea's regional States. Nord Pool Spot launched a bidding area in Lithuania in June 2012, and the bidding area in Latvia in June 2013. With these developments, the electricity surplus in one country will be able to help reduce electricity prices in other countries.

Total price of the project will be LTL 1.9 billion (approx. 0,55 billion EUR⁵). The line's approximate length is 450 km and the capacity – 700 MW. The interconnection would be composed of high voltage direct-current submarine and underground cables, as well as converter stations in Lithuania and Sweden.

⁴ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL for 2011 = 3,4528

⁵ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL for 2011 = 3,4528

The interconnection is expected to become operational in December, 2015. A feasibility study on developing the Lithuania-Sweden power link was developed between 2007 and 2008. In March 2013, the Lithuanian government permitted the construction of submarine power cables in the Lithuanian coastal areas and the special economic zone.

In May 2013, the 'green light' was given for the construction of NordBalt, as the Lithuanian authorities issued all necessary permits for building the power link. The extensive stage of the NordBalt project, which included spatial planning, the design of technical solutions and obtaining permits, has been duly finalised. The next phase will be the construction of the power link itself, which is scheduled to begin in the spring of 2014.

At present, the Klaipėda transformer sub-station is under re-construction to get prepared for the construction of a direct current converter – NordBalt's main component – at the beginning of 2014, which will be connected to a high voltage cable on the bottom of the Baltic Sea, going to Nybro in Sweden. The Klaipėda-Telšiai electricity line, also under construction at the moment, will be connected to the reconstructed Klaipėda transformer sub-station in the autumn of 2014. The line will be used for the transmission of Scandinavian electricity to Lithuania and Latvia, following the completion of NordBalt, scheduled for the end of 2015.

New nuclear power plant in Visaginas: Due to strong European Union reservations about the Chernobyl-type reactors, accession to the EU was conditional, upon a commitment by Lithuania to close down both units of the Ignalina Nuclear Power Plant. Ignalina NPP was operated by Ignalinos Atominė Elektrinė (IAE) and provided very low cost electricity to the national utility, Lietuvos Energija. Construction of the two 30-year design-life units started in 1978, with the first unit becoming operational at the end of 1983, and the second one in 1987. The two Russian reactors of the RBMK type were initially 1500 MWe units (1380 MWe net), and subsequently, downgraded to 1300 MWe (1185 MWe net). After the collapse of the Soviet Union in 1991, the units were State-owned.

The reactors were light-water, graphite-moderated types, and differ considerably from the RBMK-1,000 Chernobyl units. They were fitted with an accident localisation system to counteract the effects of rapid steam production in the event of a pipe break. Numerous safety upgrades were made to ensure that a runaway power excursion, which happened at Chernobyl, would have

been prevented at the Ignalina NPP site. Construction of the reactor was started in 1984, but it stopped in 1989.

In 1994, in line with the safety improvement programme, Lithuania accepted ECU 34.8 million (\$36.8 million) funding from the Nuclear Safety Account, disbursed by the EBRD. The EBRD's grant conditions included the closure of both units by the deadline for the replacement of the pressure tubes. Significant safety improvements were made in co-operation with Sweden and other countries.

The first unit was shut down in December 2004, and the second one in 2009, despite public disapproval, even with the EU covering the major part of decommissioning costs. The closure of the second unit resulted in a considerable increase of electricity prices, on average by 30% for individual customers.

In February 2008, Ministers of the Economy agreed to further co-operate in the process of the preparation and development of the power plant in Lithuania. The Visaginas NPP project had been developed by the Lithuanian energy holding company. In 2006, a Communiqué was signed by the Prime Ministers of the three Baltic States with the intention of co-ordinating the actions of Lithuania, Latvia and Estonia, and to start preparation of the background for construction of the new regional nuclear power plant. In October 2006, the Steering Committee consisting of representatives from the three Baltic energy companies – AB Lietuvos Energija, AS Latvenargo, and Eesti energia AS – based on the results of the feasibility study, concluded that construction of the new nuclear power plant in Lithuania was feasible. In February 2009, the IAEA special mission confirmed that the Environment Impact Assessment Report complied with common international practice and procedures.

The investor would get a majority stake in the project, along with Lithuania's Lietuvos Energija, Latvia's "atomine elektrine" JSC, together with other major national Baltic energy companies - Latvenargo, Eesti Energia and PGE Capital Group - as regional partners and prospective investors.

Additionally, Lithuania had been seeking to attract to the project, an experienced investor with strong credentials in the development and operation of new generation nuclear power plants. Consequently, in December 2009, Lithuania launched an international public tender (in effect, an invitation to invest).

In May 2011, competitive proposals were received from the potential strategic investors Hitachi, Ltd., together with Hitachi-GE Nuclear Energy Limited ("Hitachi") and Westinghouse Electric Company. In July 2011, Hitachi was selected to serve in the role of strategic investor and GE Hitachi obtained the EPC (engineering, procurement, and construction) contract. Investors from Estonia, Latvia, and Poland, took part in the assessment of bids, alongside the Lithuanian government and Hitachi, but in December 2011, the Polish energy company, PGE, withdrew from the Visaginas NPP project.

A single Hitachi-GE 1,350 MWe Advanced Boiling Water Reactor is expected to operate by 2022. Several reactors of this type are already operational, or under construction, in Japan and Taiwan. Following the selection of Hitachi as a strategic investor, the agreed technical pre-concession activities were performed and finalised in December 2011. In line with the scope of the project's development activities, Exelon Nuclear Partners, LLC, a division of one of the largest American electric utility companies, was selected as the owner's engineer for the project.

Other significant development and pre-development works were completed, including an Environmental Impact Assessment (approved in early 2009 for a nuclear power plant of total capacity up to 3,400 MW) and a full-scale site evaluation (IAEA mission on review of the process and results of the evaluation of the sites, in terms of IAEA safety requirements, was completed in November 2010).

In October 2011, the European Commission received a formal notification of construction plans, and in June 2012, issued a positive opinion on the Visaginas NPP project in Lithuania. After assessment, the Commission found that the Visaginas NPP project fulfils the objectives set by the EURATOM Treaty. The Visaginas NPP would contribute to a sustainable energy-mix on a national, as well as a regional level, and enhance the security of energy supply in the Baltic region. It would also play an important role in the full integration of the Baltic States into the internal European energy market, and contribute to achieving EU climate goals.

In March 2012, a concession agreement providing the contractual framework for the design, construction, and operation of the Visaginas NPP, was initialled by the Ministry of Energy and Hitachi. In June 2012, Parliament passed a package of laws approving the concession to be

granted to the Visaginas NPP project development company, which was foreseen as being established by the regional partners, national Baltic countries' energy companies, and the strategic investor, Hitachi. It was envisaged that Lithuania would have 38%, Estonia 22%, Latvia 20% and Strategic investor, Hitachi, a 20% share in the Visaginas NPP project. Estimated costs of the Visaginas NPP project are approx. €5 billion.

In June 2012, the European Commission stated that “the Visaginas NPP contributes to the security of energy supply in the Baltic region and to the full integration of the Baltic States into the internal European energy market”.

In the absence of new nuclear power capacity, Lithuania, Latvia, and Estonia will still rely, to a great extent, on Russian electricity exports, which will enhance the economic prospects of the Baltic Nuclear Power Plant (BNPP). Lithuania is objecting to the construction of the Baltic plant, since its environmental impact assessment does not fulfil the requirements of the Espoo Convention.⁶ Lithuania also has not received concrete answers from the Russian Federation on the site's selection criteria, and in particular, nuclear safety related issues. In June 2013, the nuclear corporation, ‘Rosatom’, confirmed the mothballing of the Baltic NPP. Due to the absence of infrastructure required for the export of electricity to foreign countries, the possibility of building small- and medium-capacity reactors at the site of this plant is under consideration. Lithuania is also opposed, on the same grounds as Russian plans, to building a new nuclear power plant in Ostrovetsk in Belarus, which is located only 50 km from the Lithuanian capital, Vilnius.

The Lithuanian Power Plant (The LPP): The Lithuanian Power Plant (LPP) located 2 km north-east of the town of Elektrenai, is owned by Lietuvos energija, AB, - Lithuania's largest electricity generation company. The LPP was built in the 1960s and 1970s, and at present, is the largest electricity generating plant in Lithuania, with a capacity of 1,800 MW. In the past, before commissioning of the Ignalina NPP, the LPP used to meet total national electricity demand by producing up to 9 billion kWh of electricity at full capacity.

⁶ The Espoo Convention was adopted in 1991, and entered into force on the 10th September, 1997. It sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant, adverse, environmental impact across boundaries.

In the 1990s, after the Ignalina Nuclear Power Plant became the key electricity supplier, the LPP was supposed to serve as a standby unit in the event of a sudden stoppage at the NPP, and to cover the demand during blackouts. Due to changes in the economic situation and increases in oil prices, heavy fuel oil and natural gas combustions were supplemented temporarily with the use of a synthetic oil emulsion. The distribution station was refurbished in 1997, and further upgrades of burners and smoke filters were carried out to improve the plant's environmental safety.

Combined Cycle Gas Turbine unit Investment

In order for the LPP to remain the major electricity generating source, while at the same time fulfilling efficiency demands, the construction of a new 455 MW Combined Cycle Gas Turbine (CCGT) was contracted to Iberdrola Ingenieria y Construccion, S.A.U in 2009. The unit, which can cover up to 25% of domestic electricity demand, was commissioned in October 2012. Its overall efficiency exceeds 58%, with the use of natural gas reduced by one third compared with existing old units.

The project, whose costs amounted to LTL 1.3 billion (approx. 0,38 billion EUR⁷), was financed from the Ignalina International Decommissioning Support Fund, in addition to funds from the generation company itself, the European Bank for Reconstruction and Development, and private banks.

The CCGT unit in Elektrėnai is the second project in the Baltic region, along with Riga's Power Station, to use a leading-edge General Electric air-cooled gas turbine, which allows for a considerable reduction of electricity generation net costs.

Kruonis Pumped-Storage Hydroelectric Plant: Operated by Lietuvos Energija, AB, the Kruonis Pumped Storage Hydroelectric Plant (KPSHP) is the sole power plant of its type in the Baltic region. In the case of an emergency, the KPSHP would be able to guarantee close to 94% of the total required national energy reserve.

⁷ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL = 3,4528

The decision to build a pumped storage plant to be used for regulation of the power system's operation was made in the 1960s, in light of construction of the Elektrėnai power plant and prospects of nuclear power plant construction. A pumped storage plant to balance the load and compensate the electricity supply, in case of a nuclear accident, was seen as indispensable to ensuring the continuity of supply. In 1967, the Kruonis site was selected as the best location for the prospective hydro plant with 1,600 MW generation potential, due to its access to the 63.5-km² Kaunas Reservoir. The technical project was finished in 1978, the last one of four units became operational in 1998, and the upper reservoir, located 100 m above the level of the Kaunas Reservoir's waters, was finalised two years later.

The plant, which operates in pump mode during low demand periods, raises water to the upper reservoir, whereas during peak periods, it operates as a conventional hydroelectric plant. The units can be started automatically to provide rapid reserve capacity. In addition, the plant serves to level the load balance, to adjust voltage and frequency, and to start the system in the event of a blackout.

Recently, in order to promote usage of renewable sources, KPSHP started operating a system for solar energy generation. It is expected that the water heated by a battery of solar collectors will cover the plant's hot water demand.

5 Gas

The goal for the gas sector is to decrease consumption in the long-term, whilst ensuring diversification of gas supply in the medium-term. Currently, the supply of gas is not diversified, emergency supply is not covered fully, - with limited natural gas reserves accumulated in an underground storage facility in Latvia, - and the country has no access to EU gas spot markets. As opposed to the electricity sector, transmission, and distribution are concentrated in one company. Gas supply is provided by three companies, whilst two more large consumers purchased gas for their own consumption, but do not participate in the gas supply market. However, important decisions are expected to stimulate competition in the gas sector. According to the 3rd EU Energy Package, the activities of gas transmission and supply will be separated by ownership unbundling. The plans include construction of a new liquefied natural gas (LNG) terminal in 2014, and expansion of the gas transmission network.

In order to cover emergency gas demand from alternative sources, a reliable annual supply of 0.9–1.5 Bcm of gas should be provided (the demand for gas in 2020 is predicted to range from 1.6 to 3.7 Bcm per year). To achieve this, several alternatives could be implemented, whilst construction of the LNG terminal in Klaipėda is the only viable fast track alternative by 2014, to ensure security of energy supply, diversification of energy sources and decrease dependence from a sole external natural gas supplier, thus ensuring affordable and competitive gas prices for customers.

The gas transmission network will need to be expanded for the LNG terminal to be able to function at a larger capacity. To this end, the strategic project of Jurbarkas-Klaipėda Gas Transmission Pipeline construction started in 2011, while the Gas Interconnection Poland – Lithuania project will further ensure diversification of gas supply and help the integration of the Baltic States into the EU's gas market.

According to the 3rd EU Energy Package, and in order to produce a better level of services for consumers of gas, the activities of gas transmission and supply will be effectively separated according to the 3rd EU energy package. This will ensure fairer prices to gas consumers, more investment into the development of gas infrastructure, and allow an easier supply of gas from different suppliers to the same customer.

5.1 Unbundling of vertically-integrated gas companies

The new Law on Natural Gas, which came into effect in August 2011, has been introduced by transposition of the *EU Directive concerning common rules for the internal market in natural gas* and the *Regulation concerning measures to safeguard security of gas supply*. The law provides for separation of the transmission activities from the activities of extraction and supply. This is done by unbundling of the ownership of the transmission system and its operator from the extraction and supply companies.

At present, only one natural gas company, Lietuvos Dujos AB, does not meet the requirements of the *Law on Natural Gas* – since it is involved in the activities of the natural gas transmission, distribution, and supply. The company is obliged by law to meet the deadline of the 31st October 2014, for completion of its restructuring.

5.2 Security of supply

The *EU Regulation concerning measures to safeguard security of gas supply* stipulates that Member States are required to assure the technical capacity of the natural gas facilities, which would cover the total natural gas demand of the given State, in the event of disruption of the single largest gas infrastructure, during a day of exceptionally high gas demand. As the main goal was diversification of supply, the *Law on the Liquefied Natural Gas Terminal* was adopted, laying down the requirements for construction of the liquefied natural gas terminal in the stated territory. The law stipulates that the terminal has to be operational by December 2014, at the latest.

The LNG terminal provides the fastest solution to the problem of dependence on gas imports. In order to connect the terminal with the Lithuanian gas transmission grid, and to efficiently use the terminal's capacity, the gas pipelines from the terminal to the Klaipėda gas distribution station, and from Klaipėda to Jurbarkas, will be built to create a circular natural gas transmission system.

5.3 Competition in the natural gas supply market

The new Law on Natural Gas does not regulate the natural gas supply activities; therefore, since August, 2011, the activity of supply has been functioning, according to the principles of the competitive market.

Despite only one source of gas supply to Lithuania; trading is made possible, as more than one natural gas supplier is already operating in the country. The supply could become regulated again, if the NCC establishes that, due to insufficient competition, an operator is introducing at too high a level – his/her prices, or is using his/her prices to put pressure on other market participants.

In November 2011, the NCC provided the natural gas market operator's license to BALTPPOOL UAB, whose primary function is to organise trade in natural gas at the Natural Gas Exchange, at which all natural gas consumers, who have concluded yearly agreements with suppliers or gas importers (Lietuvos Dujos AB, Dujotekana UAB, Haupas UAB), sell and buy their yearly surplus/deficit quantities of natural gas to balance their natural gas flows. In February 2012, the NCC revised and approved the *Regulations of Trading at the Natural Gas Exchange*, which had been drawn up by BALTPPOOL UAB.

In order to implement the requirements of the Regulation on wholesale energy market integrity and transparency, the NCC approved, in March 2012, the *Rules for Supervising Trade in Natural Gas*. In May 2012, the *Law on Energy Resources Market* was adopted, containing a legal framework for organisation, administration, regulation, supervision and control of the energy resources market.

In theory, these legal acts open the way for initiating competition in the natural gas market, however, volumes of trading in natural gas at the Exchange were not significant. In a 2011 Report on the Electricity and Gas Market, the NCC gives an account of only one concluded transaction. Furthermore, in 2011, the participants of the natural gas import market did not change when compared to 2010, and included Lietuvos Dujos AB, Dujotekana UAB, Achema AB, Kaunas Combined Heat and Power Plant (Kaunas CHP), and Haupas UAB. Gas imports were monopolised by a single external gas supplier - Gazprom - in accordance with the quotas set for each individual importer, with the exception of Dujotekana UAB purchasing the imported gas through Gazprom's intermediary – LT Gas Stream.

Similarly, in the retail gas supply market, there were the same two dominating suppliers – Lietuvos Dujos AB and Dujotekana UAB, who held almost the total volume of the retail gas supply market, with all other gas companies sharing a mere 1.2 % of the market.

Lietuvos Dujos AB is the only operating gas company in the transmission market. In 2011, the transported volumes increased by 21.3% compared to 2010.

Six market participants were operating in distribution activities, with the biggest market share held by Lietuvos Dujos AB – 97.6%.

In 2011, investments in the infrastructure of the natural gas sector decreased by almost half compared to 2010, and amounted to LTL 65.49 million (approx. 18,97 million EUR⁸) (in transmission activities – LTL 33.11 million (approx. 9,59 million EUR), in distribution activities – LTL 32.37 million (approx. 9,38 million EUR).

⁸ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL for 2011 = 3,4528

5.4 Strategic projects in the gas sector

Jurbarkas - Klaipėda Gas Transmission Pipeline: In December 2011, the Ministry of the Economy, the Lithuanian Business Support Agency, and AB Lietuvos Dujos, concluded a trilateral financing and administration agreement concerning the project 'Construction of the Jurbarkas-Klaipėda Gas Transmission Pipeline'. The project is being implemented by Lietuvos Dujos AB, and its main goals are to secure the reliability of supplies through the looping of the existing gas transmission pipeline system; to enhance the system capacity in the western region of Lithuania; and to enable transportation of gas from the LNG terminal in Klaipėda.

Total project investment amounts to LTL 168,524 million (approx. 48,808 million EUR⁹), of which over 45% consists of EU financial assistance from structural funds, the rest being covered by Lietuvos Dujos AB.

The route of the Gas Transmission Pipeline is from the town of Jurbarkas to the city of Klaipėda. (Graph no. 12).



Graph no. 12 Jurbarkas - Klaipėda Gas Transmission Pipeline.
Source: Ministry of Energy, Strategic Projects, Gas

⁹ Source: Eurostat, <http://appsso.eurostat.ec.europa.eu/> - Yearly Average Rates EUR/LTL for 2011 = 3,4528

From 2013, the Project's Detailed Design is being prepared, materials required for the Project's implementation are being procured, and the gas transmission pipeline construction works are being carried out.

Gas Interconnection Poland-Lithuania: The goal of the project is to integrate the isolated gas markets of the Baltic countries, via integration into the European gas system. The project will be conducted by AB Lietuvos Dujos and the Polish Gas Transmission System Operator GAZ-SYSTEM S.A.

The recommended pipeline route is from Rembelszczyna gas compressor station near Warsaw to Jauniunai gas compressor station near Vilnius (Graph no. 13). The project stages involve construction of the pipeline; construction or enhancement of compressor stations, the metering station and pressure reduction point.



Graph no. 13 Gas Interconnection Poland-Lithuania.
 Source: Ministry of Energy, Strategic Projects, Gas

In 2010, the two gas companies signed a document specifying the principles of co-operation in conducting analytical works of the project, and the European Commission adopted the final decision on the financing of the BCA and feasibility study of the project from the European Commission's Trans-European Energy Networks (TEN-E) Programme.

The project will greatly enhance the security of gas supply in the region, with its planned annual capacity of (in stage 1) 2.4 Bcm. In stage 2 of the project, and in the event of additional demand, the annual capacity could be further increased by up to 4.1 Bcm.

Efforts are being made for the project to be registered as a 'Project of Common Interest' in the 8th priority gas corridor 'BEMIP Gas' in the Proposal for a Regulation of the European Parliament and of the Council on guidelines for the trans-European energy infrastructure. This would confirm that the construction of the pipeline would be granted EU financial assistance, under the new guidelines for financing trans-European energy networks.

Liquefied natural gas terminal (Klaipėda): In July 2010, the government by its resolution 'On development of the natural gas terminal' decided that AB Klaipėdos Nafta should launch the preparations of the project for a liquefied natural gas terminal. The *EU Regulation concerning measures to safeguard security of gas supply* stipulates that Member States are required to assure the technical capacity of the natural gas facilities, which would cover the total natural gas demand of the given State, in the event of disruption of the single largest gas infrastructure, during a day of exceptionally high gas demand. In line with this provision in June 2012, the law on the Liquefied Natural Gas Terminal was adopted, laying down the requirements for construction of the liquefied natural gas terminal in the country's territory. The law stipulates that the terminal has to be operational by December 2014, at the latest.

The aim of the project is threefold: to create conditions to cover emergency gas demand; to enable the formation of national and regional gas markets, with the prospect of supplying natural gas to neighbouring countries in the future; and to create the possibility for the country to access gas spot markets.

The technology used for the LNG terminal is the Floating Storage and Regasification Unit (FSRU), selected due to its rapid construction time, 50% lower costs compared to an onshore

terminal, and the possibility to expand its capacity in the future. In 2011, the FSRU's purchase requirements package and procurement tender were announced. The same year, the marine terms and parameter studies were finalised, and preparatory territory planning works and analysis were also conducted. According to the project's implementation plan, the construction both of the FSU berth, and of the terminal connection to the natural gas transportation pipeline, is expected to be finalised in 2013.

The terminal is expected to become operational by the end of 2014, with up to 1 Bcm of gas to be dispensed through the facility in the first year. Its planned yearly capacity ranges between 2 and 3 Bcm.

In May 2013, with regard to the obligation of gas purchase from the terminal, the government proposed changing the 'so-called 25%', under which, large gas consumers would be obliged to purchase 25% of their gas supplies from the Klaipeda terminal. Changes to this rule, announced in November 2012, made the Lithuanian Gas Association submit a complaint to the European Commission re: a violation of the EU's State aid rules on distorting competition.

The new plan concerns only regulated heat and electricity producers, and not all consumers, who will remain free to select their gas source. Regulated electricity and heat producers will be obliged to purchase gas through a new market operator – a supplier, in which the state would control at least two thirds of the votes. The supplier will purchase a minimum of 540 million m³ of gas per year from the Klaipeda terminal, but it will offer to buyers, the gas sourced from both the LNG terminal and pipelines. Currently, the government is consulting the Commission on the modalities of the new scheme, which made the EU's executive recently cancel a preliminary investigation which had been launched in 2012.

6. Heating

The major problem in the heating system is inefficiency at the point of consumption – in 2011, the average annual heat consumption of Lithuanian buildings in the household sector was 133 kWh/m² (in buildings connected to district heating systems 154 kWh/m²), which is higher than the average of Nordic countries (128 kWh/m²). Reducing this inefficiency can bring substantial savings in heating costs, and would lower emissions of greenhouse gases.

In addition, the centrally-supplied heat is produced mainly from fossil fuels - approximately 70% is produced from gas, - which is imported from a single source. Increasing energy production from renewable energy can diversify energy sources for heat production and reduce the negative impact of the district heating sector on the environment.

There is the possibility of decreasing annual heat consumption of households and public buildings by 1 – 1.5 TWh by 2020. These savings would amount to 15 - 25% of final heat consumption, which may bring about energy independence, and a positive impact on the local economy for the State, with reduced heating bills – for energy consumers; and reduced pollutants and greenhouse gas emissions – for the environment.

The State will also encourage economically-viable investment into heat production from biomass, with the priority on CHP plants (yearly additional production of 1.4 TWh). Another 1.1 TWh of heat will be produced in biomass boilers. Investment into this form of production assumes there will not be an increase in heat prices.

7. Oil

Oil for the Mažeikiai oil refinery is supplied via the Būtingė oil terminal. Oil and oil products can be transported by rail and sea through the port of Klaipėda. The strategic company AB 'Klaipėdos nafta' provides an alternative supply of oil and oil products. An oil products reserve of no less than 90 days is maintained.

The most substantial shortcoming of the oil sector is that there is not enough competition in the oil product market and, therefore, consumer interests might be violated. Also, despite having a refinery in the country, prices for oil products are, on average, higher than in neighbouring EU countries.

Oil product demand in Lithuania, has remained constant in recent years, with consumption amounting to 2.5 - 2.7 million tons annually. 82% of oil products, refined by Orlen Lietuva, which owns and operates the Mažeikiai refinery, are exported. It is predicted that consumption of oil products will change slightly. Crude oil for refinement will be imported from diverse sources, and infrastructure will be made suitable for the country's demands. Therefore, investments will be largely directed towards maintenance of the already existing infrastructure.

8. Renewable energy sources and investment opportunities in renewables

With a view to reaching the goals set in the National Energy Strategy on Promotion of Renewable Energy Sources, the envisioned plan is to increase the share of renewable energy sources in the final energy consumption to 23% by 2020, in order to substantially strengthen Lithuania's energy independence and to reduce greenhouse gas emissions.

The major portion of Lithuania's RES is covered by **biomass**, which will continue to play a leading role in energy production from renewable energy sources. Given Lithuania's natural conditions, the potential of wind and hydro energy have not been fully exploited yet.

Type	%
Biomass	86,5
Biofuels	4,4
Hydroelectricity	3,9
Wind Power	3,9
Biogas	1,0
Geothermal energy	0,3

Graph no. 14 Renewable energy sources in Lithuania [%].

The Lithuanian Biomass Energy Association (LITBIOMA) notes that there are about 2.4 million tons of straw available each year. However, only a minor portion is used for energy production. Only about a half million tons of straw can be economically harvested and converted into energy. Potentially, energy production would be around 1,500 GWh.

There are no extraordinary **hydro-resources**, but the existing rivers are used as renewable energy sources. The two largest rivers, Nemunas and Neris, and numerous smaller rivers can be used for energy production. For environmental reasons, regulations now prohibit construction of large hydro-power plants, therefore, only small plants can be built in Lithuania. By 2020, the capacity and electricity generation in small hydro-electric plants is estimated to double. The Kaunas hydro-power plant is the largest in Lithuania, and has been constructed on the Nemunas

River. The plant has the capacity of 100.8 MW (4 units of 25.2 MW each). The other hydro-power plants are less than 10 MW.

Additionally, Kruonis Pumped Storage Plant has 900 MW installed capacity as of 2013.

In recent years, there has been a significant increase in the number of small hydro-power plants; in 2001, there were only 35, but by 2009, there were 85. Similarly, the capacity doubled between 2001 and 2009, from 13 MW to 26 MW and amounted to 27 MW as of 2013, according to Litgrid's data. In 2010, total gross consumption of hydro-energy was 540 GWh. Production of hydro-energy constituted **3,9 percent** of the total production of primary energy in Lithuania. After biomass, hydro-energy is the second largest source of renewable energy.

In Lithuania, production of **energy from wind** started in 2002, when the first wind turbine was installed. Lithuania's biggest wind power plant 'Vėjo Spektras Park' with a capacity of 9.13 MW was installed in 2006. According to Litgrid's data on renewable energy generation capacity, Lithuania has 274 MW of wind energy installed capacity as of January 2013.

Insufficient wind energy development in recent years (only 16 MW of wind power was installed in Lithuania in 2011) has been influenced by unfavourable wind energy support schemes in the EU, as well as unfair tariff-setting methods. Despite that, it is predicted that by 2020, wind turbines could generate 10 percent of gross electricity production.

Year	1998-2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Installed power per year (MW)	0	6	0	42	3	3	37	72	16	46
Accumulated capacity (MW)	0	6	6	48	51	54	91	163	179	225

Graph no. 15 Installed wind energy in Lithuania.
Source: Lithuanian Wind Power Association

Lithuania also has a **geothermal energy potential**. However, only aquifers with significant thickness can be used for this type of energy production. The thickness of the sedimentary pile is 200 metres in South-East Lithuania and 2,300 metres in West Lithuania. The aquifer in West Lithuania has the largest potential for heat energy. It is estimated that its capacity is in the range of 2-10 MW. The aquifer in South-East Lithuania has lower potential, with a capacity of 1.5-3.5

MW. In 2000, the Klaipeda Geothermal Demonstration Plant was built, with a capacity of 35 MW, out of which 13.6 MW is produced from geothermal sources. The total capacity is estimated at above 30 MW. Significant growth was observed between 2004 and 2009, in the number of geothermal small-scale heat pump systems installed.

Solar energy is not a considerable source of renewable energy as Lithuania receives 1,000 kWh per square metre per year, with about 80 percent of it being received during the April - September period. Due to Lithuania's geographical location and meteorological conditions, solar energy has only a limited potential to generate electricity production. In 2012, the number and capacity of photo-electric power plants, up to 30 kW, was increasing very quickly, and in January 2013, their capacity amounted to 8 MW.

9. Forecasts of the energy sector of the Republic of Lithuania up to 2050

The Strategy's key objective for 2050 is to increase the focus on sustainability in the energy sector. The basic principles of the energy sector will remain the same: energy independence, sustainability, and competitiveness, and possibly the development of nuclear power.

In 2050, Lithuanian consumers will use significantly more electricity (20–25 TWh), mostly due to a shift towards the usage of electricity-based technologies and electric vehicles. After 2030, electricity generation will gradually become more de-centralised and, in order to provide for adequate functioning of the power system, the State will need to create a legal and functional, de-centralised, electricity regulation environment, a system which efficiently balances centralised and distributed electricity generation. To this end, higher investment levels into economically-beneficial smart grid technologies will be necessary.

The generation of electricity and heat based on environmentally-friendly technologies will enable Lithuania to achieve the EU's goals, reducing greenhouse gas emissions by 40% and 60% respectively, by 2030 and 2040, and reaching a 80% reduction of greenhouse gas emissions by 2050.

In the long-term perspective, the economics of current technologies will change substantially, and new revolutionary technologies not yet widely-known or widespread, might become dominant in the energy sector. Technologies like efficient electricity storage, wireless power distribution,

energy production based on hydrogen, and mini nuclear power plants are promising, but not yet suitable for large-scale use.

Lithuania will react to the predicted technological development in a timely fashion. It is highly important to develop Lithuania's own capabilities and competences (training of specialists and developing scientific research), monitor existing technologies, and to analyse new tendencies in the energy sector (choosing and adopting technologies suitable for Lithuania). Taking into consideration the sustainable development of the energy sector, it is also important to promote awareness of energy savings in society.

10. Climate policy

Up to the end of 2009, Lithuania had a good record of low greenhouse gas emissions compared with other EU countries. However, at present, Lithuania is facing a certain rise in greenhouse gas emissions, due to the closure of Ignalina NPP, and the resulting increase in the use of older thermal power plants. From 2011 to 2012, CO₂ emissions decreased in the majority of Member States, but Lithuania registered an increase of 1.7%. In November 2012, therefore, Parliament adopted a 'Strategy for National Climate Management Policy, 2013-2050' including implementation of measures which cover both adaptation and mitigation issues.

The implementation of diverse measures, reducing greenhouse gas emissions, would allow an avoidance of an additional 11 million tons of greenhouse gas emissions in their CO₂ equivalent by 2020. This amounts to 46% of the actual greenhouse gas emissions in 2008, or 23% of greenhouse gas emissions predictions for 2020. The industry, agriculture, and electricity production sectors have the biggest potential for such reductions. There is the opportunity to reduce the emissions by approximately 20–30% in each of the three sectors. Greenhouse gas emissions in the transport sector can be cut by 5–10%.

11. Lithuanian Presidency: priorities in the field of energy

The priorities for the Lithuanian Presidency were agreed between all the Lithuanian parliamentary parties back in 2011. The Lithuanian Presidency will seek to promote sustainable economic growth and competitiveness by reducing unemployment and securing financial stability which, at present, are key EU priorities. Energy policy, and energy security, in particular, will be the main

priorities of the Lithuanian Presidency agenda. Lithuania will seek progress in completing the EU internal energy market and elimination of energy islands in the EU. The Presidency will prioritise the creation of the internal energy market, by employing the necessary infrastructure and pursuing synchronous operation with the European electricity grid, while, at the same time, focusing on building the external dimensions of EU energy policy. Lithuania will, therefore, continue the work started under the Polish Presidency, towards enhancing the role and the coordination of the EU's external energy policy. The country perceives the consistent and steady external dimensions of the EU's energy policy, as being crucial to ensuring energy security and fair prices.

11.1 External Energy Policy

In the light of on-going negotiations with third world countries, as well as the implementation of existing instruments, Lithuania will review and update the orientations, as set out in 2011, on external energy relations in the Energy Council's conclusions, prepared under the Polish Presidency.

In autumn 2013, the European Commission is expected to publish a report on Members States' implementation of the IGA's decision (on setting up an information exchange mechanism with regard to intergovernmental agreements between Member States and third world countries in the field of energy).

Based on this review, the Lithuanian Presidency plans will include recommendations on how to determine consistency and coherence in the EU's external energy relations with key producer, transit, and consumer countries.

11.2 Internal Energy Market

Lithuania will give high priority to the 'three S's', - Security of supply, Safety and Sustainability of energy production and use. To that end, the finalisation of the Connecting Europe Facility package – a financing mechanism for energy, transport and ICT infrastructure projects – by the Irish Presidency, was of key importance. During the Lithuanian Presidency, a list of Projects of Common interest under the revised TEN-E (Trans-European Energy network) guidelines will be compiled and officially presented at the high level conference on energy infrastructure in Vilnius, 4th - 5th November, 2013. Energy infrastructure development projects on this list will be eligible for

European financing. Lithuania is committed to working on initiatives which will help to give a long-term perspective on energy investment.

With regard to the internal energy market legislation, the latest evaluations show that continued efforts are needed to adopt the necessary network codes, and to implement the 3rd energy package without further delay. To this end, and building on the Irish Presidency's conclusions on the state of the internal energy market, Lithuania will work towards endorsement of an Action Plan, involving all stakeholders, to ensure that the energy market delivers its benefits to consumers, as well as to businesses, and provides the appropriate price signals to investors.

Regional co-operation between Member States will receive particular attention, especially with regard to national energy policies affecting the functioning of the energy market.

By July 2013, the European Commission is expected to publish non-binding guidelines on the issue of national capacity markets, which have recently been distorting the functioning of the internal energy market.

11.3 Energy efficiency, renewable energy

Building on the adoption of the Energy Efficiency Directive, Lithuania plans to facilitate the swift adoption of new measures on eco-design, and labelling of energy-related products and appliances.

Under the Lithuanian Presidency, the Council will also be invited to examine initiatives for the development of smart energy grids and smart metering, which facilitate integration of renewable energy and energy efficiency.

With regard to renewable energy, Lithuania will concentrate on the question of its sustainability and effectiveness of the support schemes. By June 2013, the European Commission is expected to publish guidelines on the national support schemes and co-operation mechanisms, with regard to renewable energy sources. In autumn 2013, the European Commission is expected to publish a legislative proposal on sustainability criteria for biomass.

Building on the progress made by the Irish Presidency, Lithuania will work towards finalisation of the proposals related to the sustainability of biofuels production.

11.4 Nuclear safety

Regarding nuclear safety, the Lithuanian Presidency will start examining the review of the Nuclear Safety Directive. This initiative is intended to strengthen independence of the national regulatory authorities, enhance transparency, and improve monitoring and peer review mechanisms ensuring continuous improvement of nuclear safety in the EU.

12. Conclusions

Taking into account all the actions already taken, and which are about to be implemented in the coming years, it is clearly visible that Lithuanian decision-makers are not only determined to meet the EU's directives concerning a decrease of CO₂ emissions, but also to make their energy-mix more flexible, sustainable, secure, and competitive on the European arena.

Lithuania's current situation was determined by historic and political circumstances, as well as by scarce internal energy resources. The country must supply sufficient local capacity to satisfy the internal energy demand, and with regard to energy-related questions, should be able to participate and compete in common EU energy markets and effectively co-operate with other countries.

Implementation of the National Energy Strategy in the fields of electricity, district heating, gas, oil, renewable energy sources, and improvement of energy efficiency, environmental protection, and reduction of greenhouse gas emissions, shall not only strengthen the Lithuanian role in the Baltic region, but also make the national market attractive for foreign investments.

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