

National Energy Independence Strategy of the Republic of Lithuania



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National Energy Independence Strategy of the Republic of Lithuania was approved by Resolution No XI-2133 of the Seimas of the Republic of Lithuania of 26 June 2012

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SEIMAS OF THE REPUBLIC OF LITHUANIA

RESOLUTION ON THE APPROVAL OF THE NATIONAL ENERGY INDEPENDENCE STRATEGY

26 June 2012 No XI-2133

Vilnius

The Seimas of the Republic of Lithuania,

acting in compliance with paragraph 2 of Article 14 of the Law of the Republic of Lithuania on Energy (*Valstybės žinios (Official Gazette)*, 2002, No 56-2224; 2011, No 160-7576);

having considered:

1) the national energy development plans of Lithuania provided for in the National Energy Strategy approved by Resolution No X-1046 of the Seimas of 18 January 2007;

2) the changes in the Lithuanian energy sector after the final shut-down of the Ignalina Nuclear Power Plant, especially the increase in Lithuania's dependence on energy resources supplied from Russia;

3) the continually evolving energy policy of the European Union and the introduction of new guidelines for the Energy Strategy for Europe 2011-2020 and energy infrastructure priorities for 2020 and beyond;

4) the necessity to ensure the energy independence of Lithuania from external energy systems and monopolistic primary energy supply, competitiveness and sustainability of the energy sector;

5) particular strategic importance of integration of the Lithuanian energy systems into the respective European Union's systems and the developing single energy market of the European Union;

6) the Baltic Energy Market Interconnection Plan approved by the European Commission, the importance of the strategic partnership of the Baltic states and Poland in the field of energy when implementing joint projects of the energy infrastructure;

7) the need in Lithuania for further development of nuclear energy and intensive use of renewable energy resources;

having regard to the fact that energy independence and energy security is an integral part of national security;

recognizing that the implementation of the National Energy Independence Strategy which will ensure energy security of energy consumers and the whole country as well as competitiveness of the market must be a consistent process independent from democratic change of governments, *r e s o l v e s*:

Article 1.

To approve the National Energy Independence Strategy (appended).

Article 2.

To instruct the Government of the Republic of Lithuania to inform the Seimas in its annual activity report about the implementation of the provisions of the National Energy Independence Strategy when fulfilling the five-year National Energy Independence Strategy implementation plan and programmes.

Article 3.

To repeal Resolution No X-1046 of the Seimas of the Republic of Lithuania of 18 January 2007 on the Approval of the National Energy Strategy (*Valstybės žinios (Official Gazette)*, 2007, No 11-430).

SPEAKER OF THE SEIMAS

IRENA DEGUTIENĖ

EXECUTIVE SUMMARY



1. The purpose of the National Energy Independence Strategy (henceforth – Strategy) is to define the main objectives of the Lithuanian state in the energy sector and to set national targets for the implementation of strategic initiatives until 2020, as well as to lay down guidelines for the development of Lithuania's energy sector until 2030 and until 2050. The main goal of this Strategy **is to ensure Lithuania's energy independence before the year 2020 by strengthening Lithuanian's energy security and competitiveness**. Lithuania's energy independence will ensure an opportunity to freely choose the type of energy resources and the sources of their supply (including local production) so that they best meet the state's energy security needs and Lithuanian consumers' interests to procure energy resources at the most favourable prices.

2. Like many other countries in Europe, Lithuania is facing challenges in the energy sector on three main dimensions: security of energy supply, competitiveness and sustainability of the energy sector. This situation was determined by historic and political circumstances as well as scarce internal energy resources.

3. Most of energy resources used in Lithuania are imported. After the shutdown of Ignalina Nuclear Power Plant, the country is not able to satisfy its internal electricity demand at competitive prices. The Lithuanian electricity network is not connected to the European electricity system and therefore electricity can be imported only from a very limited number of countries.

The Lithuanian Energy Sector until Year 2020

4. In order for Lithuania to become a fully-fledged Member State of the European Union (henceforth – EU), the Lithuanian energy sector should be entirely integrated into the European energy system. The country must have 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 cooperate with other countries.

5. The Strategy sets a number of tasks and major solutions in the fields of electricity, heating, gas, oil, renewable energy sources and improvement of energy efficiency, environment protection and reduction of greenhouse gas emissions.

6. In the **electricity energy** sector, the focus is on the implementation of those strategic projects and solutions which have crucial impact on ensuring the country's energy independence, i.e.:

1) Full Integration into the European Energy Systems:

- Start-up of the Lithuanian–Polish power link *LitPol Link 1* in 2015 and extension of the link in 2020; also the completion of the extra Lithuania-Poland cross-border power connection (*LitPol Link 2*) which are required for the future synchronous interconnection with the European Continental Network of the European Network of Transmission System Operators for Electricity (henceforth – ENTSO-E);
- Completion of the Lithuanian–Swedish power link *NordBalt* in 2015;

EXECUTIVE SUMMARY

- Development of the Regional Baltic States' electricity market and integration into the Nordic and Continental European Electricity Markets;
- Synchronous interconnection of the Lithuanian, Latvian and Estonian electricity transmission systems with the European Continental Network of ENTSO-E;

2) Ensuring sufficient competitive local electricity generation capacities to cover the basic generation demand and domestic energy demand in 2020 (estimated at 12–14 TWh per year) through:

- Construction of a new regional nuclear power plant in Visaginas;
- Increase of the electricity generation capacity from renewable energy sources.

3) Implementation of the 3rd EU Energy Package¹:

- Unbundling of transmission activities from the supply and other activities;
- Conformity of the electricity market, development and management principles with provisions and requirements of the 3rd EU Energy Package.

7. The main task in the **heating sector** is to increase energy efficiency in heat production, distribution and consumption while at the same time shifting from mainly gas-based production towards biomass. The state will support initiatives aimed at increasing the heat consumption efficiency, utilization of waste energy potential and the use of biomass. By the year 2020 the target for decrease in households' and public buildings' heating consumption is 30–40 %. Compared to 2011, it will allow to save annually as much as 2 to 3 TWh of heat. The district heating will be restructured in compliance with principles of the 3rd EU Energy Package, as well as by ensuring provisions for arrangement of activity of heat production and transmission enterprises substantiated by fair and efficient competition. The transparent activity of heat production and transmission enterprises and their control will ensure heat supply services at the least prices.

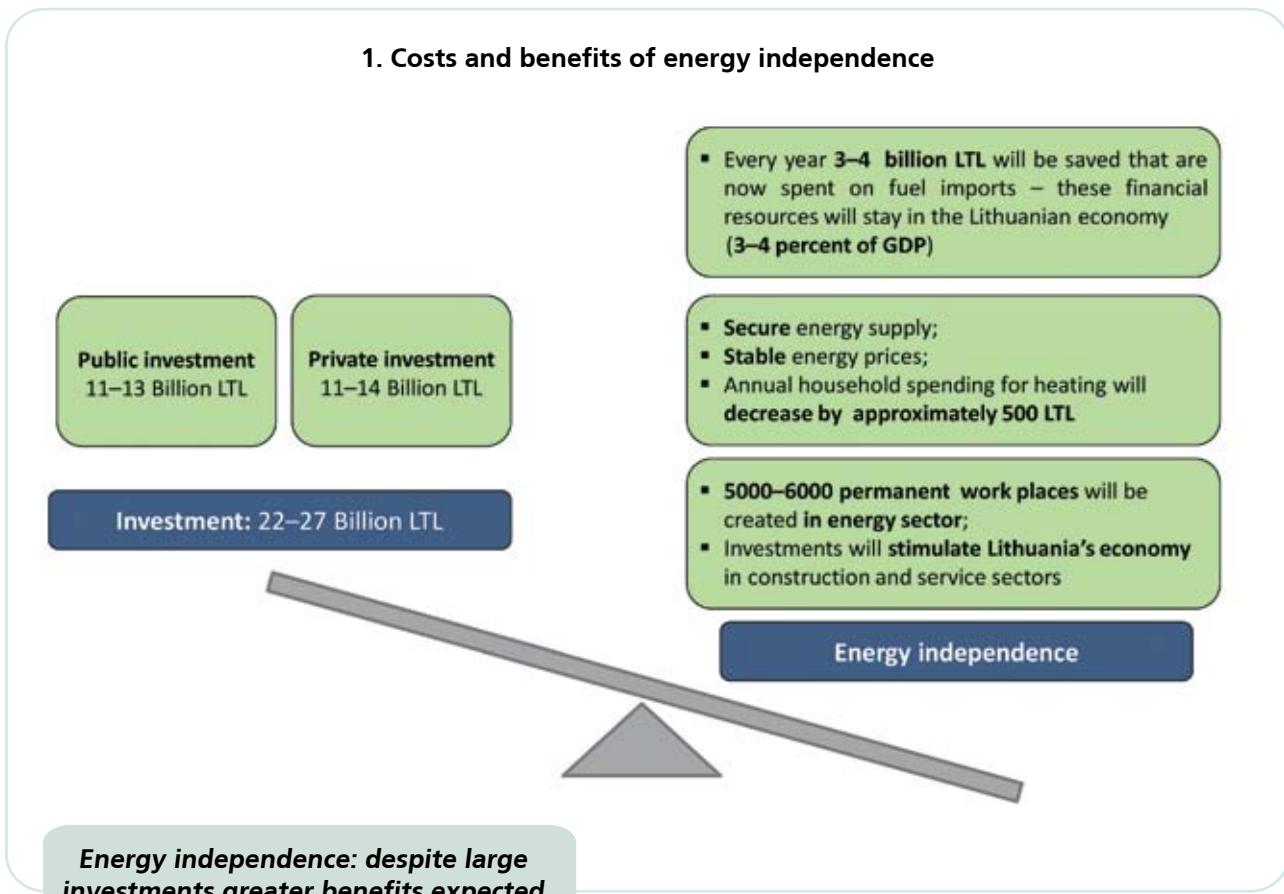
8. In the **gas sector**, Lithuania will strive in the long run to decrease gas consumption by replacing it with renewable energy sources, while ensuring gas supply alternatives in the short run. To this end, Lithuania will construct a Liquefied Natural Gas (henceforth – LNG) terminal in Klaipėda, undertake all efforts to build an underground gas storage facility and a Lithuania-Poland gas pipeline linking the country to the EU's gas pipeline networks and markets. In order to promote competition in the gas sector, the gas market will be liberalised by separating gas supply and gas transmission activities according to the provisions of the 3rd EU energy package.

9. In the **oil sector** the goal is to consistently replace oil products with renewable energy sources and increase competition in the Lithuanian market.

10. Lithuania will progressively increase the use of **renewable energy sources** (henceforth – RES) in the production of electricity and heating as well as in the transport sector. The state will aim to reach the target of no less than 23 % of renewable energy in final energy consumption, including no less than 20 % of renewable energy

¹ 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 Cooperation 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 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 networks and repealing Regulation (EC) No 1775/2005; Directive 2009/72/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC; Directive 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.

1. Costs and benefits of energy independence



in the electricity sector, no less than 60 % in the district heating sector and no less than 10 % in the transport sector. Clear conditions of support to RES will be introduced, giving preference to the most economically and technically feasible solutions of renewable energy.

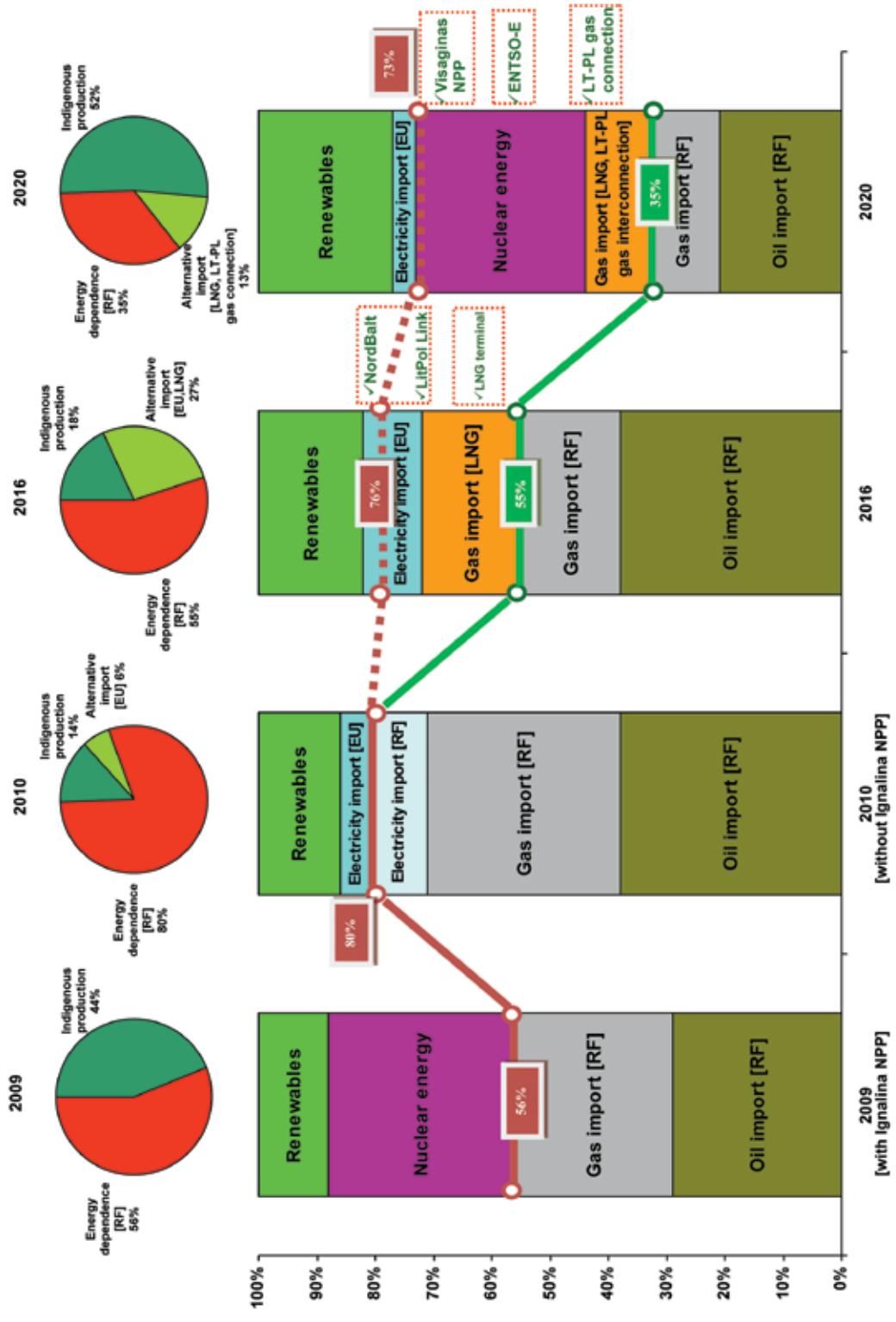
11. Considering the **energy efficiency**, the target is to achieve annual savings of 1.5 % of the total final energy consumption in the period through 2020, and in such way to contribute to the enhancement of Lithuania's energy independence, competitiveness and sustainable development.

12. The initiatives outlined in the Strategy will have a positive **impact on the environment**, as their implementation will enable Lithuania not to emit additionally 11 million tons of greenhouse gas emissions in CO₂ equivalent before 2020. This would amount up to 46 % of the actual greenhouse gas emissions in 2008.

13. In 2020 the Lithuanian energy sector will be fully independent of the energy supply from a single source. Electricity demand will be covered by using the new regional nuclear power plant in Visaginas and by increasing production capacity from renewable energy sources. Stable and diversified gas supply will be ensured after installation of LNG terminal. In addition, Lithuania, having possibilities to import oil and oil products through AB Klaipėdos Nafta, will be able to satisfy demand for oil products from diversified sources.

EXECUTIVE SUMMARY

Lithuanian Primary Energy-Mix: Reducing Energy Dependence on Single External Energy Supplier



14. Strategic initiatives that will bring Lithuania's energy independence will cost the government sector 11–13 billion LTL (including the assets of state-owned companies, EU structural funds and other international support). Additional 11–14 billion LTL will be attracted from private investors. The investment will yield annual savings of 3–4 billion LTL (3–4 % of the Lithuanian General Domestic Product), which are currently spent on imported energy resources. What is more, after implementation of the strategic projects the country will benefit from a reliable energy supply and more stable energy prices based on market competition. Each household will on average save 500 LTL per year on heating costs alone. 5–6 thousand permanent work places will be created in the energy sector. The investment will also stimulate the economy in the construction and services sectors.

15. Failure to implement the projects and initiatives outlined in this Strategy would jeopardise all the three key principles of Lithuania's energy policy: security of energy supply in Lithuania and other Baltic States, the country's competitiveness and sustainable development. Dependence on the single external energy supplier and foreign energy monopolies would persist and energy prices would be determined not by the EU competitive market but by the decisions of suppliers from the third countries (see diagram "Lithuanian Primary Energy-Mix: Reducing Energy Dependence on the Single External Energy Supplier", p.12).

Lithuanian Energy Sector from 2020 to 2050

16. In the period through 2050, Lithuania will progressively move towards a fully sustainable and low greenhouse-gas-emitting economy. In 2050, the demand for electricity will be fully satisfied through the use of nuclear power and renewable energy sources. Centrally supplied heat will be produced only from renewable energy sources.

17. The country will increase the efficiency of energy consumption. As the development of technologies increases at a rapid pace, current energy production and consumption ways will be considerably improved or new, more effective ways will be developed by 2050. In order to timely react to technological progress the State will monitor the development of technologies and promote the application of economically justified technologies in the energy sector. Lithuania will focus on fostering capabilities and competences in the areas of nuclear power management and energy production from renewable energy sources.

18. The essential principle of the Strategy in the period from 2020 to 2050 will remain the same – to meet the needs of Lithuania's consumers by allowing them to procure energy resources at the most favourable prices.

1 chapter

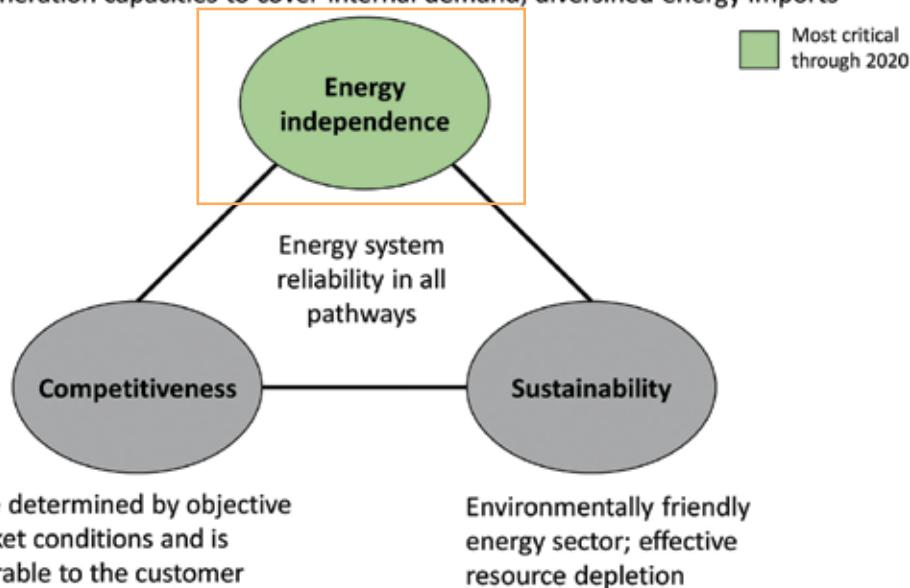
1st GENERAL STRATEGIC GUIDELINES

Section 1

PROVISIONS OF THE ENERGY SECTOR ACTIVITY AND DEVELOPMENT

2. The main 3 strategic principles of the Lithuanian energy sector

Integration into European energy networks; sufficient and competitive local energy generation capacities to cover internal demand; diversified energy imports



19. Analysis of the developments of the Lithuanian energy sector and evaluation of major challenges revealed three essential and interconnected principles on which the Strategy is based:

1) Energy independence. Lithuania will cover its domestic energy demand from local and diversified sources. This is a necessary condition for reliable functioning of the energy system and prevention of energy supply interruptions;

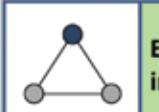
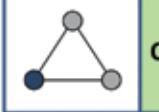
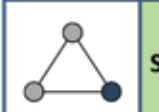
2) Competitiveness. Lithuania will join European energy markets and reform existing energy sector monopolies. This will guarantee favourable energy prices for consumers and ensure sufficient investments into the energy sector to develop the missing energy infrastructure;

3) Sustainability. Both production and consumption of energy must be based on the principles of sustainable development. When ensuring sustainability the volume of emissions of greenhouse gas will be reduced by increasing energy production, transmission and consumption efficiency and encouraging energy production from environmentally-friendly resources (renewable energy sources and nuclear energy).

Section 2

CURRENT STATUS

3. Strategic principles of the energy sector: current situation

Strategic principles of the energy sector	Current situation
 Energy independence	<ul style="list-style-type: none">• Single supplier of most of fossil fuels• Isolation from the EU energy systems• Shortage of competitive power generation capacities (more than half of electricity is imported)
 Competitiveness	<ul style="list-style-type: none">• Steadily rising electricity prices almost reach EU average prices• Potential for improvement through full de-monopolization of domestic market and integration into the EU market
 Sustainability	<ul style="list-style-type: none">• Higher energy intensity per unit of GDP than EU average• High energy efficiency potential in the heating sector• Increasing greenhouse gas emissions

 Most critical through 2020

Lithuanian energy sector is currently not fully aligned with the strategic principles

20. After the shutdown of Ignalina Nuclear Power Plant (NPP), local electricity generation capacities are being increased and electricity sector is being restructured in order to ensure competitive and continuous electricity supply. Currently a new electricity generation capacity is under final construction stage in Elektrėnai, the internal electricity transmission and distribution network is being strengthened, construction of electricity links with Sweden and Poland is in progress, as well as implementation of the LNG terminal and Visaginas Nuclear Power Plant projects, electricity power exchange has been established and the work on creation of energy sources exchange is already in progress. However, despite the successful implementation of these measures in the energy sector, full energy independence has not been achieved and consumers still cannot buy electricity at competitive prices set according to market principles.

Energy Independence

21. After the shutdown of Ignalina NPP, Lithuania's energy system became highly dependent on import of electricity and fossil fuels. The fact that differently from many other EU member states Lithuania is isolated from the EU energy systems complicates the situation: there are no electricity and gas interconnections with

the Continental Western Europe and, therefore, the country is dependent on the sole external energy supplier. Lithuania has to import more than half of consumed electricity from neighbouring countries, with most of the remainder of electricity and heat generated using gas supplied by a single source.

22. This situation creates additional threats to energy consumers and national security. Lithuanian energy consumers are more vulnerable to electricity or gas supply interruptions or large fluctuations of fossil fuel price compared with countries with diversified and self-sufficient energy systems.

Competitiveness

23. Currently the Lithuanian energy sector is not fully competitive. The country's energy market, pursuant to the 3rd EU energy package, is being made more competitive through implementation of ownership unbundling in the electricity and gas sectors to boost competition and bring more transparency. In the electricity sector, ownership of electricity generation, distribution and transmission is being unbundled. In the gas sector, ownership of gas transmission and supply is being unbundled.

Sustainability

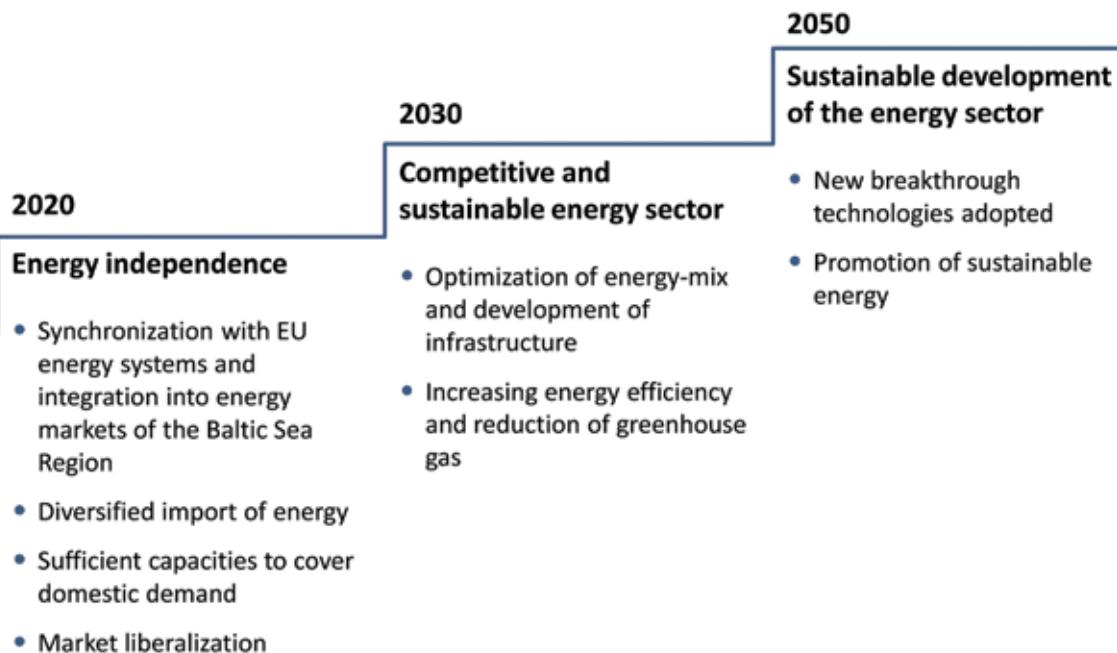
24. The energy sector also faces sustainability challenges. Energy intensity per unit of the Gross Domestic Product (henceforth – GDP) is 2.5 times higher than the EU average. This reveals vast untapped potential in the field of energy efficiency, especially in heating and transport sectors.

25. Lithuania's dependence on fossil fuels has caused CO₂ emissions to increase, especially after the closure of the Ignalina NPP. This creates additional difficulties for sustainable development of the energy sector.

Section 3

VISION OF THE ENERGY SECTOR

4. Long-term vision of Lithuanian energy sector



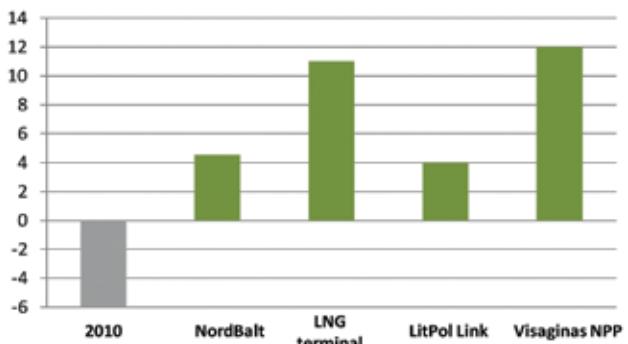
26. The vision of Lithuanian energy sector is based on three main principles, each being given the highest priority in different periods of the Strategy's implementation (by 2020, 2020 to 2030 and 2030 to 2050).

27. Until 2020, the country's highest priority is energy independence. 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 best meet the state's energy security needs and Lithuanian consumers' interests to procure energy resources at the most favourable price. The structural changes in the energy-mix through gradual decrease of dependence on fossil fuel and alternatives to a single external energy supplier will ensure the country's energy security and the sustainable development of the energy sector.

28. Following the regain of its independence, Lithuania integrated (in political and economic terms) into the Transatlantic space, while energetically remained in the Eastern space by sticking to the Baltic States and the Commonwealth of Independent States synchronised electricity system (henceforth – IPS/UPS) controlled by Russia; the country totally relies on the single supplier both in respect of links to the energy resources infrastructure and the energy system regulation principals. This ambivalent situation, both in political and energy terms, threatens Lithuania's energy and national security. Therefore, Lithuania's integration in the EU energy systems following the

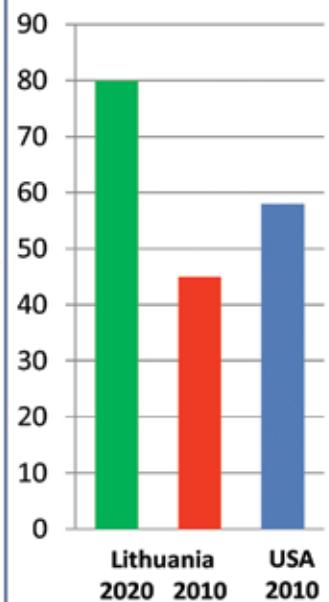
5. Energy security level of Lithuania

Change in energy security level compared to 2009, %



Source: Development and Research of the Methodology of Energy Security Analysis and Assessment of the Integrated Security Level. Final Report. Vytautas Magnus University, 2012

Energy security level, %



The implementation of strategic energy projects will increase the level of Lithuanian energy independence by 80 per cent

implementation of the strategic energy projects and initiatives will not only help to develop market-based relations, but also reduce energy, economic and political threats posed to Lithuania.

29. Energy projects and initiatives outlined in the Strategy also form an integrated set which is required in order to achieve Lithuania's energy independence. The implementation of all these strategic projects will help reach 80 % of Lithuania's energy security level² and allow Lithuania, as an integral part of the EU Baltic Sea Region, to move to another geopolitical space, which is based on the competition of energy market players, equal conditions and transparency. As a result, it will open up possibilities of securing the most important interest of energy consumers – to choose energy sources at the most favourable price.

30. Taking into account the fact that strategic energy projects implemented in Lithuania are systemically interrelated (though may differ in terms of implementation time frames) and that these projects are also a part of the regional energy strategy of the Baltic States, failure to finalise some of the projects would create obstacles for the achievement of energy independence.

² The Energy security level implies the weighted average of the rationed security indicator values. The security indicator is a special indicator reflecting one or another aspect of the energy security. Security indicators are economical, technical, geopolitical and sociopolitical. Every energy project changes values of these indicators including the overall level of the state's energy security. (Source: Development and Research of the Methodology of Energy Security Analysis and Assessment of the Integrated Security Level. Final Report. Vytautas Magnus University, 2012).

GENERAL STRATEGIC GUIDELINES

VISION OF THE ENERGY SECTOR

31. Energy independence – the possibility of free choice of the type of energy resources and sources of their supply – will be achieved by: (a) enhancing competitive local energy generation, including the implementation of the new regional nuclear power plant project; (b) providing alternative supply of energy sources; (c) promoting the development of renewable energy sources and enhancing energy efficiency.

32. The implementation of strategic projects required for the achievement of energy independence will ensure that in 2020 more than 80 % of energy-mix, which is currently being imported from the single supplier, is replaced with a well-balanced structure of energy resources. In 2020, at least half of the required energy will be generated locally (with the focus on nuclear power and renewable energy sources), while the rest of 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 satisfied and allow benefiting from participation in the joint EU energy market.

33. The key objective of Lithuania's energy independence – the country's transition to an absolutely different geopolitical space with different values, based on market conditions and competition – will be attained through the following main measures outlined in the Strategy:

1) Natural gas sector: ensuring alternative supply sources and means of supply (LNG terminal) and security of supply (enhancement of the internal gas pipeline transmission network);

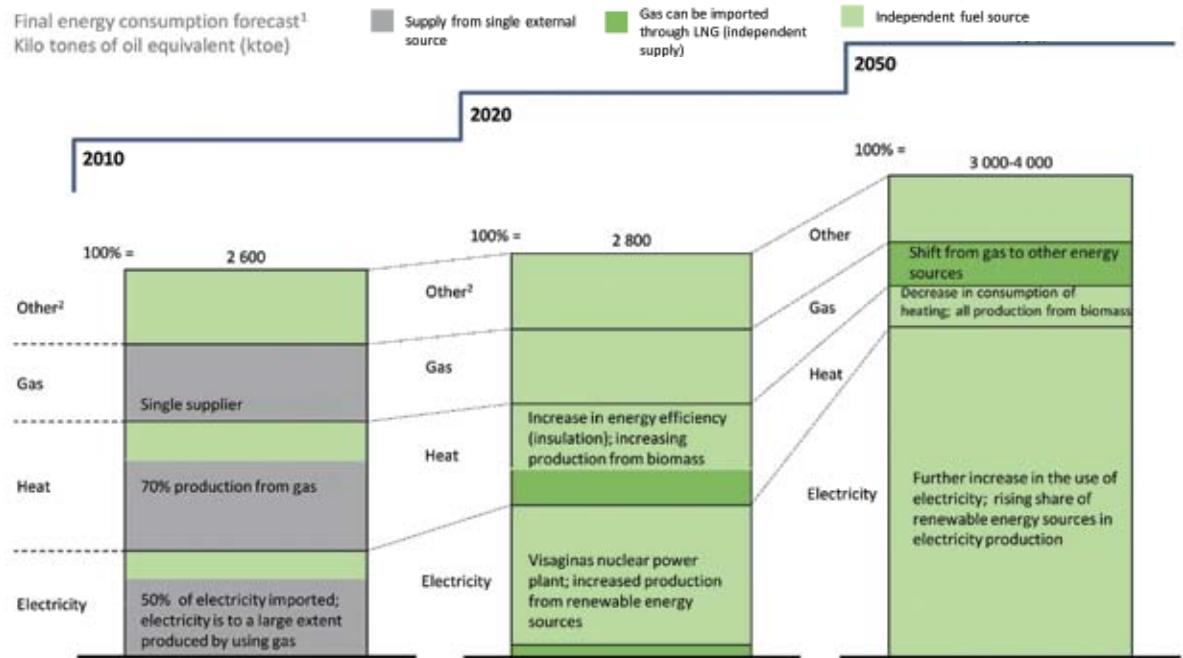
2) Electricity sector: ensuring competitive local electricity generation capacities (regional nuclear power plant in Visaginas), electricity links to Sweden (*NordBalt*) and Poland (*LitPol Link 1*, *LitPol Link 2*), a functional regional electricity market, a synchronous interconnection with the European Continental Network of ENTSO-E and increasing generation from renewable energy sources, which are the most beneficial in economic and technical terms;

3) Establishing market conditions in the energy sector: reorganisation of the energy sector, including electricity, natural gas and heat sectors, according to the provisions of the 3rd EU energy package.

34. In the period from **2020 to 2030**, the Strategy aims at **creating a competitive and sustainable energy sector**. Lithuania will continue to increase the share of environmentally-friendly energy sources in the energy-mix and will further enhance the energy sector infrastructure in order to fully support advancements in renewable energy production. As a result, by 2030 Lithuania will have a competitive and environmentally-friendly energy sector, with most of the energy produced from renewable energy sources and nuclear energy.

35. In the period from **2030 to 2050**, the main priority of the Strategy is to **further increase the sustainability of the Lithuanian energy sector**. In this period, new breakthrough technologies will be selectively adopted, focusing on the sustainable and environmentally-friendly energy production and consumption. As a result, by 2050 Lithuania will be independent from imports of fossil fuel and produce its energy only from nuclear energy and renewable energy sources.

6. Final energy consumption forecast



**The Strategy will help to achieve
energy independence by 2020**

36. An alternative to the projects outlined in the Strategy is non-implementation or selective implementation of these strategic energy projects. The non-implementation of the projects and initiatives set out in the Strategy would result in the following negative effects for Lithuania's and other Baltic States' security of energy supply, the country's competitiveness and sustainable development:

- 1) Persistent dependence on the single external energy supplier and foreign energy monopolies – energy prices for consumers would depend on the external supplier and the decisions of foreign companies rather than on the conditions of the competitive market;
- 2) Persist external threat that monopolistic energy supply may be used not only for economic purposes, but also for the attainment of (geo)political goals;
- 3) Failure to develop the common Baltic States energy market, leading to low competitiveness of Lithuania and all Baltic States as well as inadequate security of energy supply because of the unused market potential;
- 4) Due to the absence of own nuclear power plant the needed electricity would be imported from the third (non-EU) countries (not excluding the nuclear power plants with questionable security level of the third countries);

GENERAL STRATEGIC GUIDELINES

VISION OF THE ENERGY SECTOR

5) Lithuania, as a constituent part of the IPS/UPS electric energy system controlled by the Russian Federation, would remain within the authority area of the Eastern geopolitical space;

6) Non-implementation of the 3rd EU energy package: non-liberalised energy market, inadequate access to supply networks by alternative energy suppliers, absence of competitiveness and unfavourable energy prices for consumers;

7) Persistent dependence on fossil fuel (oil and natural gas) – decrease in the reserves of fossil fuel and simultaneous increase in their demand would cause disproportionate growth of their prices undermining the competitiveness of the country's economy;

8) Unused potential of the local and renewable energy sources and inefficient use of energy sources resulting in a larger-scale import of electricity from the outside and greater energy dependence.

Section 4

LITHUANIA'S ENERGY POLICY IN THE EUROPEAN UNION

37. The vision, goals and strategic initiatives of the Lithuanian energy sector are in line with the guiding principles of the EU's energy policy – security of energy supply, competitiveness and sustainability whereas the assurance of Lithuania's energy independence is directly related with the recently growing trend towards the strengthening of the EU external dimension of the EU energy policy.

38. Political commitments of vital importance for Lithuania facilitating the achievement of Lithuania's energy independence and chances of integration into the European energy system have been adopted at the European Union level.

39. In February 2011, Heads of the EU Member States pledged to ensure that no EU Member State is left isolated from the European gas and electricity networks after 2015 and their energy security is not undermined by lack of the appropriate connections. The provision stating that the fully functioning single internal energy market of the European Union should be completed by 2014 so as to allow gas and electricity to flow freely was also approved.

40. In order to eliminate the energy islands within the European Union a well developed energy infrastructure is required. It is also necessary for the functioning of the EU internal energy market. Therefore, in this context, the proposed European infrastructure network instrument is of vital importance for Lithuania as it would help to finance the energy infrastructure projects that are less commercially attractive, but nonetheless strategically important. Correspondingly, the European infrastructure network instrument shall be applied for implementation of Lithuania's strategic goal, i.e. to become an integral part of the EU's internal energy market.

41. Lithuania's integration into the EU energy systems makes an indispensable part of the strengthening of the EU policy with the external partners. The EU Member States agree that it is necessary to fully review the EU's energy dialog with Russia and promote the development of transparent and non-discriminatory relations based on the principles of the rule of law and market. A broader regulation area should be implemented at the EU level to ensure that it would be beneficial for all and provide access to information exchange on a regular basis regarding the concluded and future intergovernmental agreements of the EU Member States.

42. Therefore, with regard to the status of energy security in Lithuania and priorities of its energy policy, Lithuania's main initiatives in the context of EU's energy policy shall focus on abolishing the energy isolation, the creation of an EU's internal energy market, the improvement of the regulatory environment and the strengthening of the external dimension of the EU's energy policy. Lithuania shall make efforts to contribute to the implementation of this initiative in the following ways:

1) Abolishing energy isolation of Lithuania and creation of the EU internal energy market:

- By implementing the Baltic Energy Market Interconnection Plan (BEMIP), which foresees the realization of crucial energy generation and interconnection projects as well as the integration of energy markets in the Baltic Sea Region;
- By consolidating the EU's financial instruments, necessary for implementation of priority energy infrastructure projects in Lithuania and throughout the region.

GENERAL STRATEGIC GUIDELINES

LITHUANIA'S ENERGY POLICY IN THE EUROPEAN UNION

2) Strengthening the EU's internal regulatory instruments and external energy policy:

- By forming regulatory environment, necessary for the creation of the EU's internal energy market and its effective functioning;
- By encouraging the European Commission to take an active part in negotiations with the external partners in the energy sector;
- By simplifying the decision-making procedures for realization of the EU's priority energy infrastructure projects;
- By applying (based on the principle of reciprocity and aiming for equal market conditions and sustainable development of the energy sector at global level) the same environmental standards both to energy produced in the EU and imported from the third (non-EU) countries.



2

chapter

2nd STRATEGIC OBJECTIVES

Section 1

ELECTRICITY

7. Electricity production, transmission and distribution strategy

Vision	Strategic initiatives
<ul style="list-style-type: none">▪ Synchronized operation with continental Europe and integration into Western and Nordic countries' regional energy systems▪ Sufficient capacities to cover domestic demand▪ Diversified fuel supply	<p>① Infrastructure and market integration with European electricity networks</p> <ul style="list-style-type: none">• Electricity interconnections with Poland and electricity market of Western Europe• <i>NordBalt</i> link with the Nordic market• Creation of common Baltic electricity market <p>② Interconnection of the power system with the synchronous grid of Continental Europe</p> <ul style="list-style-type: none">• Installation of converters necessary for synchronous operation with European Continental Network• Strengthening the internal power links in preparation for synchronous operation with European Continental Network <p>③ Sufficient local capacities for base-load generation</p> <ul style="list-style-type: none">• Visaginas nuclear power plant <p>④ Increase in production from renewable energy sources</p>
Current situation	
<ul style="list-style-type: none">▪ Lack of supply in the Baltic States (1.3 GW in 2020) due to the closure of Ignalina NPP and other older plants as well as expected growth in the region▪ Production mix heavily dependent on fossil fuels▪ No electricity link with the EU and thus no possibility to exploit the benefits of single market▪ Extensive electricity network requiring investments into modernization	

43. After the decommissioning of the Ignalina Nuclear Power Plant, Lithuania turned from electricity exporter to electricity importer. Electricity generation has decreased considerably in the domestic market, therefore, more than half of the electricity consumed in Lithuania is imported from neighbouring countries, mainly from Russia. The country is also highly dependent on the electricity generated using fossil fuel such as natural gas imported from the single source.

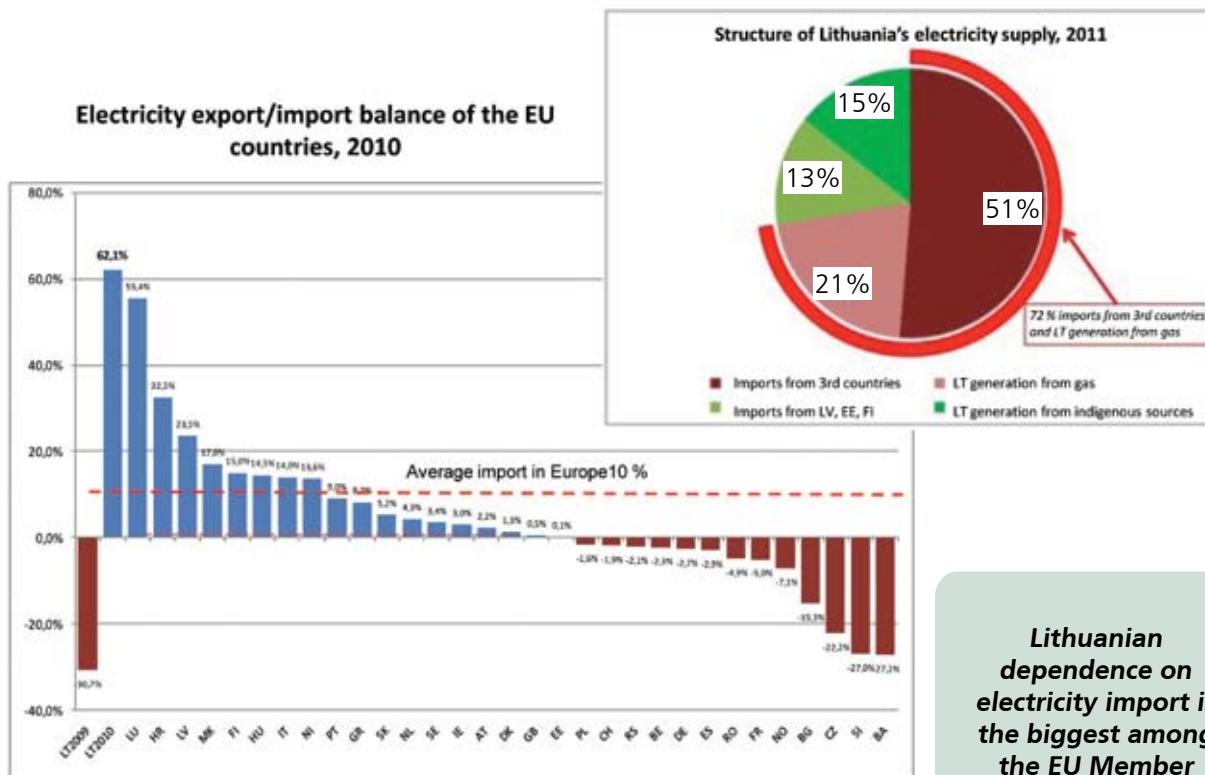
44. Lithuania operates a relatively old power transmission network, which is not linked with the networks of Continental Europe and the Nordic countries. Such interconnections are of vital importance for Lithuania, which seeks to use the advantages offered by the EU's single electricity market. Due to the growing economies of Lithuania and other Baltic States, the region will experience a significant shortage of electricity by 2020; additional 1.3 GW power generation capacities will be necessary to eliminate it.

45. Lithuania is gradually liberalising its electricity market. Market operator Baltpool was set up at the end of 2009. From the beginning of 2010 Baltpool started to run the electricity market according to the principles of Nord Pool Spot exchange. This is an important step in the formation of the Lithuanian electricity market as part of the Baltic Sea Region and the single electricity market of continental Europe.

STRATEGIC OBJECTIVES

ELECTRICITY

8. Lithuanian dependence on electricity import



46. For historical reasons, the power transmission systems of the Baltic States still operate synchronically within the IPS/UPS energy system jointly with the Russian and Belarusian power systems. However, the system control and the market operation according to the IPS/UPS rules are incompatible with the requirements of the 3rd EU Energy Package.³ Such disparity also prevents the Baltic States from achieving the objective of integration into the EU's single electricity market by 2014, set by the European Council on 4 February 2011, and is not in line with the aspirations for energy independence. Therefore, comprehensive integration of the power sector into the EU power systems must be ensured through both developing the infrastructure and electricity markets and changing the system control principles that are required for the operation within the synchronous grid of Continental Europe.

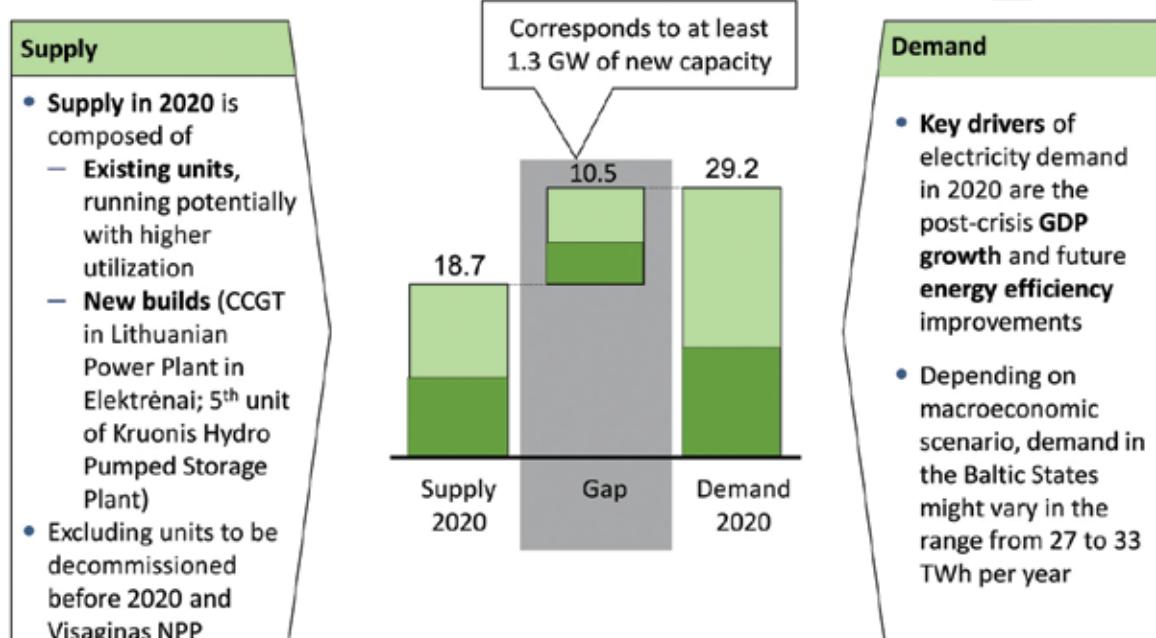
47. A sound and modern power sector is required for its full integration into the EU systems. Following the provisions of the 3rd EU Energy Package, Lithuania is carrying out a consistent reform of the power sector by separating the generation, transmission and distribution functions. The main steps of the reforms are as follows:

³ A market for electricity operates in the European Union, zone pricing is applied, rules for inter-system trading are in force, and access to inter-system capacities is based on the free market mechanisms. In Russia, both energy and power markets are in operation, point pricing is applied, rules are focussed on trading in the domestic market, and there is a monopoly on both import and export.

9. Electricity demand and supply in the Baltic States: 2020

TWh, all Baltic States, "Middle case" macroeconomic scenario

Lithuania



In order to balance electricity demand and supply in 2020 in the Baltic States, at least 1.3 GW of new capacity has to be built

1) power transmission function is separated from generation and a strong transmission system operator is established (AB Litgrid), capable of connecting the Lithuanian power system to ENTSO-E synchronous grid of Continental Europe;

2) in order to secure the country's energy independence, the majority of the power generation capacities controlled by the state are consolidated (AB Lietuvos Energija);

3) to achieve synergy and to better meet the needs of customers, two distribution network operators are merged together (AB Lesto).

Strategic Initiatives till 2020

48. The main short-term strategies of the power sector include the construction of the power links with Poland and Sweden, increasing new capacities of energy generation from nuclear energy and renewable energy sources, and interconnection of the Lithuanian power system (jointly with those of the other Baltic States) with the synchronous grid of Continental Europe.

STRATEGIC OBJECTIVES

ELECTRICITY

49. These strategies will enable Lithuania to make use of the advantages of the EU's single electricity market, form the basis for the formation of competitive electricity prices for final customers, ensure the security of power supply, and contribute significantly to the sustainable development of the power sector.

50. **Integration of infrastructure and markets into the European power systems:**

1) The Lithuanian-Polish power link LitPol Link 1. The Lithuanian-Polish power link LitPol Link 1 is of vital importance in order to eliminate isolation of the Lithuanian power sector, to connect to the synchronous grid of Continental Europe, and to integrate in the European Union's single electricity market. LitPol Link 1 will be constructed in two phases: in Phase I, a 500 MW link will be established (2015), and in Phase II, 1,000 MW will be reached (by 2020). The cost of construction of the link in Lithuania is LTL 485 million.

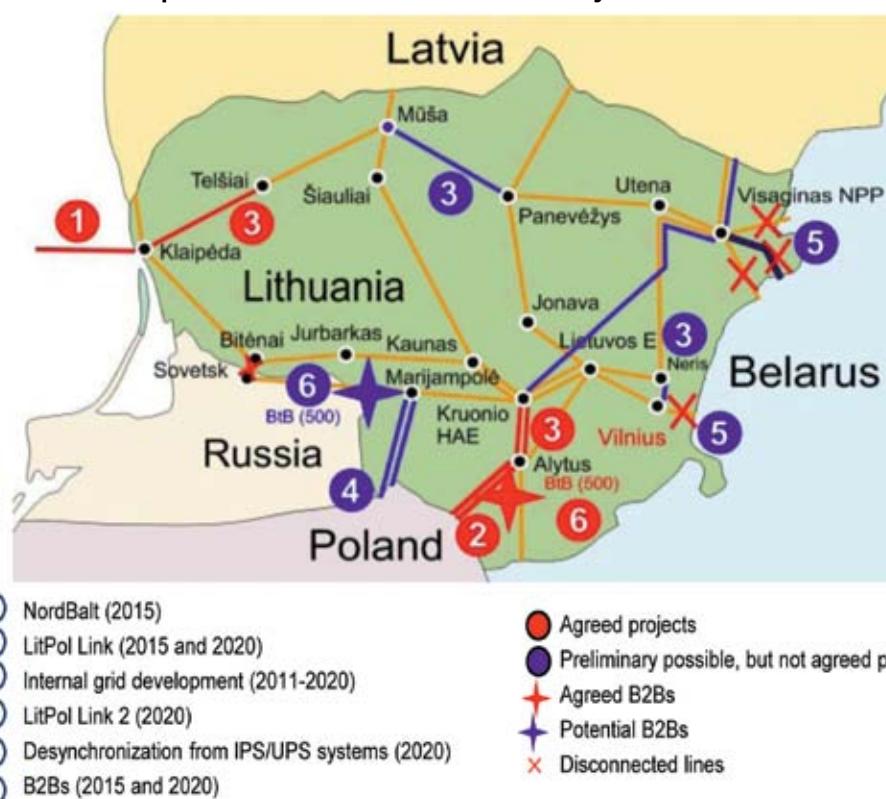
2) The Lithuanian-Polish power link LitPol Link 2. In order to ensure full interconnection of the electricity markets, to effectively use the opportunities for electricity trade, and to integrate the renewable energy, another separate 700-800 MW power transmission line must be constructed in Lithuania and Poland (LitPol Link 2). The estimated cost of this power link in Lithuania is LTL 380 million.

3) The Lithuanian-Swedish power link NordBalt. By the end of 2015, a 700 MW submarine power cable will be constructed. This link will enable Lithuania to connect to the Nordic countries' power system and to trade in electricity as well as will provide access to cheaper power balancing reserves. The estimated cost of the link in Lithuania is up to LTL 800 million.

51. Interconnection of the power system with the synchronous grid of Continental Europe. In addition to the integration of infrastructure and markets, the system control integration is necessary in order to achieve full integration of Lithuania's power sector in the EU systems. Therefore, synchronous operation (jointly with other Baltic States) with the Continental Europe grid is the strategic objective of the national energy policy of Lithuania. The Baltic States have reached a political agreement on this issue and the support of the European Commission has been secured. By decision of the Council of the European Union of 28 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 Baltic States' power systems with the synchronous grid of Continental Europe. Such interconnection will secure for Lithuania (together with Latvia and Estonia): (a) the system control and planning according to non-discriminatory principles which have been agreed with the system operators and which are in line with the 3rd EU Energy Package; (b) opportunities for equal competition with third parties in the electricity market; (c) conditions for trading and securing electricity reserves in the market; and (d) opportunities for increasing the competitiveness of the Lithuanian power system and promoting investments in the power sector, which are necessary for its modernisation.

52. In order to secure timely (by 2020) implementation of the project on the integration into the synchronous grid of Continental Europe, urgent consolidated actions by the state authorities are required. The main components of implementation of the project are as follows:

10. Vision of Lithuanian electricity system operation with European Continental Network in the synchronous mode



1) political consensus of the parties to the interconnection process. The project on the integration into the synchronous grid of Continental Europe is a regional one. It will be implemented by constructing the power links with Poland and by integrating them into the grid for synchronous operation;

2) implementation of technical requirements. The requirements including the necessary infrastructure developments and the feasibility of autonomous operation will be set by the European Network of Transmission System Operators for Electricity (ENTSO-E);

3) political support on the part of EU institutions. Considering the importance and regional character of the project, the European Commission acts, on behalf of the EU, as a representative of interests of the EU Member States in the relevant issues related to third countries.

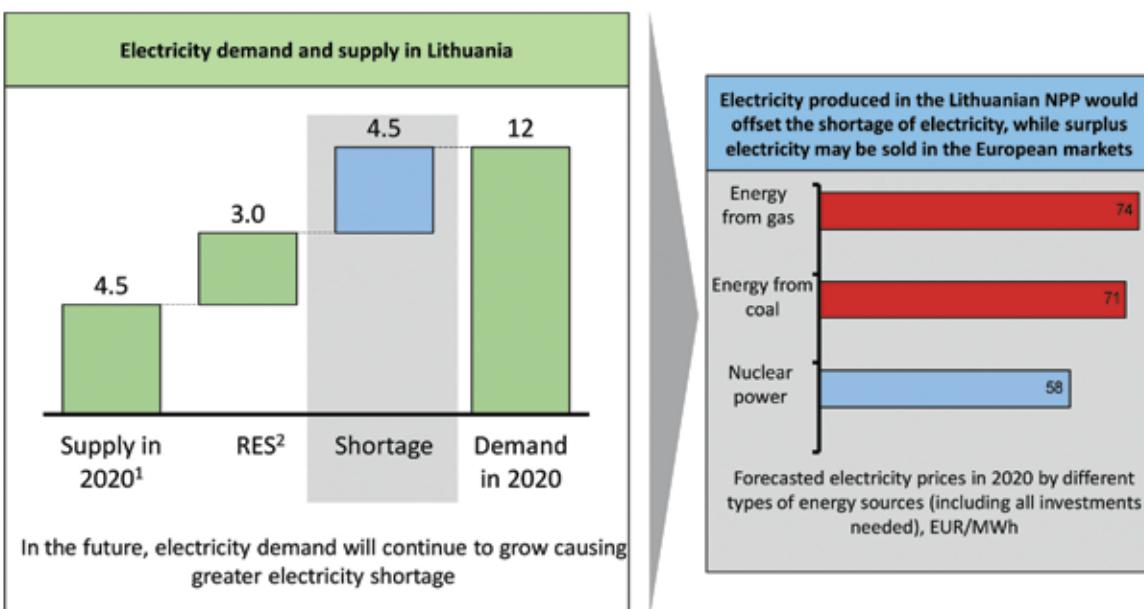
53. Installation of converters necessary for synchronous operation with European Continental Network. Projects on the construction of interconnections with Poland and currency converter stations necessary for the synchronous operation are underway or will be launched in the nearest future. The LitPol Link 1 project (which is a priority project in terms of infrastructure and market integration) and the construction of the converter station in Alytus are under implementation. The second link (LitPol Link 2) must be completed by 2018.

STRATEGIC OBJECTIVES

ELECTRICITY

11. Electricity demand and supply in Lithuania

TWh, scenario of average growth of economy in the Baltic countries



1 Supply is forecasted taking into account the plans to shut down or build new NPP and increase the use of current capacities

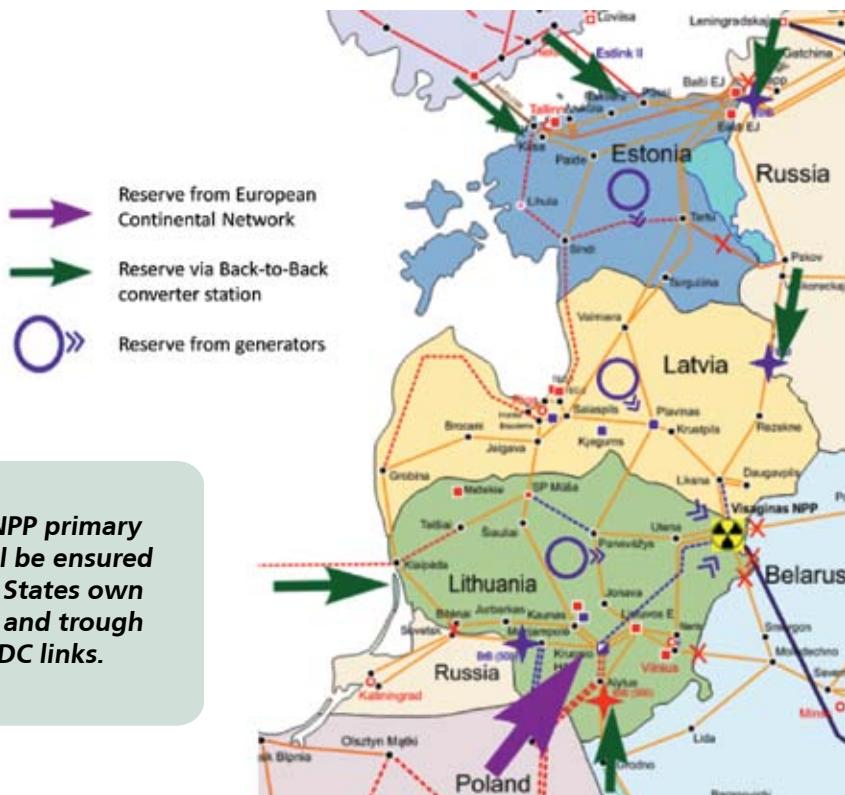
2 RES development is planned to reach technologically and economically efficient level

Even the increase of renewable energy will not eliminate the gap between electricity demand and supply in Lithuania

54. Upon construction of the said links and fulfilment of other pre-conditions for the operation with the synchronous grid of Continental Europe, the Alytus converter station of LitPol Link 1, the original purpose of which is to ensure the electricity exchange with Poland, will be reorganised for asynchronous operation (through the Alytus-Grodno power line) with the IPS/UPS power system controlled by Russia. This will enable Lithuania to carry out the electricity exchange with the markets within the IPS/UPS power system. An additional converter would be constructed at the border with the Kaliningrad region depending on Russia's decision on the integration of the Kaliningrad region into the Continental Europe grid for synchronous or asynchronous operation. The project on the construction of such converter would cost about LTL 250 million. Such additional converter, however, would not be required in case of an agreement with Russia on the Kaliningrad region's integration with the synchronous grid of Continental Europe jointly with the Baltic States.

55. Strengthening the internal power links in preparation for synchronous operation with European Continental Network. Lithuania will strengthen its domestic power grids necessary for the synchronous operation with the Continental Europe grid and the stable operation of the Visaginas Nuclear Power Plant. In establishing the single Baltic market for electricity, priority will be given to the reinforcement of the power transmission networks in the north-south direction. Projects on transformer stations and other grid reconstruction-related projects will

12. Integration of Visaginas NPP into the Continental Europe grid



be implemented accordingly. About LTL 300 to 700 million will be required for the strengthening of the internal power links.

56. Securing sufficient domestic capacities for the base-load power generation. Construction of the Visaginas Nuclear Power Plant (Visaginas NPP) is the key strategic project in terms of the development of competitive domestic power generation by 2020. The Visaginas NPP project is a project of regional importance, supported by the European Commission. At the same time, this project forms an integral part of the Baltic Energy Market Interconnection Plan (BEMIP). Lithuania and its regional partners as well as a strategic investor Hitachi, Ltd. (Japan) jointly with Hitachi-GE Nuclear Energy, Ltd. (Hitachi) take part in the preparatory phase of the plan. Electricity generated at the Visaginas NPP will be allocated in proportion to the number of shares held by the relevant parties, whereas any excess electricity will be exported to the Nordic markets (via NordBalt power link) and continental Europe (via LitPol Link 1 and LitPol Link 2).

57. The project on the regional nuclear power plant in Lithuania will:

- 1) ensure the meeting of the increased demand for electricity consumption in Lithuania and other Baltic states. Both before and after 2020, a considerable increase in the demand for electricity in the Baltic States is

STRATEGIC OBJECTIVES

ELECTRICITY

13. Electricity generation: pros and contras

Nuclear scores well on all the criteria		Other options for electricity generation	
Criteria	New NPP	Option	Drawbacks
	Energy independence <ul style="list-style-type: none">• High energy independence due to the possibility to import fuel potentially from multiple countries• It is a regional project ensuring additional generation capacities for Lithuania and regional partners 		Hard coal <ul style="list-style-type: none">• High environment pollution• Economically unattractive due to high CO₂ emission price• Lithuania should cover all investment costs
	Competitiveness <ul style="list-style-type: none">• Positive impact on trade balance• Potential boost of economy during construction period• From the economic point of view, the most attractive option 		Gas <ul style="list-style-type: none">• Energy dependence – fuel coming from one source• High fuel price - 10-year payments for imported gas equal to investment into nuclear• Lithuania should cover all investment costs
	Sustainability <ul style="list-style-type: none">• No CO₂ emissions,• High contribution to EU's CO₂ emissions reduction targets 		Import only <ul style="list-style-type: none">• Energy dependence – electricity import is mostly expected from Russia, as well as from possible nuclear power plants in Kaliningrad's oblast• Negative impact on export/import balance (each year 1 billion LTL paid for electricity import)

Building new NPP is the most viable option to close the gap

forecast. Domestic power generation meeting the efficiency and competitiveness criteria will not be enough to meet such increased demand, therefore, a gap between the energy demand and supply will be unavoidable. The gap will be somewhat reduced, but not completely eliminated, by the renewable energy and higher energy efficiency. Importing electricity in order to cover the shortage would be in contravention of the main objectives of the Lithuanian energy policy, i. e. the energy independence and the energy security. Therefore, construction of a new regional nuclear power plant in Lithuania is the most reasonable alternative for ensuring a competitive and sustainable supply of electricity in Lithuania and other countries in the Baltic Region in line with the principle of energy independence;

2) support the implementation of the strategic objective – the connection to the synchronous grid of Continental Europe. The Visaginas NPP will facilitate the implementation of the project on the connection to the Continental Europe grid as, by ensuring the competitive basic power generation, it will support the autonomy of power generation in the Baltic States. Autonomous balancing of the Baltic States' power system is one of the key preconditions for ensuring its synchronous operation with the Continental Europe grid. The Visaginas NPP is being designed as a regional power plant of the EU, which will operate within the Continental Europe grid and

the EU single internal market for electricity. The primary power reserves necessary for the synchronous operation (1350 MW) will be secured by the power generation sources in the Baltic States as well as via the alternating (AC) and direct current (DC) links. The secondary and tertiary power reserves will be secured from local power plants of the Baltic States;

3) eliminate the dependence on fossil fuels and the increasing prices for such fuel. In addition to meeting the demand for electricity in Lithuania and ensuring the energy security and independence, the Visaginas NPP will guarantee stable and affordable prices to customers. Considering that the estimated operating life of the Visaginas NPP is over 50 years, the electricity generated by it will be cheaper than that obtained from natural gas.

58. Thus the new power plant in Lithuania will considerably reduce the energy dependence of the country, enhance the energy security, and become an important supplier of electricity for the whole region. It will also have a positive impact on the Lithuanian economy by attracting investments to the country, creating new jobs and generating orders for Lithuanian businesses. The Visaginas NPP will make a significant contribution to the reduction of greenhouse gas emissions in the energy sector of the Baltic States: 2.4 million tons of carbon dioxide emissions will be eliminated, i. e. 10 % of greenhouse gas emissions in Lithuania in 2008. It is estimated that the cost of the new nuclear power plant can be LTL 17 billion (including investments by Lithuania LTL 6 billion), with the planned start of operation in 2020–2022. The size of Lithuania's investments would be equal to the amount paid during 3 to 4 years for the import of electricity and the gas for the electricity generation (in 2011, Lithuania paid LTL 1.7 billion for the imported electricity and gas for the electricity generation). Thus, in this respect the Visaginas NPP is the most reliable option for securing the supply of electricity; it would resolve the issue of the power supply shortage and would provide additional benefits for the State, local businesses, and all electricity customers.

59. The Visaginas NPP operations will be safe and reliable: in the Visaginas NPP project planning phase, an appropriate power plant safety and radioactive waste management system will be selected. The highest international nuclear safety requirements will be complied with in the project development and operation phases.

60. **Power generation from renewable energy sources** is one of the most important priorities in the national energy policy. Co-generation plants fuelled by biomass and wind energy are most significant in this area. By 2020, the State will provide conditions for the installation of wind farms totalling 500 MW of power and for the increase of the total installed power of biofuel plants connected to the power grid up to 355 MW. In addition, the hydropower potential will be used to such extent to which this will have no negative impact upon the environment.

61. Power generation from renewable energy sources will account for at least 20 % of the final electricity consumption. Such generation will be developed up to the level which is economically, technically and environmentally beneficial. Competitive and affordable price is the main criterion for the power generation from renewable energy sources.

62. It is estimated that LTL 13 to 14 billion will be required for the realisation of all the key initiatives in the power sector by 2020 (including funds provided by state enterprises, EU structural funds and other international support). Synchronous operation with the Continental Europe grid and the construction of the Visaginas NPP are the highest priorities.

Strategic Guidelines for 2020–2030

63. In 2020–2030, the power sector will be capable of generating sufficient electricity to meet the domestic demand which will be 13–17 TWh in 2030. The majority of electricity will be generated at the Visaginas NPP and from renewable energy sources. Connected with the Nordic countries by means of power links and operating within the synchronous grid of Continental Europe, Lithuania will form part of a liberalised EU single electricity market.

64. No substantial investments are planned for 2020–2030, however, domestic electricity networks will be developed consistently. Measures will be taken to increase the network efficiency, in particular through the use of smart network technologies. The State will continue its efforts to ensure sustainable development of the energy sector by encouraging the energy generation from renewable sources and increasing the efficiency of the power system.

Section 2

HEATING

14. Heating sector strategy

Vision	Strategic initiatives
<ul style="list-style-type: none">▪ Enhanced energy independence through increased energy efficiency in heating sector and shift towards the use of renewable energy sources for heating production▪ Low heating price for end users	<ul style="list-style-type: none">① Promote heat savings initiatives② Support for renewable energy use in heating :<ul style="list-style-type: none">• To increase production from biomass (both bio boilers and bio CHPs)• To utilize waste in the most efficient way to produce heat• To utilize available residual heat③ Increase in competition and market liberalization by reforming centralised energy heating sector according to the principles of the Third EU energy package
<ul style="list-style-type: none">▪ Lithuania's heat production system is based on fossil fuels (more than 70% natural gas)▪ High heat consumption of buildings▪ Low competition of heat suppliers▪ High heating price	

65. Lithuania has a developed district heating system with around 65 % of consumed heat produced in centralized systems. The share of district heating in the whole heating sector remained fairly constant over the last years.

66. The major problem in the heating system is inefficiency at the point of consumption – the average yearly heat consumption of Lithuanian buildings is 209 kWh/m₂, which is substantially higher than the average of Nordic countries (128 kWh/m₂). Reducing this inefficiency can bring substantial savings of heating costs and would lower emissions of greenhouse gas.

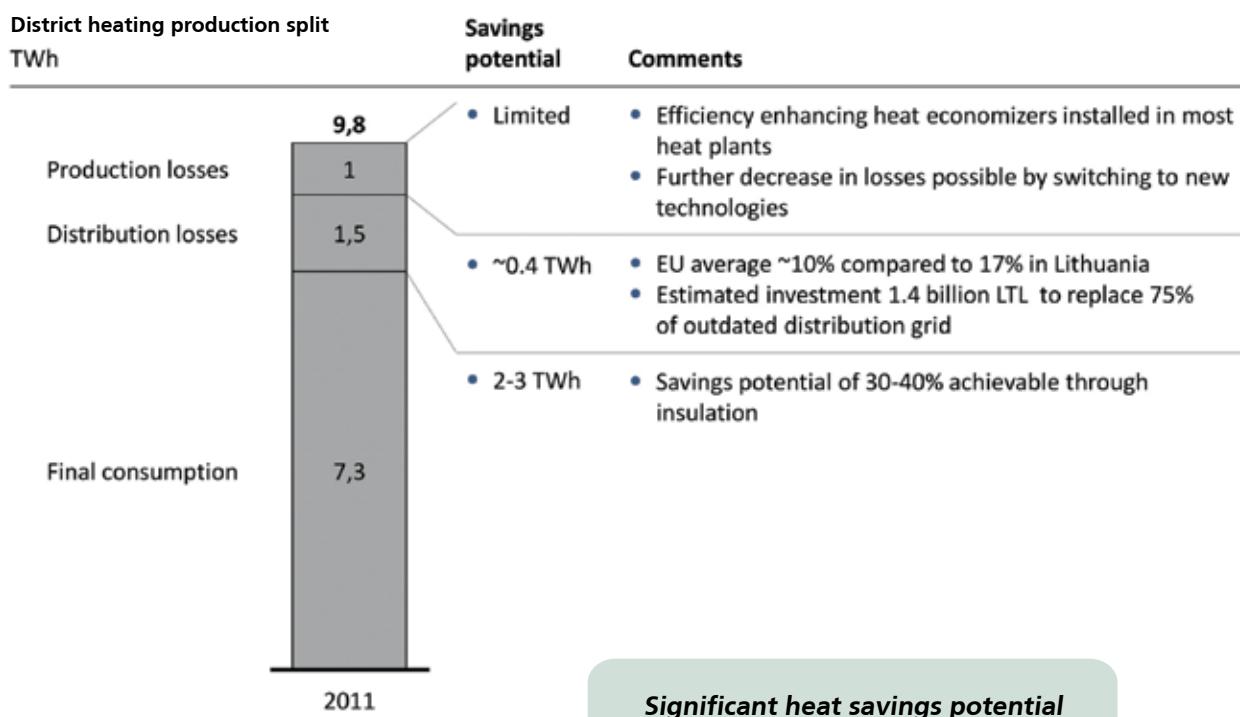
67. At present the heat supplied in district heating systems is produced mainly from the fossil fuels – approximately 70 % is produced from gas, which is imported from a single source. Increasing energy production from renewable energy can diversify energy sources for heat production and reduce negative impact of the district heating sector on the environment.

68. **Increasing efficiency of heat consumption.** By increasing energy efficiency of households and public buildings, 2–3 TWh heat savings will be achieved in 2020. Compared to 2011, these savings would amount to

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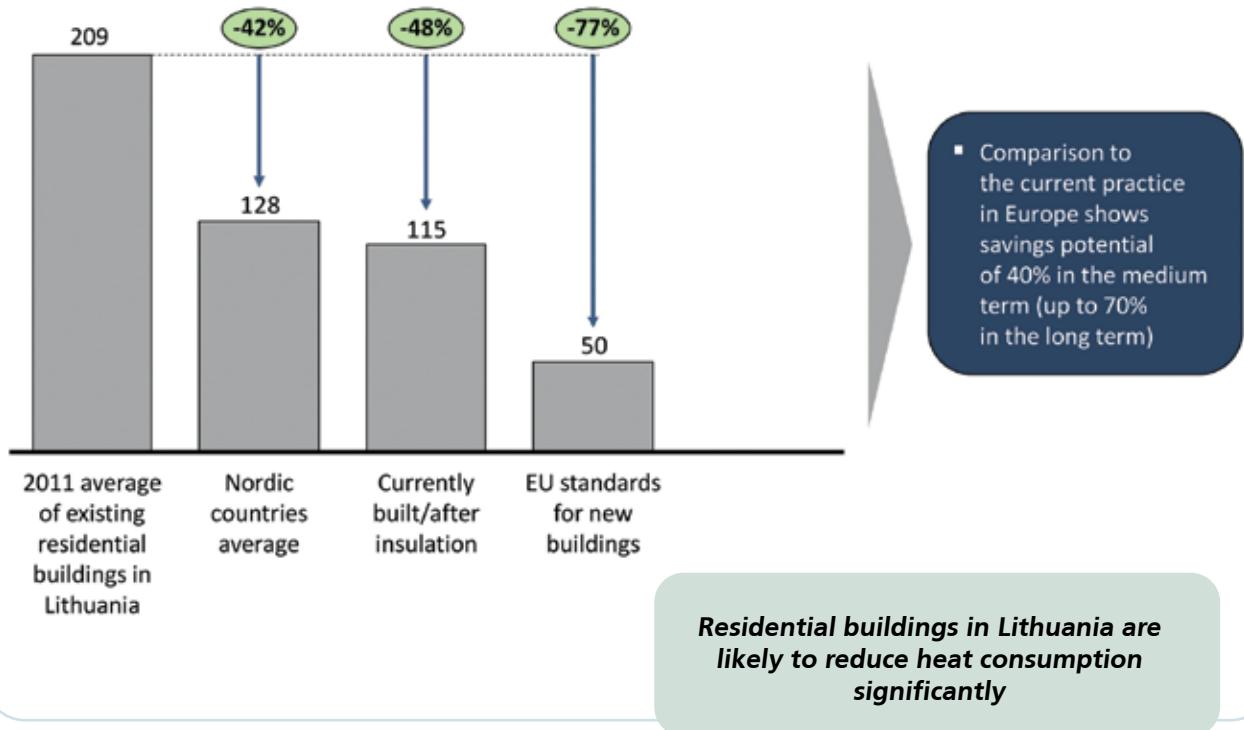
15. District heating production



30–40 % of final heat consumption. Lithuania will strive to realize most of the identified savings potential, as reducing heat consumption is very beneficial. It brings increased energy independence and positive impact on the local economy for the state, reduced heating bills – for energy consumers, and reduced pollutant and greenhouse gas emissions – for the environment. Therefore, Lithuania will implement all economically justified heat energy consumption efficiency initiatives.

69. Heat savings in production and distribution. Apart from savings in heating consumption, further savings will be sought in production and transportation of heat by gradually improving the heat production and transportation infrastructure. In heat transmission, as much as 0.4 TWh is expected to be saved annually by gradual replacement of outdated and insecure heat transmission grid. In heat production, savings will be achieved by replacing old less efficient boilers with newer more efficient boilers using biomass and by installing combined heat and power (CHP) biomass plants.

16. Average heat consumption in Lithuania, kWh per m² per year



Strategic Initiatives till 2020

70. **Heat consumption savings.** In Lithuania by 2020 the heat consumption will be reduced by 30–40 % in buildings the majority of which will have been insulated. In order to achieve this, sufficient financing has to be secured. Also, since the investment level is substantial, there is a need to prioritize insulation projects – houses in which the highest potential of heat consumption increase is expected will be renovated first:

1) the initiative will increase energy independence of Lithuania – consumption of gas for district heating will decrease. This will lead to annual savings of over 400 million LTL that would otherwise be spent on natural gas import. For households, investment into the efficiency of heat energy consumption will bring annual savings of approximately 600 million LTL on heating costs – or over 500 LTL per household;

2) renovation will also increase economic and social value of the renovated real estate, especially in the least energy efficient houses;

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HEATING

17. Costs and benefits of insulation

Benefits of insulation		Costs of insulation
	<ul style="list-style-type: none">Higher energy independence due to decrease in import of gas~400 million LTL annual savings on natural gas imports (0.34 bcm or 10% of total consumption in 2011)	✓
	<ul style="list-style-type: none">Current positive net value of investment – 600 million LTL annual savings on heating costs by final consumer (payback period ~10 years)Local construction and insulation companies benefit from insulation projects	✓
	<ul style="list-style-type: none">Decreased CO₂ emissions (~1.1 million tonnes or 5% of total greenhouse gas emissions of Lithuania in 2008)	✓

Investment into insulation is a financially viable decision

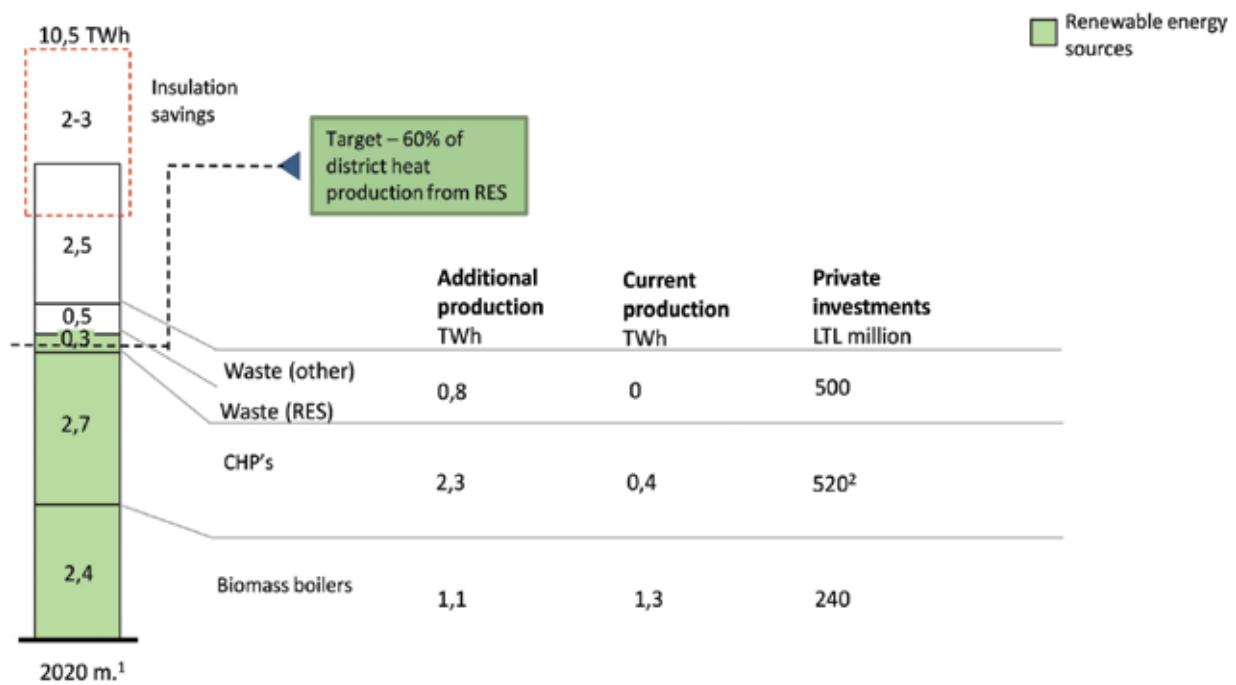
3) initiatives for heat efficiency will make the heating sector more environmentally-friendly by decreasing CO₂ emissions. As a result of efficiency gains, emission of 1.1 million tonnes of CO₂ equivalent in the heating sector will be prevented, which represents more than 5 % of total greenhouse gas emissions of Lithuania in 2008.

71. In order to achieve a substantial large energy efficiency improvement, 5–8 billion LTL will have to be invested in renovation of buildings. Renovation will be financed by the State, EU structural funds, and home owners. The estimated payback period is 10 years.

72. Increasing the share of renewable energy sources in the heating sector:

1) enhancing the use of biomass. The State will encourage economically viable investment into heat production from biomass with priority on biomass CHPs which will produce additional 2.3 TWh of heat. Another 1.1 TWh of heat will be produced each year in new biomass boilers. Investment into this production will not increase heat prices and will enable to achieve that the share of renewable energy sources of the final energy consumption balance in 2020 would make up not less than 23 %. Concrete decisions on capacities of biomass boilers or biomass CHPs will be adopted taking into account the particularity of heat consumption in separate central heating systems;

18. Renewable energy sources in district heat production



2) utilization of waste energy potential. Waste incineration plants will be first built in or near the largest cities. It is projected that the waste energy plants will produce 0.8 TWh of heat annually. Possible locations for other waste incineration plants will be decided upon at national level by ensuring the sufficient supply of waste for these plants;

3) use of solar energy. The use of solar energy for preparation of hot water will be encouraged;

4) use of residual heat. Wherever it is economically feasible, residual heat from electricity plants will be used for heating buildings (for example, heat released by AB Lietuvos Elektrinė in Elektrėnai could be used for heating buildings in neighbouring towns and localities).

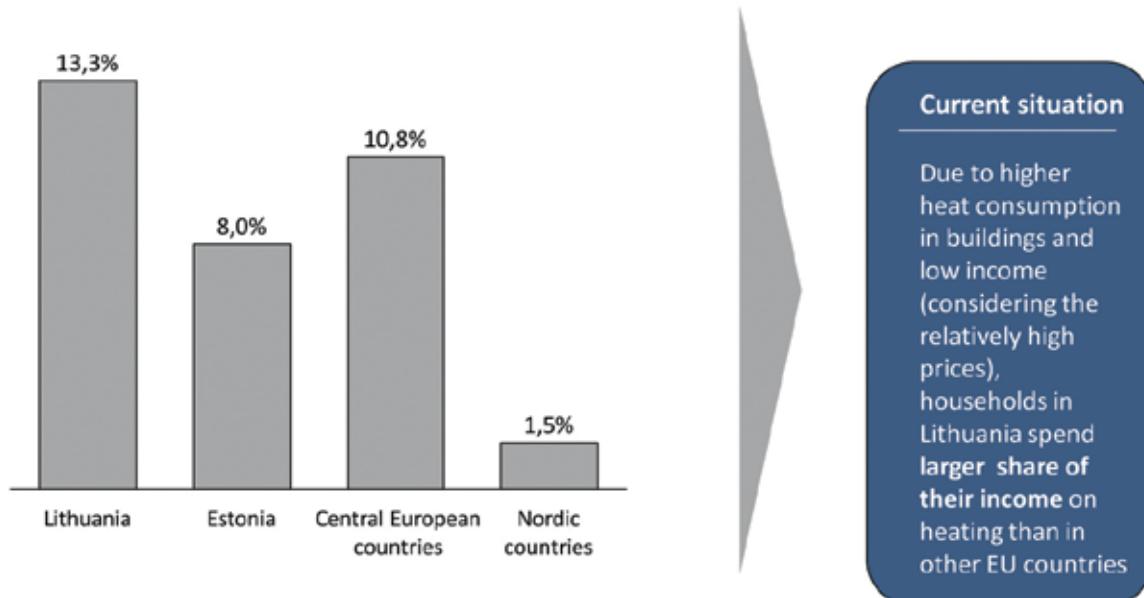
73. Increasing the level of competition and liberalization of the market. Ensuring the heat consumers' interest, the State will reform district heating sector introducing the principles of competitiveness, efficiency and transparency as well as main provisions of the 3rd EU Energy Package and the following guidelines:

- 1) unbundling the vertically integrated heat companies;
- 2) transferring part of functions in heating sector from municipalities to the State competence;
- 3) creating conditions for efficient competition among heat producers;

STRATEGIC OBJECTIVES

HEATING

19. Share of income spent for heating 50 m² living space



Lithuanian households spend larger share of their income on heating than those in other EU countries

- 4) establishing requirements which would bind energy companies to increase efficiency in heat transmission and consumption.

Reformation of central heating sector will create necessary preconditions to form heat production and distribution activities based upon fair competition rules. Transparent and efficient procedures for connection of new heat production facilities to the grid will be established, and by taking the advantages of energy resources exchange consumers will be secured with stable heat supply at a competitive and economically reasonable price.

Strategic Guidelines for 2020–2030

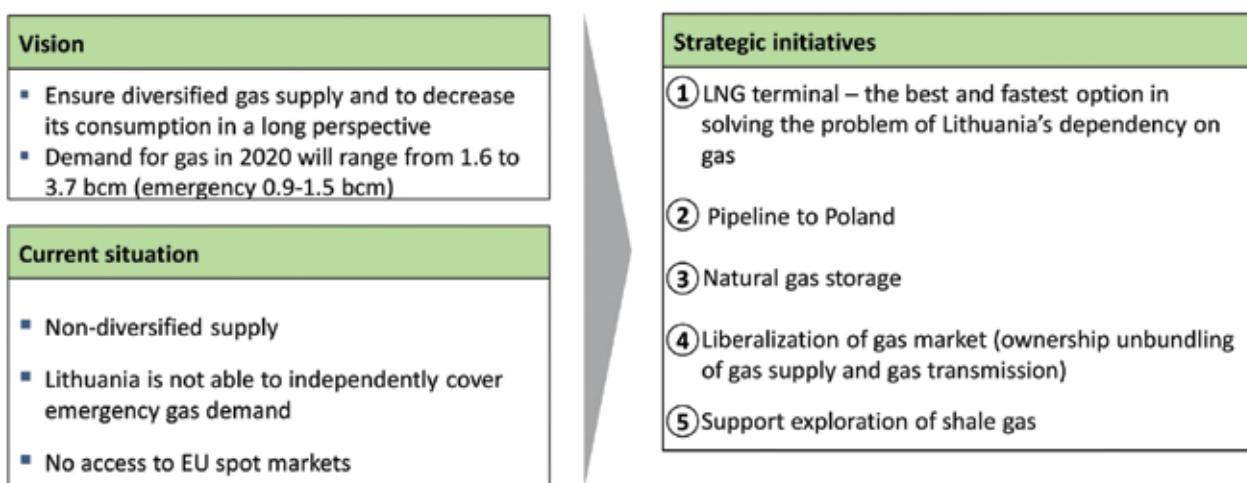
74. Continuing the trend of increasing energy efficiency, the demand for centrally produced heat should decrease by more than 3.5 TWh and amount to 6.5 TWh by 2030.

75. There are three major priorities in the district heating sector for the period from 2020 to 2030: increasing the efficiency of heat energy consumption, encouraging heat production from environmentally-friendly sources (renewable sources) and upgrading the heat production and supply system. Upon the implementation of these initiatives the Lithuanian heating sector will become stable, competitive and environmentally friendly.

Section 3

GAS

20. Gas sector strategy



76. The main objective for the gas sector is to ensure diversification of gas supply and in the long run decrease the consumption of gas by switching to renewable energy sources and nuclear energy.

77. Currently the gas sector is faced with the problem of its dependence: gas supply is not diversified, alternative emergency gas supply is not ensured and Lithuania has no access to international foreign markets.

78. In order to cover emergency gas demand from alternative sources, reliable supply of 0.9–1.5 bcm of gas should be provided (the demand for gas in 2020 is forecasted to reach 1.6 to 3.7 bcm). There are several alternatives to ensure reliable supply of gas of which the most viable option in terms of economy is the construction of a LNG terminal in Klaipėda.

Strategic Initiatives till 2020

79. **LNG terminal** is a priority project of the gas sector in order to decrease gas prices and to create the gas market. LNG terminal has these especially significant advantages: a) supply of natural gas will be diversified and the country will not be dependent on a single supplier of gas; b) it will make possible the implementation of the EU's

STRATEGIC OBJECTIVES

GAS

21. Gas infrastructure to secure energy supply: pros and contras

	 Key pros	 Key cons	 Preferred alternatives
A	 LNG terminal 	<ul style="list-style-type: none">Emergency reserve functionAccess to EU spot marketDiversification of supplyPotential for expansion for relatively low cost	<ul style="list-style-type: none">In small sizes, more expensive than UGSOperating on the gas spot market might require new skills to fully benefit from price arbitrage and to secure the emergency function
B	 UGS 	<ul style="list-style-type: none">Cheap in small sizesAll the emergency volume physically stored in Lithuania	<ul style="list-style-type: none">No diversification,Long and risky construction
C	 Pipeline to Poland 	<ul style="list-style-type: none">Attractive investment cost	<ul style="list-style-type: none">Functionalities dependent on contractual agreementsInvestments in reverse flow on Yamal would be needed to secure emergency function
D	 Combination of LNG and UGS 	<ul style="list-style-type: none">Summer/winter demand balancingHigher storage capacity than LNG terminal tanks only	<ul style="list-style-type: none">Lengthy process for UGS developmentRisk of unsuitability of currently identified sitesHigher capex than LNG solution providing the same emergency coverage

LNG terminal (potentially combined with UGS) is the most attractive gas supply option

N-1 infrastructure standard which will become valid in December 2014; c) emergency natural gas reserve function will be provided – Lithuania will be able to independently cover emergency demand for gas; d) the country will gain access to international gas markets; e) preconditions for forming a domestic gas market will be created; f) in comparison with the underground gas storage and the pipeline to Poland, the LNG terminal will provide the fastest solution (by the end of 2014) to the problem of dependence on gas imports.

80. In order to connect the terminal with Lithuanian gas transmission grid and to efficiently use the terminal's capacity, there is a need to build a gas pipeline to link up the terminal with the trunk gas pipeline and the Klaipėda–Jurbarkas gas pipeline to create a circular natural gas transmission system of Lithuania in addition to other modernisation works of the gas transmission system.

81. **Connection with Poland.** A gas pipeline between Lithuania and Poland is strategically important at regional level because it will connect the gas networks of the Baltic States with Poland and with Western European gas networks. This pipeline has benefits similar to the ones of the LNG terminal. However, Lithuania would not have full control over flows of gas in the pipeline, which is critically important in times of emergency.

82. **Underground gas storage (UGS).** As the strategic goal of the country is the availability of natural gas reserves, the underground gas storage would contribute to the achievement of the goal. It is a good alternative because the entire emergency volume would be physically stored in Lithuania. However, the UGS does not provide diversification of supply, ensure steady supply security and access to international gas markets. This project is best suited to be implemented together with the project of building a LNG terminal.

83. **Liberalization of gas market.** According to the 3rd EU Energy Package and in order to bring better level of services for gas consumers, the activities of gas transmission and supply must be separated by ownership unbundling. This will enable greater competition, ensure fair prices to gas consumers and more investment into development of gas infrastructure. What is more, the unbundling will allow easier supply of gas from different suppliers to the same customer.

84. **Shale gas.** According to initial estimations, Lithuania has nearly 500 bcm of shale gas in western part of the country out of which 100 bcm could be technically recoverable volumes. This amount would fulfil Lithuania's natural gas demand for around 30-40 years. It shows that shale gas can significantly contribute in strengthening energy security in Lithuania and in the region, because shale gas would:

- 1) decrease dependence on gas import;
- 2) increase security of supply;
- 3) foster developments of regional gas market and infrastructure in the Baltic States.

Therefore, Lithuania will support exploration of shale gas in the country and will support economically viable shale gas extraction and import in consistency with environmental principles. While exercising exploration and extraction of shale gas, the interests of the State, land owners and energy companies engaged will be taken into account.

Strategic Guidelines for 2020–2030

85. By 2020 Lithuania will have the LNG terminal and, depending on timing of the project completion, will have a gas interconnection with Poland. The country will have diversified gas supply and the adequate infrastructure; therefore, no major investments are planned for the sector during 2020–2030. In this decade further reduction of gas consumption in electricity and heat generation by switching to renewable energy sources and nuclear energy will remain a priority.

86. Depending on the technology development and the EU regulatory framework, Lithuania may consider opportunities of investment in other projects. For example, if shale gas is discovered in Lithuania by 2020, the country will thoroughly assess options of commercial shale gas extraction and potential of its supply.

Section 4

OIL

22. Oil sector strategy

Vision	Strategic initiatives
<ul style="list-style-type: none">▪ Ensure diversified supply of oil and oil products▪ Gradually replace oil products with renewable energy sources and increase competition in the Lithuanian market	<p>① Increase in competition in the oil sector to ensure low prices for the consumers:</p> <ul style="list-style-type: none">• Ensure <i>Klaipédos nafta</i> as a strategic and state attended company and maintain supply of oil products through the sea• Supply of oil products in most competitive way
<p>Current situation</p> <ul style="list-style-type: none">▪ Diversified oil and oil products supply through <i>Klaipédos nafta</i>▪ Sufficient back up supply reserves (for 90 days)▪ Sufficient infrastructure and refining capacities▪ Sufficient competitiveness not yet ensured	

87. 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 Klaipédos Nafta ensures alternative supply of oil and oil products. An oil products reserve of no less than 90 days is maintained.

88. The most substantial shortcoming of the oil sector is that there is not enough competition in the oil products' market and therefore consumer interests might be violated. Also, despite having the refinery in the country, prices for oil products are on average more expensive than in the neighbouring EU Member States.

Strategic Initiatives till 2020

89. **Increasing competition in the oil sector.** In order to guarantee supply of oil products by the sea, strategic state control of AB Klaipédos Nafta will be retained. In order to ensure favourable prices to customers, supply of oil products will be based on the most competitive way.

23. Oil sector: current situation

Area	Current situation	
Supply	<ul style="list-style-type: none">✓ Supply base diversified as oil is imported via the <i>Būtingė</i> oil terminal and oil products can be imported via <i>Klaipėdos nafta</i>▪ Local reserves limited (further exploration conducted, but potential limited)	
Infrastructure	<ul style="list-style-type: none">✓ Sufficient infrastructure for rail and ships	
Refining and storage	<ul style="list-style-type: none">✓ Refining capacities – 10 million tons annually▪ Sufficient reserves capacities (90 days)	<ul style="list-style-type: none">• While no major investments are necessary, economically viable projects can be implemented (i.e. capacity expansion of <i>Klaipėdos nafta</i>)
Demand	<ul style="list-style-type: none">✓ Oil products demand in Lithuania constant in the recent years, consumption amounting to ~2.6-2.7 million tons annually▪ 82% of oil products, refined in the <i>Orlen Lietuva</i>, are exported	

In the upcoming years there is no demand for major investments in the oil sector

Strategic Guidelines for 2020–2030

90. Consumption of oil products in the local market will gradually decline; crude oil for refinement will be imported from diverse sources; infrastructure will be adequate for the country's demand for oil and oil products. Therefore, investments will be largely directed towards maintenance of the existing infrastructure.

Section 5

RENEWABLE ENERGY SOURCES

24. Renewable energy sources sector strategy

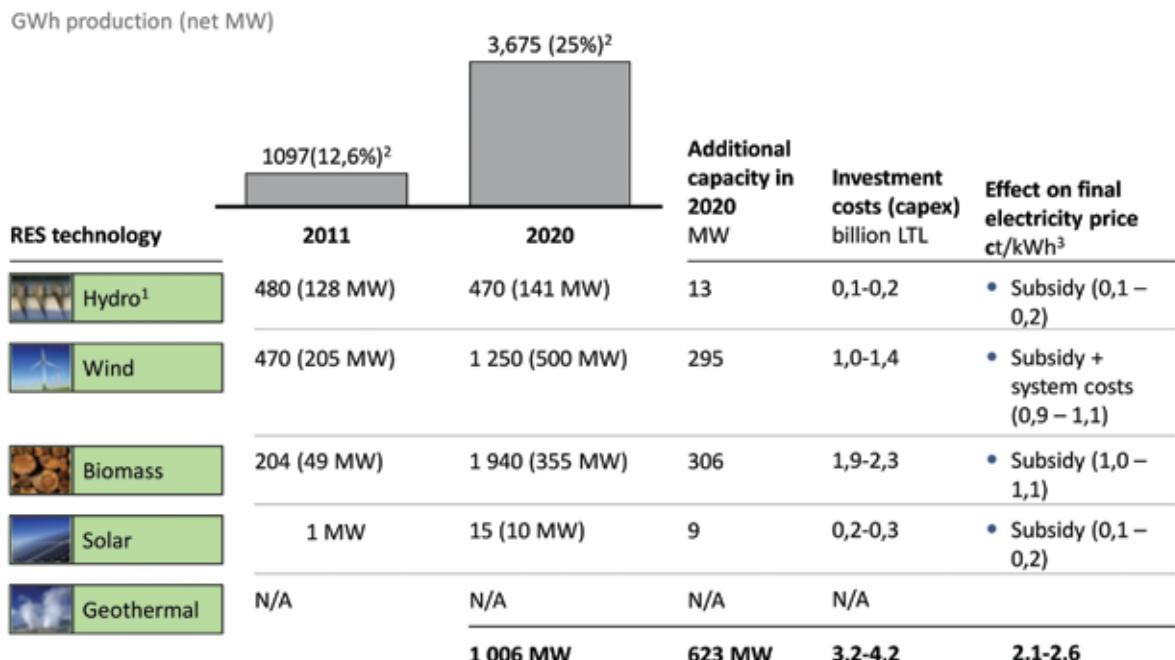
Vision	Strategic initiatives
<ul style="list-style-type: none">■ Increase in energy production from renewable energy sources in order to diversify energy-mix and boost energy independence■ Preference on the most economically feasible technical solutions	<p>① Increase in the share of renewable energy in electricity, heat and transportation – targets are aligned with overall EU goals</p> <ul style="list-style-type: none">— Electricity<ul style="list-style-type: none">• 20 % (mainly from biomass and partially wind)• Construction of the 5th unit of Kruonis Hydro Pumped Storage Plant— Heat<ul style="list-style-type: none">• 60 % of district heat production (from biomass)— Transportation<ul style="list-style-type: none">• 10 % from biofuels
<p>Current situation</p> <ul style="list-style-type: none">■ Current share of renewable energy sources in the final energy consumption is 20 %■ EU target for Lithuania for 2020 is 23 % of renewable energy sources in the final energy consumption■ Majority of energy from renewable energy sources is currently being produced from biomass	

91. With a view to reaching the goals set in the Strategy on Promotion of Renewable Energy Sources, the vision is to increase the share of renewable energy sources in the final energy consumption no less than 23 % by 2020 in order to substantially strengthen Lithuania's energy independence and reduce greenhouse gas emissions.

92. In 2011 the share of renewable energy sources in the final energy consumption amounted to around 20 %. The major portion of it is covered by biomass, which will continue to play a leading role in the energy production from renewable energy sources. Given Lithuania's natural conditions, the potential of wind and biomass energy is not fully exploited yet. Therefore, necessary technical, economic conditions and regulatory framework will be created for better usage of wind and biomass economically viable potential.

93. In its efforts to promote renewable energy, Lithuania will take steps to gradually introduce suitable and clear market conditions that would take into account total costs of energy produced from renewable energy sources, including back-up capacity, balancing and grid expansion costs. The state will also set priorities on the most economically viable renewable energy technologies.

25. Electricity production from renewables



1 Excluding Kruonis Hydro Pumping Power Plant

2 Of total electricity consumption

3 Mainly private investment

Increased electricity production from renewables is produced by combination of wind and biomass

Strategic Initiatives till 2020

94. Increase in the share of renewable energy sources in the final energy consumption:

1) electricity sector. The state will aim for not less than 20 % of electricity to be generated from renewable energy sources, mainly coming from biomass CHP plants and wind power plants. In order to reach this goal, in 2020 Lithuania will have installed wind energy power plants of 500 MW capacity, biomass CHP plants of at least 355 MW capacity, hydro electric power plants of 141 MW capacity and solar energy power plants of 10 MW capacity;

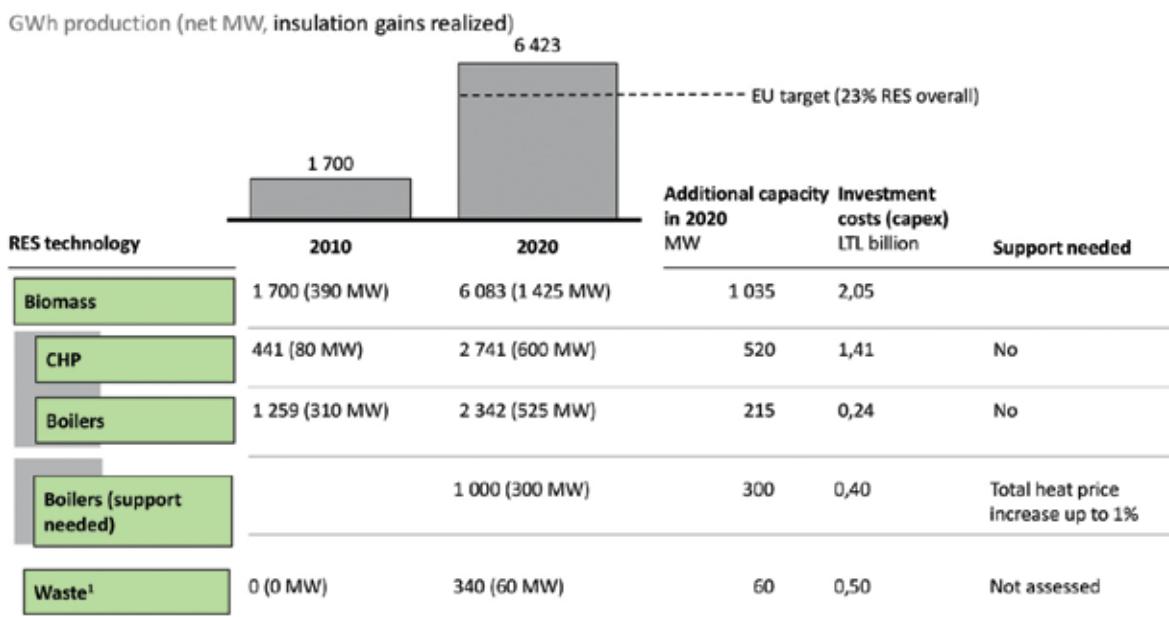
2) heating sector. In 2020 renewable energy sources will cover no less than 60 % of district heating sector, mainly by unlocking the biomass potential. In this regard, it is very important to ensure the availability of sufficient biomass resources at competitive prices. Infrastructure for wood biomass collection will be developed, proper management of flows of wood products will be ensured and the use of straw substantially increased;

3) transport sector. Renewable energy sources will account for no less than 10 % of fuel energy consumption.

STRATEGIC OBJECTIVES

RENEWABLE ENERGY SOURCES

26. Heat production from renewables



1 40% of energy production is considered renewable

Increased heat production from renewables is mainly from biomass in district heating sector

Strategic Guidelines for 2020–2030

95. During the period from 2020 to 2030 Lithuania will aim for higher sustainability of the energy sector, primarily through increasing the share of renewable energy sources in final consumption of the electricity, heating and transport sectors. The country will encourage investment into sustainable forms of energy production in accordance with technically feasible and economically beneficial prospects of increasing energy production from renewable energy. In this period transport sector will become more sustainable by gradual switch to more environmentally-friendly vehicles powered by electricity or vehicles running on alternative fuels, thus decreasing a negative impact of the transport sector on the environment.

Section 6

ENERGY EFFICIENCY

27. Energy efficiency strategy

Vision	Strategic initiatives
<ul style="list-style-type: none">■ Increased energy efficiency in all areas of the final energy consumption	<p>① Increase in total energy consumption efficiency by 1.5 % annually until 2020</p> <p>Greatest potential identified in:</p> <ul style="list-style-type: none">• Households and public sector buildings (increase in heat consumption efficiency)• Transport• Industry
Current situation <ul style="list-style-type: none">■ Energy consumption in Lithuania is 2.5 times higher per GDP unit than EU average■ Energy savings potential is especially high in the households' and transport sector	

96. The energy consumption per unit of GDP is 2.5 times higher than the EU average and can be reduced significantly if the overall energy savings are increased.

97. The total savings potential of final energy consumption in Lithuania by 2020 is approximately 17 % compared to the final energy consumption in 2009 (not including the increase in energy consumption caused by the growth of GDP). Realization of this potential would imply yearly savings of 740 kilotons of oil equivalent (ktoe) by 2020.

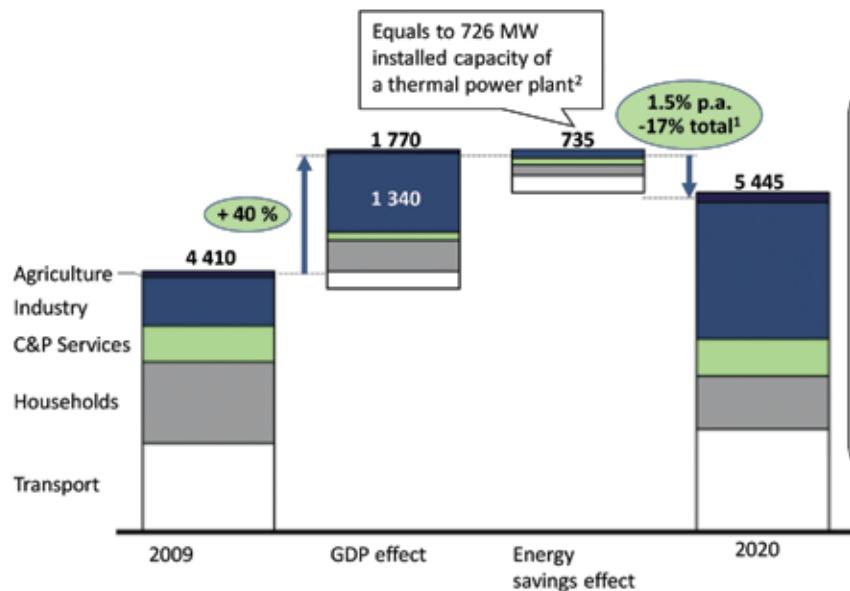
98. The largest saving potential exists in the household and transport sectors, where energy efficiency measures constitute 65 % of total energy savings. The potential for households amounts to 290 ktoe and for the transport sector – 300 ktoe.

99. Taking into account the total amount of energy that can be saved the overarching strategic goal in energy efficiency is to achieve 1.5 % annual savings of the total final energy consumption by 2020.

STRATEGIC OBJECTIVES

ENERGY EFFICIENCY

28. Final energy consumption, Ktoe



- Based on a study by the Energy Economics Group that was adopted into the Lithuanian National Energy Efficiency Program 2011-15
- Savings potential is calculated assuming high policy intensity in promoting energy efficiency measures in given areas

Total energy savings potential in Lithuania until 2020 is ~17%

Strategic Initiatives till 2020

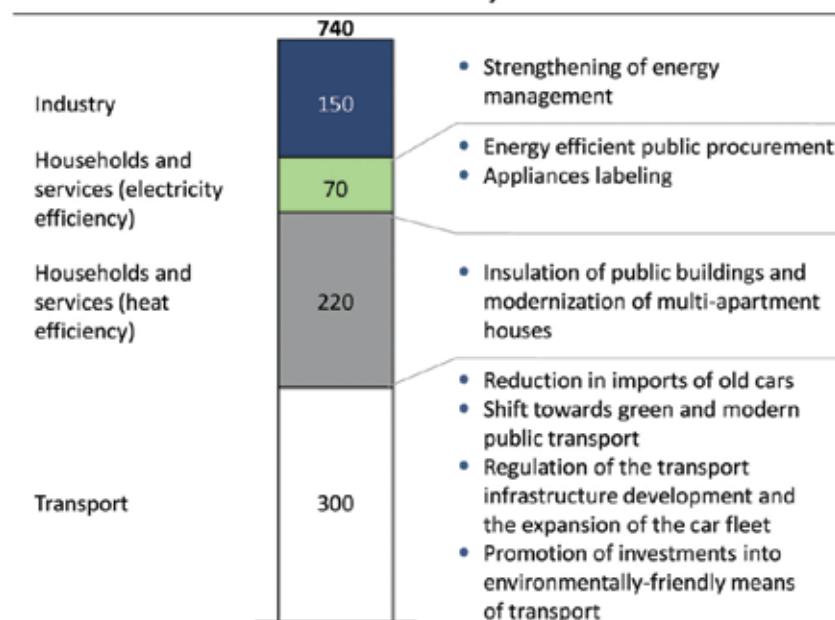
100. Increase total energy consumption efficiency:

1) in residential and public buildings. Energy efficiency will be increased by insulation and modernization of buildings. It will bring 220 ktoe energy annual savings from efficient heating and 70 ktoe savings will be reached by public procurement promoting efficiency and greater use of more efficient appliances;

2) in the transport sector. Energy efficiency of the transport sector will be improved by measures to promote the renewal of car fleet in the country, a shift towards modern and environmentally-friendly public transport, optimizing transport infrastructure and promoting investments into environmentally-friendly means of transport.

29. Energy savings till 2020, Ktoe

Energy savings till 2020
Ktoe



Current situation

- Insulation – very slow progress
- Transport – specific measures to be developed to achieve energy savings in transport sector

Insulation and transport improvements are the biggest energy efficiency levers

Strategic Guidelines for 2020–2030

101. By 2030 the energy efficiency of Lithuanian energy sector will be gradually approaching the EU average. The Lithuanian Government will set substantially stricter energy efficiency norms for new buildings and will take measures to increase energy efficiency in the transport sector. The country will aim for at least 1.3 % annual improvements in energy efficiency.

Section 7

ENVIRONMENT AND THE REDUCTION OF CO₂ EMISSIONS

30. Environment protection and CO₂ reduction strategy

Vision	Strategic initiatives
<ul style="list-style-type: none">Energy sector is environmentally friendly and meets international environmental conventions such as the Kyoto protocol, EU Climate Change Package	<p>① Several measures are in place to decrease the emission levels:</p> <ul style="list-style-type: none">Construction of a new nuclear power plantIncrease in production of energy from renewable energy sourcesIncrease in energy efficiency <p>Lithuania will meet all relevant targets of EU and international environmental conventions agreed upon for 2020</p>
<ul style="list-style-type: none">Sharp decrease in CO₂ emissions after 1990Increase of CO₂ emissions in 2010 due to closure of Ignalina NPP and increased use of older thermal plants whose operation is based on fossil fuels. Increase in CO₂ emissions has been mitigated by importing a part of electricity	

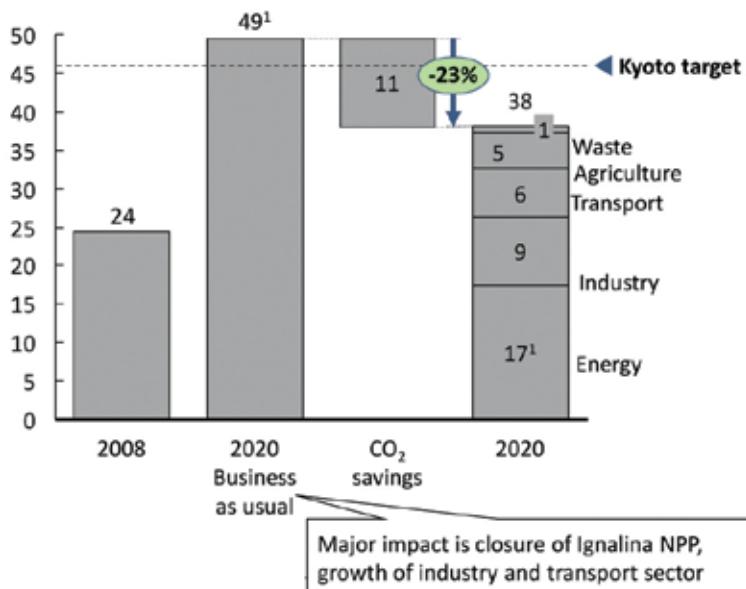
102. Up until the end of 2009, Lithuania had a good record of greenhouse gas emissions compared with other EU countries. However, at present Lithuania is facing a major rise in greenhouse gas emissions due to the closure of Ignalina NPP and the resulting increase in use of older thermal power plants.

103. The implementation of diverse measures reducing greenhouse gas emissions would allow not emitting additionally 11 million tons of greenhouse gas emissions in CO₂ equivalent by 2020. This amounts to 46 % of the actual greenhouse gas emissions in 2008 or 23 % of greenhouse gas emissions anticipated in 2020.⁴ The industry, agriculture, and electricity production sectors have most potential for the reduction. There is a potential to reduce the emissions by approximately 20–30 % in each of the three sectors. Greenhouse gas emissions in the transport sector can be curbed by 5–10 %.

104. Lithuania is already taking a number of measures to decrease the level of CO₂ emissions. Three measures, which are thoroughly described in other parts of the Strategy, will have the largest impact:

⁴ Ministry of Environment of the Republic of Lithuania, 2010. Fifth National Report of the Republic of Lithuania on the Implementation of the United Nations Framework Convention on Climate Change.

31. GHG emissions, Million tones of CO₂ equivalent



- Specific target set by EU on non-ETS GHG (all apart from energy and industry sectors) – max 15% GHG increase compared to 2005 – will be reached (projections indicate max 14% increase)
- Lithuania will contribute to the EU target in the ETS sectors to reduce the GHG by 21 % compared to 2005

Major impact is closure of Ignalina NPP, growth of industry and transport sector

¹ Exact size dependent on the share of electricity imports versus local production in 2020

Currently planned measures in CO₂ reduction are sufficient to meet international targets

- 1) construction of the regional Visaginas nuclear power plant;
- 2) increasing energy production from renewable energy sources;
- 3) increasing efficiency of energy consumption.

105. Timely and comprehensive implementation of these measures will enable Lithuania to tap the full potential of curbing greenhouse gas emissions and significantly limiting their maximum increase by 2020 as required by the EU Energy and Climate Package⁵. If the three initiatives are not implemented, less economically effective, alternative measures of reducing the emissions will have to be taken.

⁵ EU energy and climate change package includes Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community; Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC; Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006; Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC; Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO₂ emissions from light-duty vehicles.

STRATEGIC OBJECTIVES

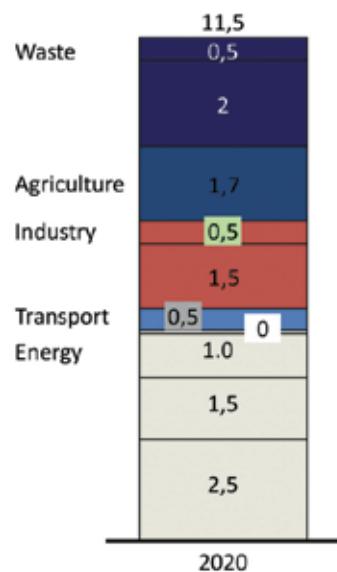
ENVIRONMENT AND THE REDUCTION OF CO₂ EMISSIONS

32. GHG savings, Million tones of CO₂ equivalent

GHG savings

Million tones of CO₂ equivalent

Main GHG savings levers



- Lowered amounts of landfilled biodegradable municipal waste
- Use and collection of methane from all existing and new landfills

- Implementation of the nitrates directive

- Change of cement production technology
- Joint Implementation Projects in other countries

- Stimulation of biofuel production and consumption

- Promotion of CHPs (combined heat and power production)
- Increase of energy efficiency
- Increase of the use of renewable energy sources
- Construction of new nuclear power plant

Several planned projects will have significant impact on expected greenhouse gas emissions

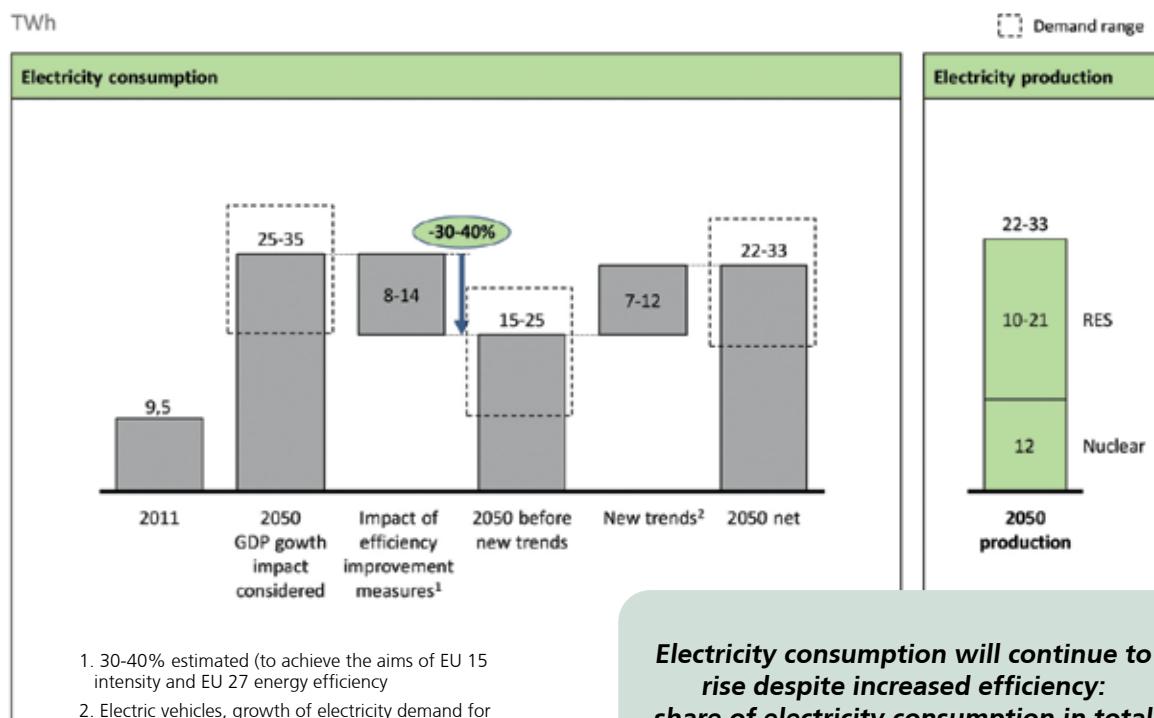
106. In the period from 2020 to 2030 period greenhouse gas emissions will further decline due to continuous increase of energy production from renewable energy sources and gains in the efficiency of energy consumption (on average by 1.3% annually).



3
rd chapter

VISION OF LITHUANIAN ENERGY SECTOR UNTIL 2050

33. Electricity consumption forecast 2050



Electricity consumption will continue to rise despite increased efficiency: share of electricity consumption in total final energy consumption will increase from 15% in 2009 to ~50% in 250

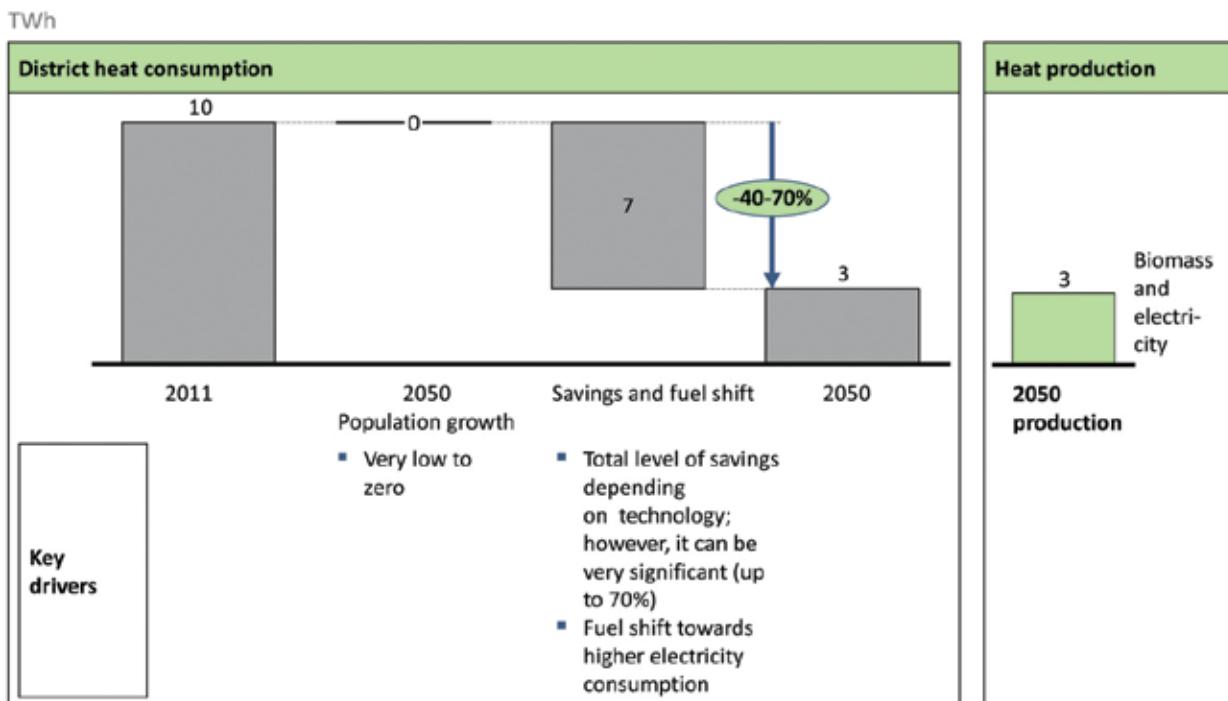
107. The Strategy's key objective for 2050 is the increased focus on sustainability in the energy sector. The basic principles of the energy sector will remain the same: energy independence, sustainability and competitiveness. In line with EU policies and in order to create a more environmentally-friendly energy sector, the state will drive the energy sector according the principles of sustainable development.

108. Lithuanian energy mix will gradually shift towards production based only on carbon free fuels:

- 1) electricity production will shift towards nuclear power and renewable energy sources;
- 2) heat will be produced from renewable energy sources;
- 3) there will be a significant increase in energy consumption efficiency.

109. In 2050 Lithuanian consumers will use significantly more electricity (22–33 TWh), mostly due to a shift towards use of electricity-based technologies and electric vehicles. After 2030 electricity generation will gradually become more decentralized and, in order to provide for adequate functioning of the electricity system, the state will need to create a legal and functional decentralized electricity regulation environment. A system that

34. Heat demand forecast 2050



Heat demand is forecasted to decrease significantly till 2050 and will be fully covered through production from biomass and electricity

will efficiently balance centralized and decentralized electricity generation will be created. To this end, higher investment levels into economically beneficial smart grid technologies will be necessary.

110. It is expected that in the period till 2050 breakthrough technological changes will occur having a profound positive impact on the energy sector, i.e. energy production and consumption will be considerably effective. One of the areas of improvement will be the heating sector, where technological improvements in energy efficiency will lead to up to 70 % reduction of heat used as compared to 2011.

111. The generation of electricity and heat based on environmentally-friendly technologies will enable Lithuania to achieve the EU goals to reduce greenhouse gas emissions by 40 % and 60 % till 2030 and 2040 respectively and reach 80 % reduction of greenhouse gas emissions by 2050.

112. In the long run, economics of current technologies will change substantially and new revolutionary technologies that are not yet 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.

35. Reaction of Lithuania to dramatic technological development

Develop own capabilities and competence

- Training of specialist and scientific research supporting topics most relevant to the Lithuanian energy strategy and to build and export competence
 - Nuclear energy, safety and radioactive waste management
 - Decommissioning of nuclear power plant
 - Build up of new nuclear power plant and related supply chain
 - Environmentally friendly technologies
 - IT and grid competence

New trends

- Positive attitude towards new trends
- Constantly following new trends in the energy sector and selecting of technologies suitable for adoption

Wait and see

- Wait and see approach for certain technologies – adopt once proven and economically feasible for Lithuania
 - Electric cars – wait with major investments into infrastructure until it is proven as a dominant trend
 - CO₂ geological storage
 - Distributed generation and energy storage

Update Strategy every few years to reflect on these changes

Lithuanian National Energy Independence Strategy needs to be continuously updated

113. Lithuania will timely react to the predicted technological development. In order to stay competitive and make good use of new trends and technologies, **Lithuania is going to:**

1) develop its own capabilities and competences. This includes training of specialists and developing scientific research in areas most relevant to Lithuanian energy sector, in particular: nuclear energy, nuclear safety, radioactive waste management, nuclear decommissioning, power system management and environmentally-friendly technologies (renewable energy and CO₂ management);

2) monitor existing technologies that are promising but not yet economically beneficial for development in Lithuania. Among others, 3 technologies will be followed: electric cars, carbon capture and storage, distributed generation;

3) analyse new tendencies in the energy sector, choose and adopt technologies suitable to Lithuania.

114. With regard to the importance of the priority of sustainable development of the energy sector, it is important not only to consider the technological dimension, but also to promote awareness on energy saving in the society. With a view to increasing efficiency of energy consumption in multi-dwelling buildings, private transport,

trade and service sectors, Government will devise programmes on promoting positive energy consumption habits in the society. These programmes will, first of all, include:

1) **informing** – constantly providing information to consumers about energy-efficient products, alternative energy sources and ways to save energy in daily life;

2) **motivating** – creating favourable financial conditions for consumers to purchase energy-efficient products and encouraging them to save energy by means of mass media;

3) **obligating** – energy saving as an obligatory social norm.

115. The Strategy will be continuously updated to keep track of technological and infrastructural developments in the energy sector.



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