

# CURRENT TRENDS AND FUTURE ROLE OF RENEWABLE ENERGY SOURCES IN LITHUANIA

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## Abstract

Paper describes current status, specific features and future trends in the Lithuanian energy sector particularly trends in usage of renewable energy sources during the period 1990-2008. High dependence on energy import from Russia after closure of Ignalina Nuclear Power Plant and necessity to comply with country's international obligations are factors stimulating faster growth of renewable energy sources use for energy needs by 2020. However, owing to striking economic decline and still existing administrative obstacles possibilities to support required investments into new technologies using renewable energy sources are limited. The paper focuses on analysis of existing potential of renewable sources by their forms, scenarios of their utilization and the role of renewable energy sources for the future energy needs in Lithuania.

Keywords: renewable energy sources, energy balance, national target on renewable energies

## 1. Introduction

To avoid or at least to reduce climate change the European Union has proposed an ambitious plan of the European Union committing to increase the share of renewable energy sources in primary energy consumption to 20% and a mandatory target of a 20% share of renewable energy sources in the gross final energy consumption in the EU countries by 2020. In the Annex I of the EU Directive on promotion of renewable energies, overall targets for the share of energy from renewable sources in the gross final energy consumption are presented. For Lithuania the target of 23% is planned (Directive, 2008). This national target is supplemented also by the indicative trajectory of its implementation. However, comprehensive analysis of existing potential by forms of renewable energy sources and their contribution into energy balance by sectors of the national economy is required. Based on this analysis, relevant measures necessary to reach this mandatory target as well as corresponding support mechanisms for the promotion of energy from renewable sources should be prepared.

The Lithuanian energy sector constructed through 1990 was oriented towards large, but inefficient energy consumption, as well as towards considerable exports of electricity and refined oil products. The energy policy in the former Soviet Union was based of principles of central planning and was directed to creation of strongly integrated energy systems. Prices for natural gas, oil products and coal were comparatively stable during decades and rather low. Contribution of indigenous resources was low because imported primary energy in Lithuania was used not only for internal needs but also for exports of electricity and refined petroleum products. Owing to very high dependence on import of primary energy sources from Russia the Lithuanian Government since early 1990s was concerned with political and economic consequences of this dependence. Therefore stimulation of increased use of renewable energy sources was one of the main strategic objectives in the country's energy policy.

During the process of accession, one of the country's obligations was decision on the final closure of Ignalina Nuclear Power Plant (NPP), major source of electricity generation with a share of more than 70% during the period 1987-2008. Electricity generation will become heavily dependent on import of fossil fuels, mostly of natural gas. Significant increase of electricity generated from renewable energy sources could reduce this dependence. Increase of district heat generation from renewable energy sources and substitution of motor gasoline and diesel oil by liquid bio-fuel are also important factors stimulating stable growth of the shares of renewable energy sources in the primary energy balance and the final energy balance. However, due to global economic recession and current striking decline of the Lithuanian economy country's possibilities to implement adequate instruments of financial support during the period 2009-2014 will be limited.

The aim of this paper is to set out some findings from analysis of the Lithuanian energy sector development during the period 1990-2008, to focus on changes in the country's energy balance and contribution from renewable energy sources as well as to examine future trends and feasible scenarios their larger use in Lithuania.

## **2. Current status and trends of primary energy consumption**

One of important features of the Lithuanian energy sector is very high dependence on primary energy supply – the country depends on Russia for 100% of its natural gas, and for more than 90% of its crude oil and almost 100% of coal requirements. Prices for natural gas, oil products and coal were comparatively stable and rather low for long time. Such policy has provided little incentives to use indigenous energy resources in Lithuania. In 1990, their share in the country's primary energy balance was only 2.6%. Primary energy resources in Lithuania are rather scarce. Nevertheless their share in the structure of country's primary energy balance during the period 1990-2008 increased by 4.4 times. As one can see from Fig. 1, oil and oil products were over several decades the most important fuels in Lithuania (Statistics, 2004, 2006, 2007, 2008, 2009a). However, since 1990 their share in the primary energy balance has been fluctuating in comparatively large range – from 44.2% in 1991 to 25.6% in 2003 with clear tendency of reduced role of heavy oil products due to decreasing consumption of heavy fuel oil for production of electricity and district heat. During the period 2003-2008 contribution of oil products was increasing due to fast growth in consumption of motor fuel and in 2008 it was equal to 31.7%.

At present natural gas is another of the most important fuels in the Lithuanian primary energy balance. At the beginning of transition period its role was decreasing because of sharp increase of prices for this fuel. Later on changes in natural gas consumption were related mostly to development of prices for heavy fuel oil and natural gas because the largest power plants in Lithuania are dual-fired. The share of natural gas, the most attractive fuel in a long-term perspective, was about 25% over the period 1990-2008. It decreased from 29.0% in 1990 to only 16.7% in 1993. In 2007, volume of natural gas consumption increased by 17.8%, and its share in the primary energy balance has reached the value of 30.9% mostly due to sharp increase (by 1.9 times) of gas used for production of mineral fertilizers. In 2008, the share of this fuel decreased again to 27.9 %.

The role of coal has decreased throughout the period – from 4.8% in 1990 to 1.0% in 2001 and increased to 3.0% in 2006 but decreased again to 2.2% in 2008.

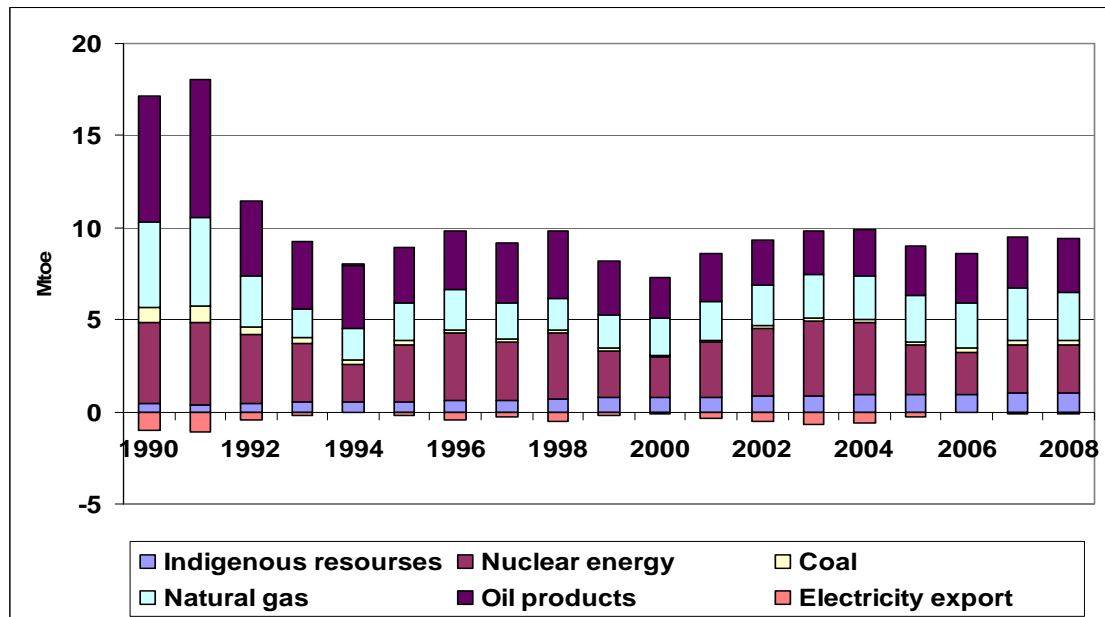


Figure 1. Primary energy consumption in Lithuania

During the transition period to a free market economy the share of the nuclear – the cheapest imported fuel – was quite high in the Lithuanian primary energy balance fluctuating about 30% with the lowest value of 19.7% in 1991 and the highest value of 37.0% in 2003. The role of nuclear fuel was very important because being comparatively cheap it helped to relieve some burden of balance of payments and therefore softening social problems. Nuclear fuel helped to increase the security of the primary energy supply, especially in the power sector. Even after closure of Unit 1 at Ignalina NPP in 2004 the role of nuclear energy in the primary energy balance is still rather high – in 2008 its share in the primary energy structure was equal to 26.8%.

Total primary energy supply during the period 2000-2008 was fluctuating due to changes of nuclear fuel required for export of electricity which was generated at Ignalina NPP. Owing to fast economic growth during this period primary energy consumption for internal country's needs was increasing on average by 3.5% per year.

### 3. Current status and trends in consumption of indigenous and renewable energy sources

Indigenous energy resources in Lithuania are rather scarce. Nevertheless their contribution into the country's primary energy balance during the period 1990-2008 was increasing. As it is shown in Fig. 2 (Statistics, 2004, 2006, 2007, 2008, 2009a), so far the main domestic energy resource is wood (including wood waste, boughs, wood chips, pellets, sawdust and waste from agriculture). One can see a tendency of steady growth of local oil extraction from 12 thousand tonnes in 1990 to the maximal amount of 471 thousand tonnes in 2001 and its significant reduction during last few years to 128 thousand tonnes in 2008 (Statistics, 2009a). In 2008, its extraction was about 17.1% lower than in 2007. Certain contribution into balance of indigenous resources is originated from energy of chemical processes. Contribution of heat utilized at factories producing mineral fertilizers was fluctuating with the highest value of 19.6% in 1990 and the lowest value of 5.8% in 1994. In 2008, their share was equal to 16.8%. This energy corresponds to the content of the thermal energy gained in the chemical processes (production of fertilizers), which is transferred into hot water and steam. In 2008, share of indigenous resources was 11.4% (including domestic oil this indicator was about 12.8%).

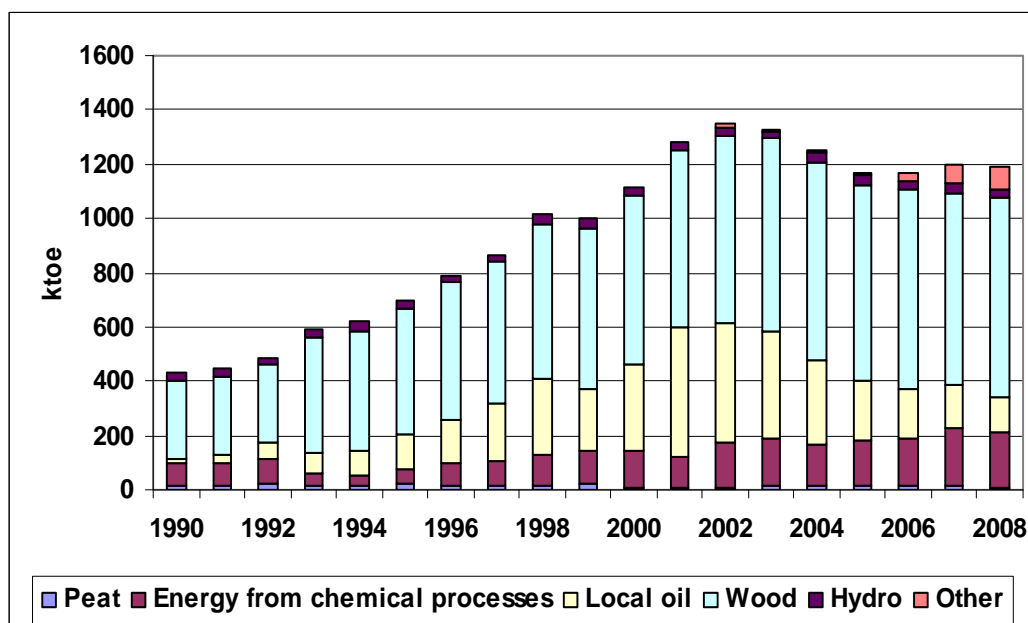


Figure 2. Production of renewable and other local energy resources in Lithuania

Due to limited indigenous resources contribution of renewable energy sources is especially valuable. It could be illustrated by several indicators. The most aggregated are the following:

- share of renewable energy in the country's primary energy balance;
- share of green electricity in the gross electricity consumption;
- and share of renewable energy resources in final consumption.

As one can see from Fig. 3, share of renewable energy in the primary energy balance is growing but with some fluctuations which are caused mostly by different volumes of electricity exported to neighbouring countries and by corresponding consumption of nuclear energy (Statistics, 2004, 2006, 2007, 2008, 2009a). This indicator was the highest in 2006 with 9.2% (in 2008 it was equal to 9.1%). In a case the share renewable energy sources in the primary energy consumed for internal needs only is calculated, fluctuations of this indicator over the period 2000-2008 are much smaller – in the range of 9.1-9.6%.

Fluctuations of the green electricity share are related to changes in gross electricity consumption and in volumes of its generation by hydro power plants. The largest contribution of green electricity was in 2007 with 4.7%, and in 2008 it was slightly less – 4.6%. The share of renewable electricity will increase faster in a near future as a result of planned construction of new wind power plants.

At present the main aggregated indicator, used in the EU-27 countries, is the share of renewable energy sources in the balance of final consumption. The highest value of this indicator was 15.7% in 2002. Despite increased usage of renewable sources by final consumers this indicator was decreasing during the period 2003-2007. The reason of its reduction was fast growth of final consumption (stipulated by very fast growth of the national economy), in particular high growth rates of fuel consumption in the transport sector (during the period 2000-2008 motor fuel was growing on average by 7.2% per year). In 2008, the share of renewable energy sources in the balance of final consumption increased again to 15.2%.

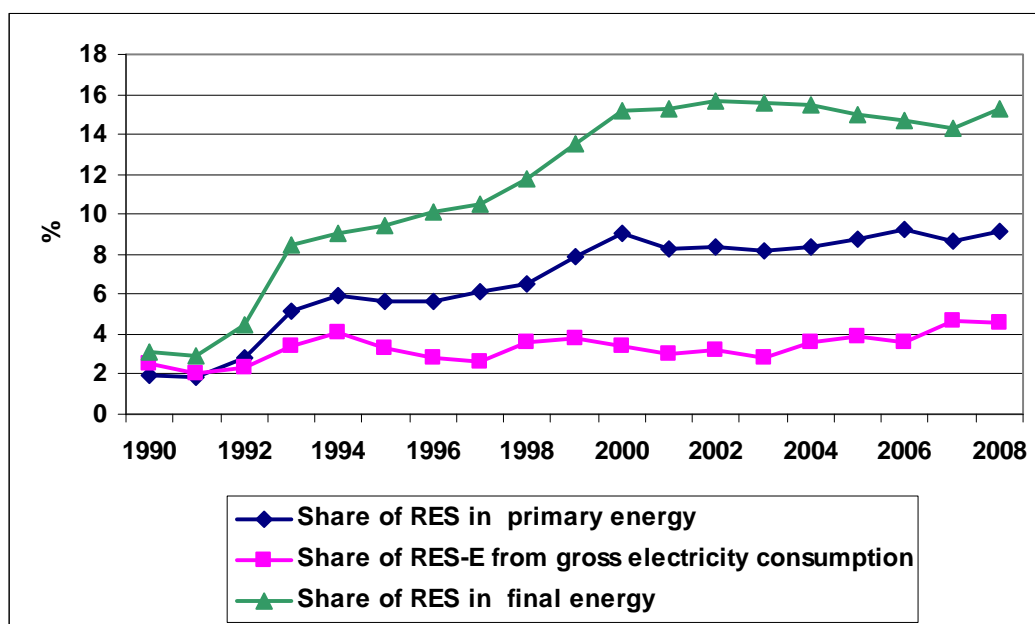


Fig. 3. Relative indicators of renewable energy sources contribution

Alterations in consumption of renewable energy sources by energy forms and by sectors are presented in Table 1 and Table 2 (Statistics, 2004, 2006, 2007, 2008, 2009a).

Table 1. Development of consumption of renewable energy sources by their forms, ktoe

	1990	1995	2000	2004	2005	2006	2007	2008
Firewood and waste wood	284.7	461.3	619.8	729.5	718.5	732.3	706.0	735.0
Hydro	35.6	32.1	29.2	36.2	38.8	34.2	36.2	34.6
Wind energy				0.1	0.2	1.2	9.1	11.3
Bio-fuel				0.8	3.6	21.4	53.6	61.4
Other sources				8.4	7.4	5.4	8.4	6.8
Total	320.3	493.4	649.0	775.0	768.5	794.5	813.3	849.1

Table 2. Development of consumption of renewable energy sources by sectors, ktoe

	1990	1995	2000	2004	2005	2006	2007	2008
Industry	10.8	18.1	29.1	97.5	96.8	86.0	85.3	78.9
Construction	1.2	2.5	2.4	5.7	4.4	5.5	5.2	4.2
Agriculture	4.5	5	6.5	7.9	6.5	6.5	9.0	9.9
Transport	0	0	0	0.8	3.6	21.4	53.6	61.4
Trade and public services	40.6	26.4	40.7	31.3	31.0	30.7	30.0	30.1
Households	215	396	501	437.8	432.6	431.5	400.9	402.3
Total end-use	272.1	448	579.7	581.0	574.9	581.6	584.0	586.8
Energy generation	48.2	45.4	69.3	194.0	193.6	212.9	229.3	262.3
Total	320.3	493.4	649.0	775.0	768.5	794.5	813.3	849.1

During the period 1990-2008 primary energy supply from renewable sources increased by 2.7 times with an average annual growth of 5.6%. The largest proportion in the structure of renewable energies still comes from combustible sources. Firewood and waste, including boughs, wood chips, pellets, sawdust and agricultural waste, account for 86.6%. The second largest

renewable source is bio-fuel (used as motor fuel). In 2008, a share of bio-ethanol and bio-diesel (methyl ester) was 7.2%. Hydro power was fluctuating and currently provides only 4.1%. Contribution from all other sources (biogas, agricultural waste, wind power, solar and geothermal energy) is still very low – 2.1%.

As one can see from data presented in Table 2, changes in the structure of consumers are rather significant, in particular during the period 2000-2008. In 2000, a share of renewable sources, used for energy generation, was only 10.7% but their consumption for this purpose during last eight years was increasing by 18.1% per year. In 2008, a share of renewable sources for energy generation increased to 30.9%. Consequently share of final consumption in branches of the economy during this period decreased from 89.3% in 2000 to 69.1% in 2008. Changes in the structure of final consumers are also significant. In 2000, the household sector was dominating with a share of 86.4%, following by the trade and public services sector with 7.0%, industry with 5.0%, agriculture with 1.1% and construction with 0.4%. During the period 2000-2008 a share of the household sector decreased to 68.6% and a share of the trade and public services sector – to 5.1%. At the same time a share of industry increased to 13.4%, the transport sector – to 10.5%, agriculture – to 1.7% and construction – to 0.7%. However, more detailed analysis of energy consumption for space heating and hot water preparation in the household sector shows that volumes of firewood during the period 2002-2008 should be by about 20-25% bigger than figures presented in the official country's energy balances. In a case statistical data are correct, up to 25% of premises in living houses, not connected to district heating systems, are unheated.

#### **4. Methodology of performed analysis**

The analysis of contribution from renewable energy sources into the country's energy balance is based on scenario approach. Scenarios are internally consistent and assessment of different options of the energy sector development consists of two parts (Miskinis and Galinis, 2006): 1) forecasting of the final energy and final electricity demand; 2) optimization of the power sector development options, which allows to assess necessity of installation of new generation units, including new power plants using renewable energy sources and modernization of existing units taking into consideration various constraints, the projected energy demand, energy policy guidelines, and impact of the energy technologies on air pollution, etc.

Forecast of the final energy and final electricity demand was based on the application of an econometric model taking into consideration future changes in the main macroeconomic indicators, characteristics of the development of various branches of the national economy, changes in energy prices, reactions of consumers to changes in their income (or economic activities) and energy prices.

Analysis of the impact of various factors on the final energy demand was based on assumptions that five the most important factors influencing its future changes are the following: GDP growth rate, income elasticity, increase of energy price, price elasticity, and additional energy saving. Sensitivity of forecast was analysed by applying the methodology of uncertainty (Miskinis et al, 2006). Different combinations of the main factors mentioned above were prepared by application of the SUSA programming code (Kloos and Hofer, 1999). Combinations generated by this code are formed using as input data values of the main parameters with their feasible minimal and maximal bounds and assumptions about their probability distribution within this range.

Previous forecast of the final energy and final electricity demand prepared in various studies was based on assumption that comparatively rapid economic growth in Lithuania will persist in the coming two decades. For instance the basic scenario in the National Energy Strategy is based on

the most likely development trends, assuming that GDP growth rate would be on the average 4.5% during the period 2005-2025 (NES, 2007). Owing to the global economic recession the national economy will shrink significantly in 2009 and possibly in 2010. Therefore energy demand projections presented in the previous studies require revision.

Evaluation of economic effectiveness of utilization of renewable energy resources, construction of new energy generating capacities, modernization of existing energy technologies, implementation of appropriate environment protection measures, etc. is a complex problem. It can be correctly performed by analysing future development of the energy sector of the country during comparatively long time period. Such analysis of the energy sector development options for about 30 years in Lithuania is based on application of modern mathematical modelling. For this purpose, the mathematical model was applied and developed at the Lithuanian Energy Institute. It is based on the MESSAGE model (model for energy supply strategy alternatives and their general environmental impact), which was originally elaborated at the International Institute of Applied System Analysis, and its enhanced version is currently distributed by the International Atomic Energy Agency (IAEA, 2003).

Application of the MESSAGE model has confirmed that this tool is suitable for comprehensive analysis of the Lithuanian energy sector development (IAEA, 2004) and detailed analysis of the Baltic power system development (IAEA, 2007). The energy demand is used as the driving input for the energy supply system optimization using this model. The model is a very flexible instrument for economic and environmental analysis of the energy systems development. Therefore rational contribution of renewable energy sources for electricity generation is based on analysis of the Lithuanian power sector development options, including interlink with the system of district heat supply because in principle combined heat and power plants can compete with other power plants in the electricity market and with other heat sources in district heat markets.

## **5. Scenarios of utilization of renewable energy resources in Lithuania**

Assessment of the role of renewable energy sources should be also based on comprehensive analysis of their real potential and possibilities of the implementation of measures necessary to comply with the strategic country's goals and obligations to meet requirements of the EU Directives.

Analysis of existing potential of renewable energy sources performed in (Actions, 2008) confirmed that the major contribution during the period 2008-2020 is expected from firewood and waste wood, including growing volumes from logging waste and energy crops (Fig.4). However, total amount of this traditional renewable source, used for energy needs, is limited by the rational felling in the Lithuanian forests, and in 2020 it would account for about 1.1 million toe. Thus, amount of this source in this case could increase by 1.5 times or can growth by 3.3% per annum. But the share of firewood in the balance of renewable energy sources will decrease significantly – from 85.5% in 2008 to 55.2% in 2020. In this study it was foreseen that consumption of bio-fuel (used as motor fuel) will increase during this period by 6.4 times and will amount to about 0.4 million toe in 2020. In this case the share of bio-fuel would increase from 7.2% in 2008 to 20.0% in 2020. Very fast growth with 27.1% per year of electricity generation from wind power plants was foreseen in the scenario of their intensive development. Although electricity generation from hydro power plants will increase only slightly a share of these two renewable sources would increase in this case from 5.4% in 2008 to 12.5% in 2020. Contribution from both municipal waste and agricultural waste into balance of renewable energy sources will become evident in 2020 with 4.6%, and a share of biogas and geothermal energy will account to 3.1%.

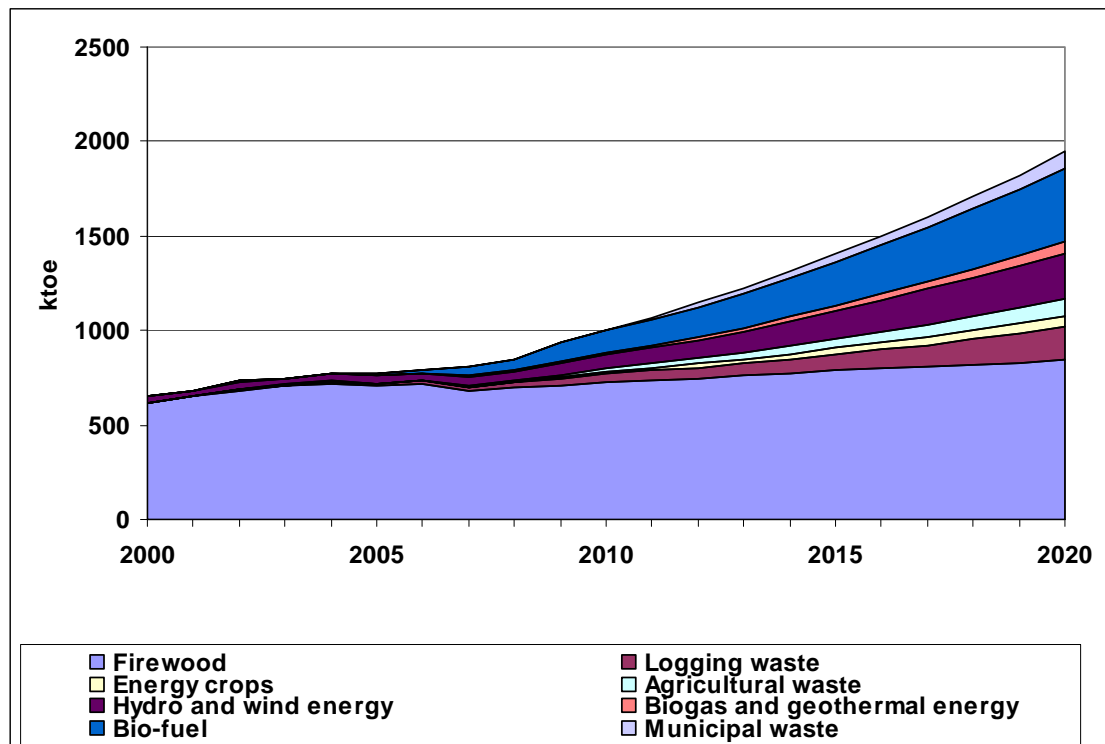


Fig. 4 Development on utilization of renewable energy sources in Lithuania (maximal scenario)

This scenario well corresponds with the country's strategic objective – to increase significantly consumption of renewable energy sources in the coming two decades. This objective is established in the National Energy Strategy adopted by the Parliament on January 2007 (NES, 2007) by envisaging:

- the application of modern technologies when using all the economically justified potential of the logging waste, which by 2025 will amount to approximately 180 thousand toe;
- the creation and implementation of the logistics system for gathering, storage, transportation and use of straw in the district heating companies. According to experts, large portion of straw still remains unused in agricultural sector of Lithuania and their energetic value may amount to approximately 120 thousand toe by 2025;
- planting of energy crops plantations and constantly expanding their area to achieve the supply volume of approximately 45 thousand toe by 2015 and about 70 thousand toe by 2025;
- arranging sorting of municipal waste and constructing incineration facilities for such waste in the largest cities (by 2010 in Vilnius, and later in Kaunas, Klaipeda, Siauliai and Panevezys) seeking to replace approximately 120 thousand toe of fossil fuel;
- to replace approximately 450 thousand toe of petroleum products with bio-fuel by 2025 by respectively expanding areas of rape and other oil-bearing plants and the production of biodiesel as well as supporting production of bioethanol.



Due to limited indigenous resources increasing contribution of renewable energy sources is especially valuable. Their use at maximum extent would be important energy policy measure by many points of view: seeking to reduce dependence on import of primary energy, create new jobs, increase security of energy supply, reduce greenhouse gas emissions, etc.

Amount of firewood, logging waste, energy crops, as well as agricultural and municipal waste foreseen in this scenario creates favourable conditions for significant increase of biomass utilization in the district heating sector and corresponding reduction of natural gas consumption. In 2008, a share of natural gas in the balance of fuel consumed by utilities of this sector was 77.6% and a share of renewable energy sources – only 17.7%. A target of district heating companies is to increase the share of renewable energy sources in their fuel balance up to 60-70% in 2020. To reach this target the amount of biomass used for electricity and heat production during 2008-2020 should increase by approximately three times.

Implementation of the scenario presented in (Actions, 2008) would guarantee that Lithuania will comply with an obligation provided by the EU Commission to reach not less than 23% of renewable energy sources in the gross final energy consumption till 2020. However, there are many factors restricting such fast utilization of renewable energy sources.

Lithuania still needs a complete vision of how the national policy on renewable energy sources should be developed. One can expect that the Law on the Renewable Energy Sources which currently is under preparation will provide the concrete measures for implementation of this policy. The Law should be focused also on the creation of financial support mechanisms, on promotion of production and consumption of renewable energies as well as on regulation of connection of distributed generators to the electricity network. Adoption of a national renewable energy action plan, required by the European Commission, would also contribute to the faster utilization of existing potential of renewable energy sources but currently this plan is also under preparation.

Existing wind energy promotion plan is limited so far by implementation of the program for the construction of wind power plants with the total capacity of 200 MW. Further development of wind farms could be restricted by various administrative obstacles: problematic connection to the electricity distribution and transmission grids, non-existence of off-shore wind power development program and appropriate regulation, detailed territory planning requirements for any size wind-turbine or wind-farm building, etc.

District heating sector also requires proper political attention and clear financial support because cogeneration technologies are expensive. Based on the preliminary assessment, financial support of about Euro 350 million is needed for implementation of measures directed to utilization of existing biomass and municipal waste potential (NES, 2007). Construction of new heat and electricity generation plants using renewable energy sources could be restricted owing to delayed and inappropriately allocated support from the EU Structural funds, limited support from the Government, unwillingness of banks to invest into expensive renewable projects and in particular due to the impact of global economic recession.

Taking into consideration absence of clear policy vision on development of renewable energies, lack of appropriate legal regulation, absence of the national renewable energy action plan, limited financial support and striking decline of the Lithuanian economy the scenario discussed above could assumed as an upper bound of utilization of renewable energy sources. Decline of economy will be followed by reduction of the final energy demand and lower utilization (one can expect at less extent) of renewable energy sources.

The period 2000-2008 could be characterised by very fast growth of the country's GDP with on average of 7.3% per annum. However, due to the global economic recession since April 2008 GDP growth rates were gradually decreasing, and in the fourth quarter 2008 GDP even decreased by 2.2%. Based on preliminary assessment of Department of Statistics, the national economy shrank by a record of 17.0% in the first half of the year 2009 (Statistics, 2009b). One can expect that the negative impact of the global crisis on the country's economy will be profound. Reviving the economy will take longer than had been expected earlier because economic development is slowing down faster than it had been thought earlier. Based on the recent assessments of the Ministry of Finance and many analysts, the Lithuanian GDP will decrease significantly (from 12 to 20%) in 2009 (Semeta, Digryte, Simonyte 2009). Certain recovering of the Lithuanian economy is foreseen for the second half of the year 2010 but still with annual reduction of GDP by 3-5%. Moderate development of the country's economy by some 3-5% is expected only in 2011.

The previous forecast of the final energy and final electricity demand (Miskinis, 2006, Galinis et al, 2008) was based on continuous economic growth until 2020. Therefore this forecast was revised recently taking into consideration significant reduction of the national economy. The main assumption was that income elasticity for the period 2009-2011 will be similar as was on average during the period 2000-2008. As one can see from Fig. 5, owing to economic recession the final electricity and final energy demand for the basic scenario will approach the 2008 year level only in 2014.

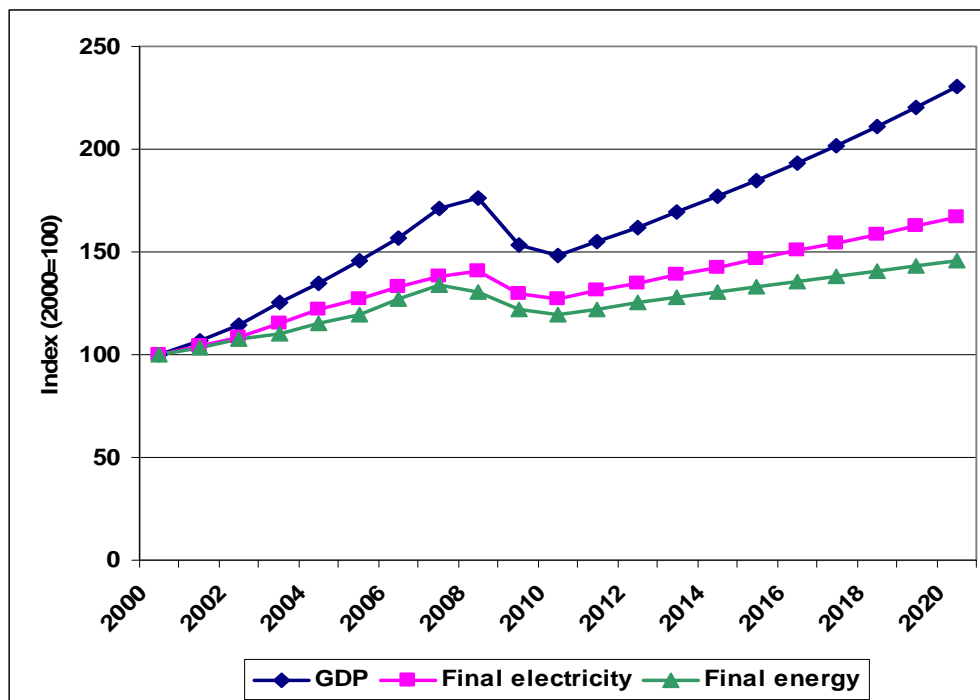


Fig. 5. Changes in GDP, final electricity and final energy index

Based on the modelling of the Lithuanian power system development it was discovered that taking into consideration expected reduction of electricity demand rational power generation from renewable energy sources during the period 2008-2020 will increase more slowly – by 3.3 times

and the share of green electricity in the gross electricity consumption will reach 13.6% in 2020. Based on the recent analysis, fuel demand in the transport sector due to significant reduction of economic activities in all sectors of the economy and mobility of population in coming few years will growth more slowly, and in 2020 total consumption of motor fuel will be less by about 15% compare with the previous forecast. Consequently bio-fuel will replace less petroleum products – about 330 thousand toe in 2020 (keeping in mind the same country’s target that a share of renewable energy sources in the balance of fuel for transportation needs will increase to about 15%). Certain reduction of bio-fuel consumption for district heat production and possibly for needs of final consumers in 2009-2010 is also expected. Thus, total amount of renewable energy sources would amount to about 1600 toe in 2020 (Fig. 6).

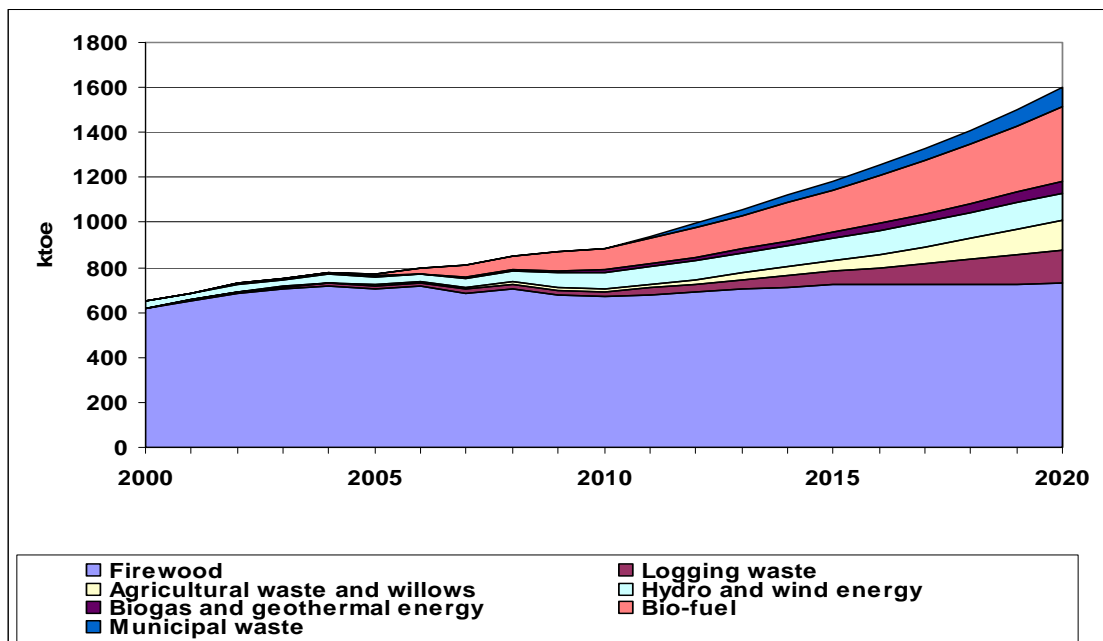


Fig. 6 Development on utilization of renewable energy sources in Lithuania (rational scenario)

Performed analysis confirmed that Lithuania in a case of rational scenario also can reach the mandatory target of utilization of renewable energy sources established by the EU Commission. Foreseen changes in the share of renewable energy sources from the gross final energy consumption and in the share of green electricity from gross electricity consumption in Lithuania could be illustrated by data presented in Fig. 7. However, additional efforts and implementation of relevant measures for promotion of renewable energy sources are required.

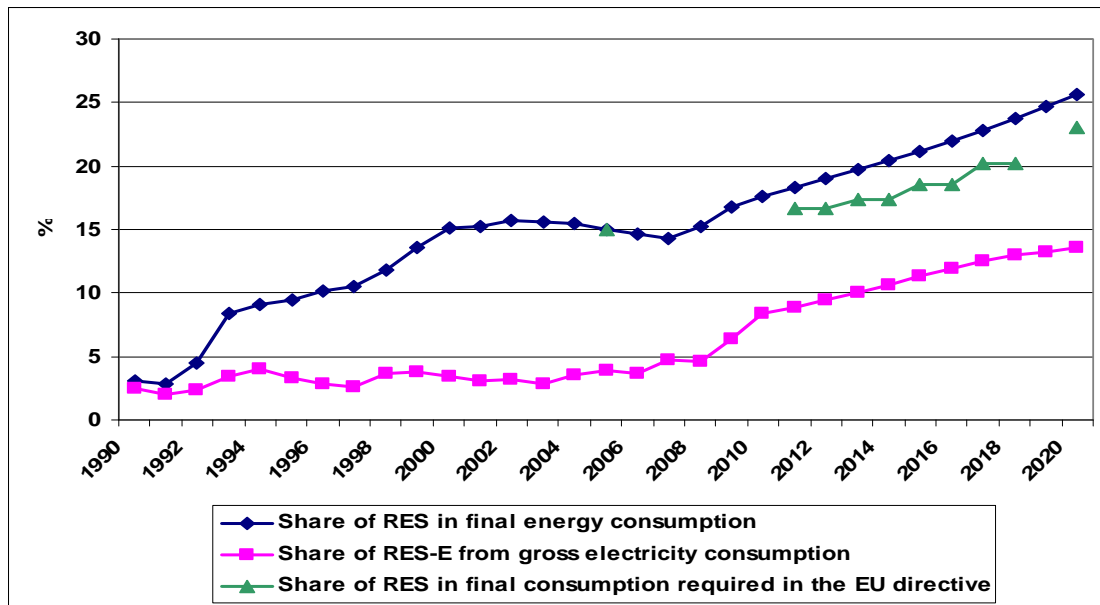


Fig. 7. Contribution of renewable energy sources into final energy and electricity consumption

## Conclusions

1. Important features of the Lithuanian energy sector are the following: high dependence on primary energy supply from one country; absence of interconnections with Western energy systems; dramatic changes in the structure of power generating capacities beyond 2010; still comparatively small contribution from renewable and local energy resources, etc.

2. Based on the analysis of existing potential of renewable energy sources, one can expect that during the period 2008-2020 their consumption for the countries needs would increase up to 1950 toe or by 2.3 times. However, owing to absence of appropriate legal regulation, national renewable energy action plan, delayed or reduced financial support and striking decline of the Lithuanian economy in 2009-2010 possibilities to use renewable energy sources at maximal extent are limited. In a case of rational scenario it is foreseen that total their amount will increase up to 1600 toe in 2020.

3. The 23% target for the overall share of renewable energy sources from the gross country's final energy consumption, the 15% target for renewable energy in the transport sector and the 12% target for the share of electricity generation from renewable energy sources in 2020 could be appropriate and achievable objectives for Lithuania. Increased investments in the renewable energy sector will reduce dependence on imported fossil fuels, will create favourable environment for development and implementation of new energy conversion technologies, mitigation of climate change, creation of new working places, etc.

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