The Impact of Renewable Energy on the Economy of Lithuania

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Abstract

The research purpose is to investigate negative and positive impacts of renewable energy sources (RES) on the economy of Lithuania on the basis of theoretical analysis, empirical investigation of significance of renewable energy for the economy and as well as possible threats for energy supply sources. The research is based on literature study, statistical and comparative research. Strategy for RES development has to be formed for a long-term period; this strategy has to be created by independent scientists not related to traditional energy producing business structures; it is necessary to involve into energy sector small investors so achieving bigger decentralized energy production based on RES expansion and parallel getting higher security of the energy sector.

Keywords: Renewable energy sources; Wind energy; Lithuanian economy; Energy security; Energy strategy.

Introduction

The insurance of the energy security is one of the most important national interests of a state and is the most important national security factor of a state. Renewable energy sources (RES) and their increasing utilization in many countries worldwide is a major energy policy strategy (Blazejczak et al., 2014). The relationship between the development and the use of RES and the characteristics of national economies has frequently been investigated and there are a wide range of approaches observed in the literature and publications (Kocsis et al., 2014). According to Lukaityte (2011), based on common standards, a state is secure, when it imports 10-15 percent of energy, meanwhile Lithuania imports around 77 percent of energy. According to energy security review done in 2013 Lithuania is indicated as energy not secure country (Budreckaitė, 2014). National energy strategy of Lithuania

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declares that energy security covers the totality of the conditions when traditional and renewable energy sources diversity is ensured, independence of monopolistic supplier dictate and the energy access to the consumers at an affordable price at competitive energy market is granted (Nacionalinė energietikos strategija, 2011). International Energy Agency defines energy security as the uninterrupted availability of energy sources at an affordable price. Different authors distinguish different, positive and negative, impacts of renewable energy on the economy of Lithuania. That is why more detailed analysis of this impact is needed.

1. RES Development problems in Lithuania

Energy sources usually are classified to non-renewable (traditional) and renewable. Non-renewable energy resources mainly are used worldwide. Non-renewable energy sources are such as nuclear energy, oil, natural gas, oil shale. Renewable energy sources are natural resources that appear from natural processes. These are wind, biomass, sun, geothermal and water energy (Vainiūs, 2008).

The development of RE is an option for many countries seeking to reduce dependence on imported petroleum and to reduce greenhouse gas (GHG) emissions at the same time. The main incentive to develop RES for industrialised countries is the decrease of carbon dioxide emissions in order to mitigate climate change, to increase energy security and strong promotion of structural changes in the economy (Edemhofer et al., 2012).

Klevas and Štreimikiene (2006) present the main market barriers and shortcomings, that prevent further development of RES, and why state measures for market barriers bypass and removing are needed. The main market barriers, preventing the development of RES are of these types:

- Commercial barriers due to new technologies competitiveness with conventional technologies;
- Price distortions due to the existing subsidies and unequal tax burden of RES technologies;
- Market failures assessing public benefits from RES;
- Market barriers, such as inadequate information, limitations to access capital and institutional barriers

Recently European Union is promoting cross-border networks, single market trade strengthening tendencies and the integration of Lithuania electricity system to European electricity power coordination system. The launching of the power exchange “Nord Pool Spot” in Lithuania, that has become one of the most important electricity market integration steps, that created equal conditions for competition, and the cross-border networks with Sweden (“NordBalt”), Poland (“LitPol Link 1”), led to lower imported electricity prices, what led to cheaper prices than the prices of produced in Lithuania electricity. This means that to import electricity into Lithuania is cheaper than to produce it by themselves (Junghans, 2015). This is becoming a reason for the government to import energy rather than to produce it by developing renewable energy.

Even if the energy problems can be solved only at the international level, by cooperating with other states, primarily every country first has to ensure the domestic production, storage and reservation capabilities (Bauman, 2008). Furthermore, before making decisions regarding the further development of renewable energy, should be taken into account not only its impact on the energy prices in the nearest future, but also is necessary to estimate the domestic energy production macroeconomic impact on GDP, employment and the external costs (for example, climate change costs), which often are ignored.

Currently, energy produced from RES in Lithuania composes around 23 percent of the total energy consumption. Most common and widely used sources of renewable energy in Lithuania are wind energy and biomass. At present, wind power produces nearly a quarter (23,6 percent) of the total electricity produced in Lithuania and comprises 7 percent of the total electricity consumption in Lithuania (Pikšrys, 2015). The biggest part of imported electricity comes from Russia, 70 percent of the total electricity import. Production of wind energy is spreading rapidly (Table 1) and the wind energy park is producing more and more electricity. Wind plants average efficiency in Lithuania is the highest between the Baltic States equals to 27 percent and in the nearest future is projected to achieve 40 percent. Investments in wind energy projects in Lithuania average payback period is 10-12 years. At the time of the construction of new power plants energy produced will be purchased at the price of 7 cents per kilowatt-hour. Cheaper electricity can produce only Kaunas Hydroelectric Power Plant (Sagatauskas, 2014).
Table 1. The change of wind energy production in 2004-2013 year, TNE (ena.lt, 2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Wind energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0.1</td>
</tr>
<tr>
<td>2005</td>
<td>0.2</td>
</tr>
<tr>
<td>2006</td>
<td>1.2</td>
</tr>
<tr>
<td>2007</td>
<td>9.1</td>
</tr>
<tr>
<td>2008</td>
<td>11.3</td>
</tr>
<tr>
<td>2009</td>
<td>13.5</td>
</tr>
<tr>
<td>2010</td>
<td>19.3</td>
</tr>
<tr>
<td>2011</td>
<td>40.9</td>
</tr>
<tr>
<td>2012</td>
<td>46.5</td>
</tr>
<tr>
<td>2013</td>
<td>51.8</td>
</tr>
</tbody>
</table>

The problem of the development of wind energy is that it could produce much greater wind electricity energy amounts, but the main barrier preventing the expansion of wind energy is the statutory wind turbines total power limit in Lithuania. The power limit of 500 MW was reached in 2013 and all onshore wind construction permits were distributed. In order to achieve further expansion of wind energy sector in Lithuania it is necessary to increase the current valid legislation limit at least until 850 MW by 2020 (Jokubauskas, 2015).

Assessing costs structure of biofuel, around 80 percent of funds that consumers will pay for biofuel, finally will return to the national economy in the form of taxes, Lithuanian citizen salaries and forests owners income and so on. Scientists have done an estimation of biofuels cost structure for 2020-2025 year in Lithuania and found that by investing 8.1 million euros in biofuel, the State would save around 18 million euros of energy consumers expenditure.

By switching to the energy produced in from biofuels in the district heating, the consumer’s costs for district heating would decrease by one-third, as it is already happening in some regions of Lithuania. The district heating network energy production from RES is about 23 percent (Ramanauskas, 2013), while the potential in heat production from RES is 70 percent. The main problem that prevents the expansion of biofuel usage is the lack of energy production from biofuel installations. Investing 319 million euros could lead to supply about 70 percent of district heating and around 6 percent of electricity from biofuels (Lapinskas, 2010).

2. RES effects on the economy of Lithuania

RES development needs to be subsidised, what leads to higher electricity prices and higher consumers spending. But when evaluating the benefit of such investment should be evaluated how much of the costs paid for electricity remain within the country and by expanding local aggregate demand increases country’s GDP. For instance, when assessing the biofuel costs structure, it is found that about 80 percent of all costs consumers pay for biofuel will return to the national economy.

In the literature the following impacts of RES on the national economy are found: Blazejczak et al. (2014) say that the support and the use of RES has an impact on the economy because it creates business opportunities in sectors producing renewable energy facilities, but at the same time it comes with costs related to supporting its deployment. The expansion of RES does not have negative impact on economic growth or employment. The analysis done for Germany reveals that RES has a positive net effect on economic growth. Even the net employment effects are small but they are positive. Kocsis et al. (2014) reveals that it is a positive relationship between R&D expenditure and RE consumption at various levels of GDP.

Comprehensive empirical assessment indicates that policies and programs aimed at RE technologies stimulus in the U.S. have had a positive effect on the RE sector. According to the U.S. Council of Economic Advisers 192,900 jobs were created by RE program in 2012 (Mundaca et al., 2014).

In the literature widely known „Merit-Order“ effect is defined as „the lowering of power prices at the electricity exchange due to an increased supply of renewable energies“. According to the president of the RES Confederation Nagevičius (2015) calculations because of the „Merit-Order“ effect, the wind energy, including its subsidies, in 2013-2014 had not increased electricity market prices in Lithuania, but decreased it. The increased part of electricity produced from RES leaves the smaller part of the market demand for traditional energy producers, what leads to the decrease of traditional energy prices. The problem here is that the additional 0,31-0,33 EUR/kWh VIAP tax (wind energy tax charge per kWh consumed) is obvious, but the decrease of electricity market prices of 1,3 EUR/kWh is hypothetical and hardly perceptible.

RES comparing with fossil fuel technologies, which are usually mechanized and capital intensive, require more labour. This mean that on average more jobs per unit of electricity generated is created from RES than from fossil fuels. In most of the research assessing the impact of RES on the national economy it is highlighted the extra economic growth and especially the new jobs created. The forecast of net employment effects of RES differ due to
appropriate methodology used. However most authors agree that long-term positive effects of RES exist as an important contribution to job creation, what is highly emphasized in many national growth strategies (Edenhofer et al., 2012).

According to Šimėnas (2012) estimations, 5 new jobs are created for every MW of installed capacity of biomass thermal energy in Lithuania. In Table 2 is shown the forecast of new jobs that can be created by different energy sources by the year 2020.

<table>
<thead>
<tr>
<th>RES</th>
<th>New jobs created</th>
</tr>
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<tbody>
<tr>
<td>Wind energy (500 MW)</td>
<td>1250</td>
</tr>
<tr>
<td>Solar energy (50 MW)</td>
<td>500</td>
</tr>
<tr>
<td>Biofuel plant</td>
<td>600</td>
</tr>
<tr>
<td>Biofuel heating</td>
<td>8000</td>
</tr>
<tr>
<td>Hydro energy</td>
<td>500</td>
</tr>
<tr>
<td>Total</td>
<td>10850</td>
</tr>
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Nevertheless, when assessing the impact of RES on the economy, should be evaluated the external costs decline, determined by RES expansion. Štreimikié (2005) claims that due to the market imperfections the external costs of energy are underestimated what causes distortions in the market, and energy produced from RES looks as much more expensive than energy produced from traditional energy sources. The assessments of the external costs in energy production are widely used in foreign countries when evaluating the effects of RES.

As the most relevant each project’s economic performance indicator for efficiency in the literature is energy production price. The evaluation of energy production prices and its external energy production costs of different power stations in Lithuania led to a conclusion that the perspectives for RES comparing to traditional sources is significantly higher. Assessment of climate change-related external costs demonstrated, that RES efficiency, compared to traditional energy sources, increases even more – e.g. for oil all external costs are 6.29 euro ct/KWh, for wind - 0.41 EUR ct/KWh.

Each year Lithuania spends around 0.9-1.1 billion EUR for energy resources import. When developing RES and producing energy inside the country, part of these costs would remain within the country and positively affect the GDP, new jobs would be created and some of the external and climate change costs would be avoided.

The expected effect of RES expansion on import of energy is the economy of 706.5 thousand toe of imported fuel. Assuming that the average price of natural gas will be approximately 395 Euro/toe, the import deficit could be reduced by 278 million euros yearly. Additional effect on the country’s balance sheet can also be assessed in economy of the CO₂ pollution costs. Without burning 706 thousand toe of natural gas wouldn’t be emitted around 1651 thousand tons of CO₂. The evaluated CO₂ costs using 20 EUR for 1 ton of CO₂ emissions comes to 114 million yearly (Šimėnas, 2012).

Further prospects of electricity energy produced from RES in Lithuania may be evaluated on the basis of scenario analysis. There can be two scenarios. According to one of them doing nothing and enjoying advantage of the current situation in the neighbouring electricity markets allowing importing cheap electricity. Another scenario is to develop local electricity production. Current energy policy in Lithuania, declares that further development of RES will depend on the electricity price changes in neighbouring markets. Thus, if the electricity prices continue to decline there, it will be difficult to justify the investments to electricity production from RES, when to import electricity will be cheaper than to produce it from RES locally.

However there is rather high possibility that the coming in 2016 stricter environmental regulations will terminate operation of large amount of fossil fuel electricity producing plants. Moreover, part of the power plants in Russia is very close to the worn-out condition and soon they will be excluded from production. Germany’s plans gradually to suspend all nuclear power plants by the year 2020 may increase electricity import from Scandinavian and other markets. These processes will lead to the electricity oversupply reduction what will inevitable cause electricity price growth, ant this also will be stimulated by the unavoidable growth of costs of CO2 emission. There is expected that
in the long-term the price of fossil fuels will grow together with the inevitable electricity demand growth in Russia and China. These long-term factors will lead to the growth of electricity prices in the neighbouring countries and consequently to the growth of the local electricity production from RES.

Conclusions

In Lithuania around 23 percent of the total energy consumption is produced using RES. Other 77 percent of energy is imported, what makes Lithuania energetically not safe state. Widely used RE sources in Lithuania are wind and biofuel. Currently in Lithuania almost one quarter (23,6 percent) of all electricity is produced from wind energy.

The literature reveals the following RES development impact on the economy: RES maintains the cash flow within the domestic economy; it reduces coal and natural gas import from other countries costs; even if consumers face bigger expenditure for electricity because of the subsidies for RES, most of these expenditure remains within the country and directly increases country’s GDP; it creates new jobs.

In order to achieve efficient energy sector development in Lithuania benefitting both, the state and the consumers, it is important to implement the following measures. Strategy for RES development has to be formed for a long-term period; this strategy has to be created by independent scientists not related to traditional energy producing business structures; it is necessary to involve into energy sector small investors so achieving bigger decentralized energy production based on RES expansion and parallel getting higher security of the energy sector.

Further electricity production from RES has to depend not only on the imported electricity prices, but also has to ensure the long-term sustainability and security of Lithuania’s energy sector.

References


