



Analysis of the fuel and energy transition in Lithuanian industry and its sustainable development in 2005–2013 in compliance with the EU policy and strategy



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ABSTRACT

The paper provides analysis of fuel and energy transition in Lithuanian industry sector and its sustainable development for the period 2005–2013 after the integration of Lithuania into the European Union.

Lithuania has limited quantity of indigenous energy sources and was depended from import of energy resources (natural gas, petroleum, hard coal). In 2005–2009 Lithuanian energy dependence from such resources was about 50–62%. About 70–80% of electricity was produced from Lithuanian Ignalina Nuclear Power Plant (INPP). In 2009, indigenous and renewable energy sources (RES) comprised 14.7% of gross inland energy consumption. At the end of 2009 INPP was closed and the structure of gross inland fuel and energy consumption changed radically. In 2010–2013 Lithuania's energy dependence on the imports of fuel increased to 80–82% and considerably exceeded the EU average 53–54%. The share of RES and indigenous energy resources in 2013 increased to 21.4%.

In analysis the structural changes of Lithuanian industry for the period 2005–2013 were carried out. About 21–25% of gross value added belonged to industry sector. The indices of the industrial production and its main composite parts were disclosed. Key attention was directed to energy consumption by main kinds the industrial activities. Energy demand and its changes in industry were examined. RES flows diagram and RES share for industry sector were shown. The final energy consumption by different energy sources and various consumer groups was researched. The greatest Lithuanian industry consumers of natural gas, electricity, heat, hard coal and firewood were examined. Industry progress indicators, energy intensity, labor productivity, emissions of greenhouse gasses and air pollutants were studied. The expenditures of industrial enterprises on environmental protection were assessed. The vision of Lithuanian energy sector operation in compliance with the larger integration in to the EU is foreseen.

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Abbreviations: CHP, combined heat and power; ENTSO-E, European Network of Transmission Systems Operators for Electricity; EU, European Union; EC, European Commission; GDP, Gross Domestic Product; GHG, greenhouse gases; GNI, Gross National Income; GVA, gross value added; INPP, Ignalina Nuclear Power Plant; LEI, Lithuanian Energy Institute; LTL, Lithuanian Litas (1 LTL=0.2896€); NPP, Nuclear Power Plant; OECD, Organization for Economic Cooperation and Development; PPS, purchasing power standards; RES, renewable energy sources; toe, tons of oil equivalent; UK, United Kingdom; USA, United States of America; VAT, Value-added tax

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1. Introduction

1.1. Some history

After the collapse of the former Soviet Union (SU) in 1991, Lithuania inherited a very strong energy sector. Energy capacities substantially exceeded domestic needs. Lithuania has also inherited grid connections with the power systems of its neighbors – the former republics of the Soviet Union. At the same time the country inherited a consumer that had no concern about energy costs and all the buildings and technologies had been designed reflecting cheap energy. The situation was complicated by the fact that Lithuania has almost no primary energy resources with almost all resources: oil, gas, nuclear fuel (except for small amounts of coal) imported from one country – Russia. The share of indigenous renewable energy sources at this time was only about 3% [1].

One of the main tasks of political and economic institutions of Lithuania was to stabilize the supply of energy to all consumers: industry, transport and households. Until 1990 Lithuania was fully integrated into the economy of the SU and the energy sector was oriented towards large but inefficient energy consumption as well as considerable export of electricity and petroleum products to neighboring regions [2].

A sharp reduction in energy demand occurred due to fundamental changes in the structure of the economy and the breakdown of economic relations with former partners followed by deep economic crisis. Primary energy consumption of Lithuania, which in 1991 amounted to 17.5 million toe, has decreased more than twice to 8 million toe. Electricity consumption and district heat supply decreased at about the same degree. The final energy consumption in Lithuania for the period 1991–1993 decreased about twice from 10.1 to 4.9 million toe and in Lithuanian industry sector – about three times from 3.1 to 1.0 million toe (Fig. 1). In 1991 about 30.7% of final energy consumption belonged to industry sector and in 1993 – only 20.5% [3].

Analysis of the energy demand in Lithuania and its industry in the earliest 1990–1998 years was performed by authors in [4]. In 1991, about 34.1% of energy consumption in Lithuanian industry belonged to oil products, 29.1% – to natural gas, 20.4% – to heat, 13.9% – to electricity, 2.1% – to hard coal, 0.3% – to firewood, wood and agricultural wastes and 0.1% – to other fuel. In 1993, fuel and energy consumption in Lithuanian industry changed radically: natural gas consumption reduced 5 times, heat – 4 times, oil products – 2.8 times, electricity – 2 times. In 1993, the shares of industrial fuel and energy consumption were as follows: 37.5%

belonged to oil products, 18.0% – to natural gas, 22.1% – to electricity, 15.7% – to heat, 5.1% – to hard coal, 1.3% – to firewood, wood and agricultural wastes and 0.3% – to other fuel.

Major energy installations in Lithuania encompass a few large thermal plants, a Nuclear Power Plant, and a refinery designed not only for the needs of Lithuania, but to supply a significant proportion of its production to Lithuania's nearest neighbors, which after 1991 were in the same economic decline. The total capacity of the power plants exceeded domestic and export demand by almost three times [1]. Development of the power system was based on construction of large power plants such as Lithuanian Thermal Power Plant (with installed capacity of 1800 MW) fired by natural gas and heavy fuel oil and Ignalina Nuclear Power Plant (INPP) (3000 MW_{el}). These power plants were constructed taking into consideration not only internal needs, but also growing electricity demand in the large North-Western region of the former SU. Excess of capacities in the power system, as well as inappropriate management of the national economy and the energy sector were serious deficiencies on a way of integration of Lithuania into the European Union (EU) [2].

1.2. Sustainable development of Lithuanian economy and industry

The Lithuanian economy development during the period 2005–2013 was very different. In 2005–2007 Lithuanian economy grew fast (approximately 8.5% each year) and Lithuania was one of the most rapidly developing countries in the EU. In 2008 the economy growth rate decreased to 2.9% and in 2009 suffered a deep recession to –14.8%, as the consequences of the global financial crisis [5,6]. The index of Gross Domestic Product (GDP) in 2009

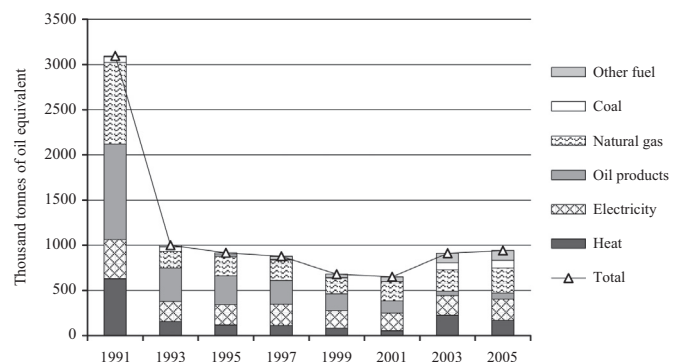


Fig. 1. Fuel and energy transition in Lithuanian industry sector in 1991–2005.

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