

Trends of Greenhouse Gas Emissions in Lithuania by 2020

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(1) Overview

To avoid or at least to reduce climate change the European Union has proposed an ambitious plans committing to reduce emissions of greenhouse gas by 20 percent (with respect to the 1990 level), increase energy efficiency by 20 percent and increase the share of renewable energy sources in primary energy consumption to 20 percent by 2020. However, the possibilities to implement carbon-efficient technologies and reduce greenhouse gas emissions for new member states are more limited than for developed EU-15 countries. Thus, obligations of the EU member states to share burden of emissions reduction should be based on analysis of the energy sector development in each country. Paper describes current status, specific features and future trends in the Lithuanian energy sector particularly changes in greenhouse gas emissions by 2020. Rather large decrease of primary energy consumption, increased share of renewable energy resources and favorable structure of total primary energy balance (especially taking into account high share of nuclear fuel in electricity generation) resulted in significant reduction of air pollution over the period 1990-2000. Total amount of the main pollutants in 2000 was by 2-3 times less than in 1990. Total emissions of greenhouse gas decreased from 48.1 to 18.7 million tonnes, and from fuel combustion – from 32.7 to 11.1 million tonnes [1]. However, over the period 2000-2005 emissions of greenhouse gas increased by 20 percent mostly due to fast economic growth. In 2005, according to data prepared by the International Energy Agency [2] CO₂ emissions from fuel combustion per capita in Lithuania are about 2,1 times lower than on average in the EU-27 countries. Indicator CO₂ emissions per unit of GDP (using Purchasing Power Parities) in Lithuania was by 20 percent less than the average in the EU-27. Comparatively low level of greenhouse gas emissions is stipulated by high contribution of nuclear fuel into primary energy balance – currently more than 70 percent of electricity generated in Lithuania is from Ignalina Nuclear Power Plant (NPP). After closure of Ignalina NPP in 2009 major part (more than 90 percent) of electricity will be generated from fossil fuels, and emissions of greenhouse gas from fuel combustion will increase significantly.

(2) Methods

The analysis is based on application of econometric model and methodology of uncertainty for energy demand forecasting as well as of optimisation modelling tool MESSAGE for investigation of the energy sector development options and assessment of changes in emissions of greenhouse gases.

(3) Results

Taking into consideration ambitious goal – to reduce emissions of greenhouse gas by 20 percent – total emissions *from fuel combustion* and *from other sectors* (industrial processes, agriculture, waste and wastewater, etc.) in Lithuania in 2020 should not exceed 38.5 million tonnes in CO₂ equivalent. Expected changes presented in Fig. 1 are based on detailed analysis of energy sector development scenarios. Two major scenarios were used, which intended to encompass the range of possible long-term of economic development – basic scenario (annual growth rate over the

period 2005-2025 is assumed 4.5 percent) and fast economic growth scenario (growth rate 6 percent per year) and corresponding projections of energy demand. These two energy demand scenarios were combined with different assumptions about development of fuel prices (high fuel prices and low fuel prices), outcomes based on optimisations of the energy sector development including analysis of existing and new technologies in energy transformation sector, as well as plans to implement additional measures seeking to reduce emissions of greenhouse gas in other sectors. Scenarios which represent in the Fig.1 upper and lower bound of greenhouse gas emissions are supplemented by scenario I (fast economic growth, low fuel prices, no new NPP, other sectors with additional measures) and scenario II (fast economic growth, high fuel prices, new NPP (500 MW in 2015 and 1000 MW in 2018), other sectors with additional measures).

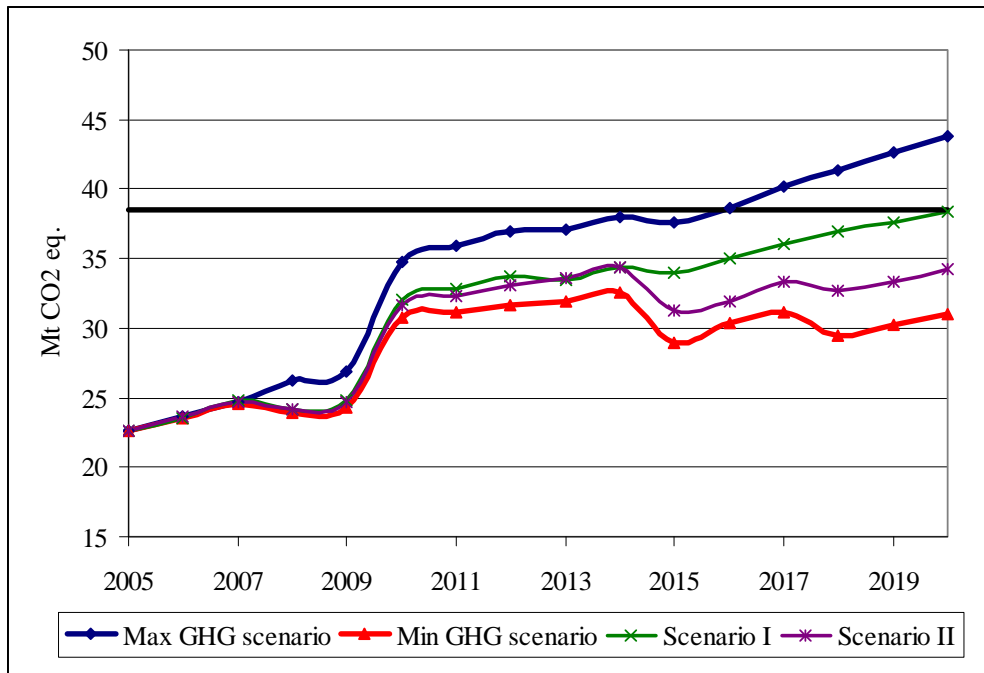


Fig. 1. Projections of greenhouse gas emissions in Lithuania

(4) Conclusions

1. Important features of the Lithuanian energy sector are the following: closure of Ignalina NPP in 2009; high dependence on primary energy in particular natural gas supply from Russian Federation; comparatively fast growth of energy demand due to fast economic growth; limited contribution of indigenous energy resources, etc.
2. Total emissions of greenhouse gas in Lithuania in any case will not exceed the 1990 level. In 2020, the highest amount of emissions (about 90% from 1990 level) occurs in high energy demand scenario with significant delay of new nuclear power plant commissioning. In the basic scenario with implementation of additional measures reducing emissions of greenhouse gas in other sectors total amount of these emissions will increase in 2020 to about 65% from 1990 level.

References

1. National greenhouse gas emission inventory report 2007 of the Republic of Lithuania. Annual report under the UN Framework Convention on Climate Change // Vilnius, 2007 March.
2. CO₂ Emissions from Fuel Combustion 1971-2005 // International Energy Agency, 2007 Edition.