

# **Biogas market report**

**Municipality of Silale**

07/02/2014



# „Euroslam ( Beneficial use of sewage sludge in small and medium-sized municipalities )“ consulting and administration services

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## The biogas usage. Biogas market Report 07/02/2014



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**euroslam**

Silale district municipality administration is participating as a partner in an international "EUROSLAM" (Beneficial use of sewage sludge in small to medium size municipalities) project. One of the goals of this project is to share best practices in the field of wastewater and sewage sludge management, also look for ways to improve the treatment of sewage sludge and to use treated sludge as a raw material for other uses. In order to achieve the above-mentioned goals there is a need to research the possibilities of providing biogas to the country's market, to assess the legal regulation of this process and to analyze the differences between operational conditions in biogas markets in different project partner's countries.

This market report is designed to introduce the project partners of the laws regarding renewable energy development and the energy tariffs regulations in Lithuania. Also, this document includes information about the overall situation of the country biogas market, the existing installed powers and electric power stations capacities, the problems of renewable energy development, including biogas extraction development.

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## Introduction

Lithuanian energy supply system until the year 2010 was heavily dominated by a nuclear electricity power supply from the Ignalina plant, which was closed finally by end of 2009 fulfilling requirements of the agreement with the EU. Since then Lithuania has been heavily dependent on import of electricity and other energy sources (gas, coal) from the neighbouring countries. So, there is a great interest to produce an alternative energy (solar, wind, bio fuels – solid ones and biogas) from local sources.

Earlier it was considered to support the use of anaerobic digestion as a best available technique for livestock farms, big wastewater treatment plants and food industries and keep guaranteed feed-in tariffs for electricity from biogas plant, which presently is LTL 0.30 per kWh. From May 2011 this system was modified and the support tariff for the new biogas installations is being shared through the auctions.

As the heating systems of majority of Lithuanian towns are still dependent on imported gas, there is also a big interest for combustion of household waste and use of the heat in the district heating systems at the moment. Household waste is already being utilized as an energy resource in Klaipeda town. There are plans to build similar factories in Vilnius and in Kaunas.

Forest-based biomass makes up the largest proportion of the Lithuanian renewable energy production basis. Biomass (e.g. wood chips or straw) is already being used in many smaller towns as well as in Panevezys (partially in Vilnius) and gives a better price than imported gas as well as improves local employment situation. Some towns have a need for the replacement of existing solid biomass boilers with newer, modern and more energy-efficient boilers. Also many living houses and public buildings still have district heating without thermostatic regulation as well as insufficient insulation causing extremely low heating efficiency. Massive process of house renovation was started some years ago, so hopefully energy demand in this sector will go down during the next 10 years.

## 1. Biogas usage possibilities in Silale district

The “Biogas conversion to useful energy” study includes the topic of the main useful biogas usage ways, i.e. electricity and heat energy production from biogas (biogas burning in gas boilers, cogeneration plants), as well as the topics about technologies and possibilities of biogas purification, preparation and usage as vehicle fuel or providing it into the general gas grid.

In that study report was calculated the potential biogas amounts, which can be extracted from the Silale WWTP sewage sludge and potential biogas value of producing heat, electricity and vehicle fuel, also were assessed possibilities to provide the mentioned products into the markets.

It was found, due to the small Silale WWTP sludge quantity (and also of the possible to produce biogas), the biogas production potential in Silale would not cover even the operational costs of conversion biogas to electricity and heat, not to mention purification and enrichment

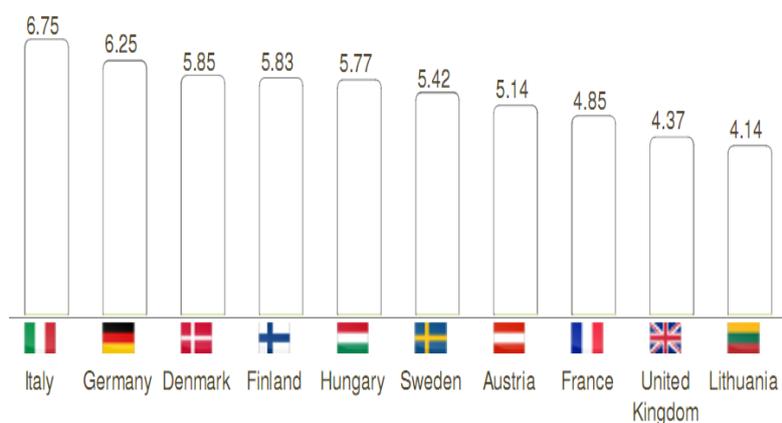
equipment prices. More possibilities of biogas production from manure are providing of livestock development in Silale district but the bigger farms are in different district locations, so manure logistics costs should be evaluate with great care.

However, if a bioreactor would be installed in Silale WWTP, its produced biogas will be best to use in the gaseous boiler for water heating and heat carrier to use for local heating needs (for bioreactor boot temperature maintenance, WWTP premises heating, water treatment process acceleration).

## 2. Biogas production possibilities in Lithuania

### 2.1. Biogas market legislation and management

Accordingly to the study of [www.crossborderbioenergy.eu](http://www.crossborderbioenergy.eu), Lithuania is among Top Ten European countries with growing biogas potential (Fig. 1).



**Fig. 1. Biogas potential. Top Ten score EU countries (data updated 03/2013)**

Source: [www.crossborderbioenergy.eu](http://www.crossborderbioenergy.eu)



**Fig. 2. Biogas potential in Lithuania. Main factors (data updated 03/2013)**

Šaltinis: [www.crossborderbioenergy.eu](http://www.crossborderbioenergy.eu)

## 2.2. Biogas market regulation and management

Accordingly to the old law, there was a unitary feed-in tariff of about 8.6 €ct per kWh of electricity. Furthermore, the annual amount of electricity entitled to subsidies was capped. In this way, the total installed capacity of biomass and biogas was supposed to increase to 224 MW (el) by 2020 (in this amount ~62 MW (el) supposed to be gained from biogas).

A new law on subsidising renewable energy was passed in 12<sup>th</sup> of May 2011. It has, amongst other effects, described the preconditions for producing biogas. According to this new law, the plan is to fully support renewable source energy production. The plans for 2020 include:

- The total power of wind power plants, connected to the electricity grid, should reach to 500 MW (not counting small power plants, that do not exceed 30 kW power);
- The total power of solar energy power plants, should be increased to 10 MW (not counting small power plants, that do not exceed 30 kW power);
- The total power of hydro power plants should increase to 141 MW;
- Bio-fuel electricity plant, connected to the electricity grid, total power should increase to 355MW.

The law provisions state, that if the above mentioned electricity power plants total power exceeds the provided values, the Government of the country will approve further electricity power plants, electricity transfer, supply networks, progressive networks and electricity accumulation infrastructure development order list. Doing so, will be kept the Lithuanian Republic obligations on environmental pollution decrease, will be ensured energy supply safety and reliability, also will be ensured requirements of consumer rights and rightful interest protection.

The above mentioned law's article 20 defines the renewable energy resource usage for electricity production promotion order. According to it, the electricity production from renewable resources is a Public interest service (PIS). Electricity production from renewable resources is promoted according to the Government's defined public interest service supply order, by paying the producer a fixed tariff and the difference in sold electricity price, according to the producer's electricity supply rules order. This price should not be smaller than the last month's average market price, calculated according to the National Control Commission for Prices and Energy defined order. The above mentioned regulations do not apply to electricity power plants which power are less than 30kW and which sell produced electricity at a fixed price according to the Government defined procedure. Fixed tariffs are determined and the promotion quotas are distributed via an auction way.

Promotion quotas and auction regions is defined and approved by the Government. Auctions are organized in regions where power plants are to be connected to the electricity supply networks. Auctions are organized separately for each group of producers, according to the National Control Commission for Prices and Energy defined terms, but not later than during 180 days from day the producer fills out an application to organize an auction for the exact producer group in the region he specified. The National Control Commission for Prices and Energy define the largest fixed tariff value for each calendar year. The winner of the auction is the participant that specifies the smallest desirable fixed tariff in his application. If two or more

auction participants provide offers for the same desirable fixed price tariff, the winner is the participant who offered to build a more powerful power plant park. He is being declared the winner after evaluating the general power output, since a separate auction zone may contain a power plant park that does not exceed 40% of the maximum power output, which is permitted to connect to the regions' power distribution grid. If two or more applications are equal according to both of these requirements, the promotion quota in the designated connection point is distributed between both participants according to their offered power plant park output.

Fixed tariffs for power plants that do not exceed 30 kW installed power output and fixed largest tariff margin for the participants of the auction are being decided upon by the National Control Commission for Prices and Energy on a yearly basis according to the fixed tariff determination principles stated in the law. Fixed tariffs are being determined according to different energy production from renewable energy sources technologies, power plant installed output, meteorology data and power plant locations in the country, according to clear and non-discriminative principles.

The National Control Commission for Prices and Energy annually evaluates the development of electricity production from different renewable energy sources with regard to factors, such as: the factual amount of electricity produced during the last calendar year, the sum of all installed power plant output and the sum of the planned power output of the power plants that are currently being built. Fixed tariffs for power plants of installed power output is less than 30 kW and the largest fixed tariff margin are being reviewed regarding to electricity production from different renewable energy sources development and it's compliance with the aims and tasks set in the National renewable energy source use development action plans. The reviewed fixed tariffs and fixed tariff largest possible margins are applied only to the electricity producers, who have acquired the permit to develop electricity production from renewable energy sources after the day these tariffs have been changed.

The law states that energy, produced from the renewable energy sources, promotion measures are applied for a 12-year period from the day the permit to produce electricity has been granted. If the producer acquired a permit to develop electricity production from renewable energy sources before this law has come into legal force by the means of a competition or if such a permit has been granted before this law has come into legal force, such a producer does not fall under the regulations of part 3 of this article and he is subject to a 12 year period The National Control Commission for Prices and Energy defined fixed tariff largest possible margin, defined during the year this law has come into legal force. Fixed tariff is used for the electricity, produced from renewable energy sources, which have an origin guarantee as required by laws and regulations.

Power plants that work on renewable energy sources that are not subject to promotion schemes or some of the measures of the promotion schemes can be built according to the general legal act regulations. The 3 part of the 13 article of this law determines the installed power output size and (or) State defined largest electricity production promotion quote does not limit such power plant construction and (or) use. Electricity produced in power plants, which are not subjects to promotion measures, trade electricity according to the Electric energy trade rules that define the order and ways for such trade.

During the last years and after the renewable energy source (mostly solar energy) producer's application peak, when they managed to fulfill or even exceed the planned energy offer, the PIS part of the consumer price for electricity has significantly increased. In order to stabilize the electricity prices for consumers and prevent creating a renewable energy production "bubble", the support of new electricity production from renewable energy sources projects has been stopped since the June of 2013. The support will not be renewed until the current support schemes will be amended or changed with new ones.

Electricity and heating power tariffs, PIS sizes, promotion programs, licensed producers lists, existing and currently created legal acts can be found on The National Control Commission for Prices and Energy webpage [www.regula.lt](http://www.regula.lt).

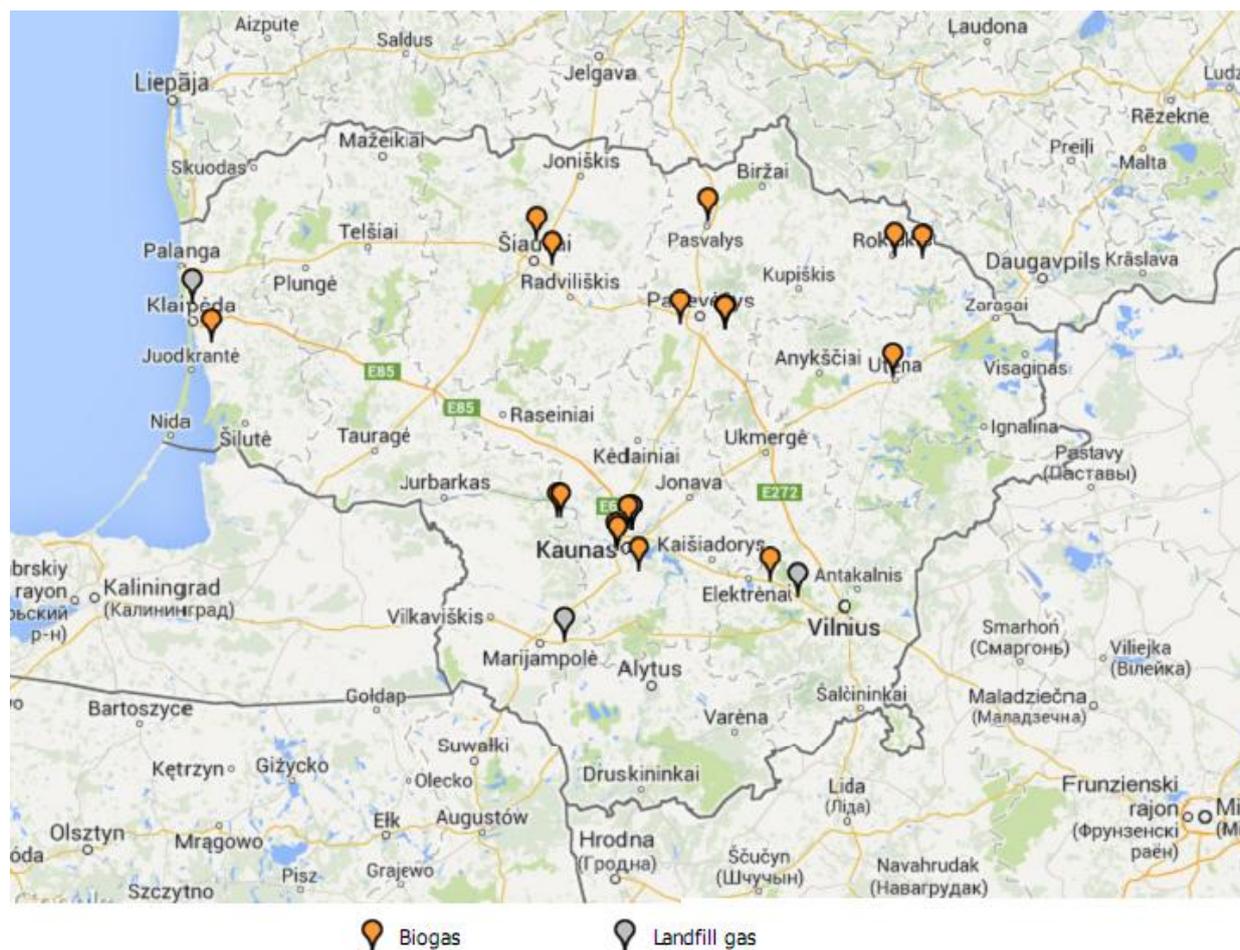
### 2.3. Biogas production in Lithuania

During the last years, the amount of biogas producers in Lithuania constantly increases. According to the Lithuanian biogas association data, there were 9 biogas (including 2 landfill gas burning) power plants, that generated a total of 14,5 MW of power in 2009. According to the Lithuanian renewable energy source webpage data, there were already 22 power plants (including 6 landfill gas burning) power plants, that created a total of approximately 19,5 MW electricity output and 11,5 MW of heating power output (Table 1) in the year 2013. The distribution of these electricity and heating plants is presented on the picture below.

**Table 1. Power output of biogas power plants currently active in Lithuania (25-02-2014)**

Name of the power plant	Installed power output (heating) in MW	Installed power output (electricity)	Heating production cost LT/MWh	Fuel energy cost Lt/kWh	Electricity production costs LT/MWh	Management and operation cost Lt/MWh	Investments Lt/MW	Return on investment time in years
Noreikiskes cogeneration power plant	1.05	0.75	166.1	0.1119	222.73	14.84	1245000	4.2
CJSC "Utenos vandenys" wastewater treatment plant cogeneration power plant	0.48	0.24	-	-	-	-	1806000	7
Domeikava cogeneration power plant	1.54	1.2	-	-	-	220	-	8
Marvele biogas power plant	0.876	0.622	-	-	-	-	-	-
CJSC "Aukstaitijos vandenys" thermofication power plant	0.335	0.33	-	-	-	-	-	-
CJSC "Kurana"	4	4	-	-	-	-	-	-
CJSC "Saerimner"	0.904	0.6	-	-	-	-	-	-

Name of the power plant	Installed power output (heating) in MW	Installed power output (electricity)	Heating production cost LT/MWh	Fuel energy cost Lt/kWh	Electricity production costs LT/MWh	Management and operation cost Lt/MWh	Investments Lt/MW	Return on investment time in years
Kariotiskiai dumpster power plant	-	0.5	-	-	-	-	-	-
Glaudenai dumpster power plant	-	1.64	-	-	-	-	-	-
JSC "Rokiskio suris" purification equipment	0.63	0.33	-	-	-	-	-	-
Dumpiai wastewater treatment plant biogas power plant	0.866	0.654	-	-	-	-	-	-
Marijampole dumpster power plant	-	0.48	-	-	-	-	-	-
BKJ-1	-	0.4	-	-	-	-	-	-
Kairiai BioE	0.8	0.8	-	-	-	-	-	-
Lapiu II	-	1.6	-	-	-	-	-	-
Agricultural company "Vycia" power plant	-	0.185	-	-	-	-	-	-
BJK-1	-	0.4	-	-	-	-	-	-
Lapiu BJ	-	0.6	-	-	-	-	-	-
Lekeciai BJ	-	0.6	-	-	-	-	-	-
JSC "Vilniaus degtine"	-	1.5	-	-	-	-	-	-
JSC "Siauliu vandenys" cogeneration power plant	-	0.62	-	-	-	-	-	-
Vievis New biogas power plant	-	0.8	-	-	-	-	-	-
<b>Total:</b>	<b>11.501</b>	<b>19.451</b>						



**Fig. 3. Renewable energy source energy production from biogas and landfill gas in Lithuania**  
 Source: [www.avei.lt](http://www.avei.lt)

In 2014 near CJSC “Saerimner” pig complexes in Panevezys and Kelme districts will begin to operate the first biogas plants producing energy from the slurry. Total company Saerimner and its partner company CJSC “Modus energy” in Lithuania during the 2013-2014 year period, are planning to build 9 biogas plants, in which will be recycled animal organic waste.

## 2.4. Basic steps to get into biogas market in Lithuania

As with each and every business, in order to start production, you need to research the current legal base, regulations, the needs and supply in the country’s or region’s biogas market (determine potential buyers and competitors), determine the biogas, biogas produced electricity and heat costs and the price change trends. You also need to choose the type of biodegradable waste you will use to produce biogas. It has been determined (Navickas, 2005), that power plants using high calorific value plants (i.e. corn biomass) are the most efficient and return investments the quickest in Lithuanian conditions, they also are more valuable from the environmental point of view because they solve ecologic problems. In case there is large pig, cattle or crop farms or you could locate a household waste sorting plant nearby – building a power plant based on recycling both the relevant type of waste mixed with high calorific value

plants makes more sense, since the biogas output and the power plant's energetic efficiency improve.

## 2.5. Quality requirements of biogas, which is supplied to the market

Up until now, all of the biogas production plants burned their biogas in the cogeneration power plants, without providing it to the gas supply networks or directly to the population. Each biogas producer in fact owned a closed production circle, where he is the one operate the biogas power plant, he is the one cover its operational and repair price, so he can set his own biogas purity and quality standards.

Perhaps, because until now there was no such need, there is not acts in Lithuania, which set the quality requirement for biogas supplied into the joint pipeline and requirements for the biogas supply in that network.

However, other countries, where biogas supply to the general network is implemented, already have minimum quality requirements (Table 2).

**Table 2. Minimal biogas quality requirements for supply into the general gas network**  
Source: Gas Safety (Management) Regulations, 1996.

Quality parameter	Value
Hydrogen sulfide (H <sub>2</sub> S)	Less or equal to: 5 mg/m <sup>3</sup>
Total sulfur (including H <sub>2</sub> S)	Less or equal to:50 mg/m <sup>3</sup>
Hydrogen (H <sub>2</sub> )	Less or equal to:0,1% per moll
Oxygen (O <sub>2</sub> )	Less or equal to:0,2% per moll
Additives, water and carbohydrates	The gas should not contain fluids or hard particles that could harm the distribution network or equipment
Wobbe number (WN)	Between 47,20 and 51,41 MJ/m <sup>3</sup>
Smell	Gas, supplied under pressure less than 7 Bar, should contain smell additives for gas leak detection.

Additional special parameters may be limited in biogas, such as calorific value, temperature, radioactivity, organic halogens, inert substances, such as carbon dioxide.

## 3. Biogas market development problems

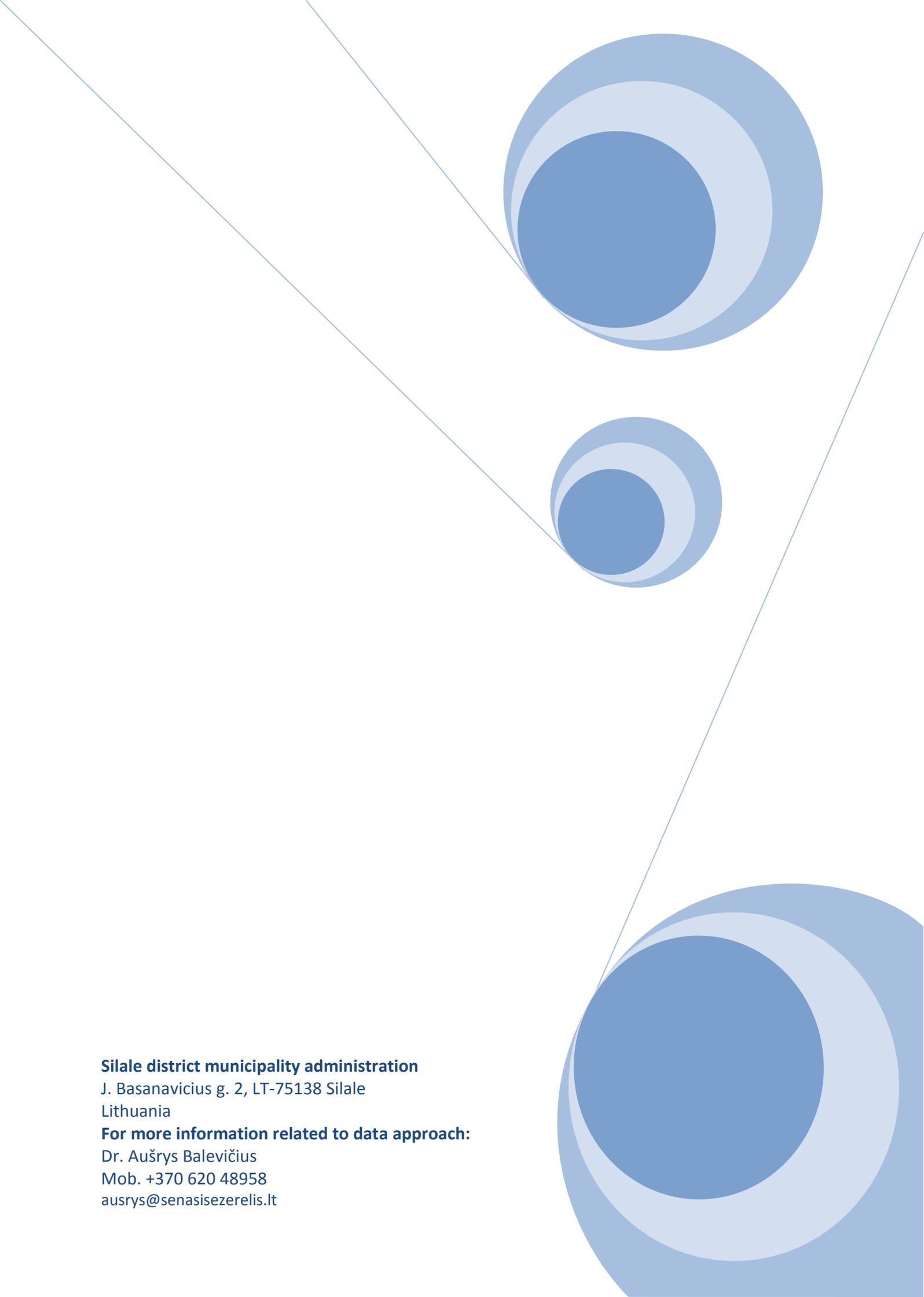
One of the largest alternative energy producer discussed problems at this time is the unstable policy of the Government of the Republic of Lithuania concerning the renewable energy source energy (including biogas energy) suppliers and developers. As it has already been mentioned, since the June of 2013, the new renewable energy source electricity production support has been partially halted, the support order and mechanisms are being currently revised and it is widely believed that the guaranteed electricity purchase tariffs may be decreased.

Another potential problem – is the small size of entities that potentially are able to produce biogas and the small power output of their power plants, what makes financing of construction, connection to the power or heating networks processes difficult and the projects' costs makes ineffective.

The third problem is the local population which tries to avoid biogas production plants (especially if the biogas is produced from communal waste), when the biogas production plants try to be as close to the final consumer as possible – it makes providing cogeneration power plant produced heat transportation more cost effective.

Some of the biogas producers are unhappy with the complicated and/or costly processes of connection to the electricity supply networks (i.e. you need to build an electricity transformer station, lay down a couple of kilometers of cable through privately own lands, etc.).

Lithuania still does not have a single biogas producer which would supply biogas to the general gas network. There are also no regulations regarding such supply.



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