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Policy Roadmap for large-scale biogas implementation in Bulgaria

Deliverable 3.3



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1. Introduction

This roadmap aims to give information about the results obtained from the analysis on Bulgarian Policies (Deliverable 3.1) and Barriers for biogas implementation in Bulgaria (Deliverable 3.2). To meet this target this report contains information about the potential of biogas in Bulgaria, a summary about the Bulgarian policies in the field of renewable energy sources (RES), summarized information about the existing barriers of biogas technologies implementation and the needed measures for overcoming those barriers.

2. Biogas Potential – An overview

In Bulgaria there is a large potential to utilize biomass (incl. biogas) as an energy source. 60% of the overall land area consists of arable and agricultural lands, and approximately 30% is forest cover. According to the National Long Term Programme to encourage the use of biomass for the period 2008-2020 the technical biomass potential is:

2.1. Solid agricultural waste

Table 1: Share of agricultural by-products, 2006

| | Yield from crops, t/a | Share of agricultural by-products, % |
|--|-----------------------|---|
| Wheat + barley + rye (annual average for the period 2000-2005) | 4 450 000 | 61 ¹ |
| Maize (annual average for the period 2000-2005) | 1 406 000 | 128 ² |
| | Harvested areas, ha | Agricultural residues, kg/ha ³ |
| Sunflower | 635 000 | 2 000 |
| Vines | 85 000 | 2 000 |
| Orchards | 38 000 | 1 550 |
| Tobacco | 40 000 | 1 250 |

Source: National Long Term Programme to encourage the use of biomass for the period 2008-2020

Straw is a solid agricultural by-product that is used in the country primarily in horticulture and livestock breeding. About 20 % of straw can be utilized for energy purposes. The remaining types of solid agricultural by-products have no other application and the share of quantities used for energy purposes is set according to the maximum capacity for collection (Table 2).

1 According to figures from the Institute of Wheat at General Toshevo

2 According to figures from the Institute for Maize at Kneja

3 According to figures from the Research Institute for Amelioration and Electrification of Agriculture

Table 2: Quantities of solid agricultural by-products, 2006

| Types of solid agricultural by-products | Total quantities, t/a | Estimated share of available % unused quantities | Available unused quantities, t/a |
|---|-----------------------|--|----------------------------------|
| Straw | 2 714 500 | 20 | 542 900 |
| Maize stems | 1 799 680 | 60 | 1 079 900 |
| Sunflower stems | 1 270 000 | 60 | 762 000 |
| Vine pruning | 170 000 | 80 | 136 000 |
| Fruit tree pruning | 58 900 | 80 | 47 120 |
| Tobacco stems | 50 000 | 80 | 40 000 |

Source: National Long Term Programme to encourage the use of biomass for the period 2008-2020

The key characteristics of solid agricultural by-products are showed below in Table 3.

Table 3: Qualitative indicators of agricultural solid by-products, 2006

| Types of solid agricultural by-products | Available unused quantities, t/a | Humidity, % | Carbon content, % usable mass | Lower caloric value, Kcal/kg | Energy equivalent, t/a |
|---|----------------------------------|-------------|-------------------------------|------------------------------|------------------------|
| Straw | 542 900 | 10 – 20 | 42 | 3 400 | 184 500 |
| Vine pruning | 136 000 | 30 – 40 | 32 | 2 200 | 29 900 |
| Fruit tree pruning | 47 120 | 40 – 50 | 27 | 2 000 | 9 400 |
| Total (straw, vine prunings and fruit tree prunings) | | | | | 223 800 |
| Maize stems | 1 079 808 | 40 – 60 | 24 | 1 800 | 194 400 |
| Sunflower stems | 762 000 | 30 – 40 | 30 | 2 200 | 167 600 |
| Tobacco stems | 40 000 | 50 | 28 | 2 000 | 8 000 |
| Total | | | | | 593 800 |

Source: National Long Term Programme to encourage the use of biomass for the period 2008-2020

The results shown indicate the great significance of the energy potential of unused quantities of solid agricultural by-products. If only the by-products, for which well-developed technologies of energy transformation exist (straw, vine pruning, fruit tree pruning), their energy equivalent would amount to 2.9 % of the gross domestic consumption in Bulgaria.

2.2. Livestock waste

Information on livestock bred in large farms⁴ is shown below in the Table 4:

Table 4: Quantities of manure produced by large farms⁵, 2006

| Type of livestock farm | Number of animals in large farms | Average daily quantities of manure per animal, kg of dry matter/ day | Annual quantities of manure from larger farms, t of dry matter/a | Energy equivalent of biogas, t/a |
|------------------------|----------------------------------|--|--|----------------------------------|
| Bovines | 127 205 | 4,0 | 92 860 ⁶ | 20 000 |
| Pigs | 462 070 | 0,6 | 101 193 | 21 800 |
| Birds | 12 000 000 | 0,03 | 131 400 | 28 200 |
| Total | | | 325 453 | 70 000 |

Source: National Long Term Programme to encourage the use of biomass for the period 2008-2020

During the proper operation of the installation, it is possible to produce biogas with an energy equivalent of 2 150 kcal/kg dry manure. This corresponds to producing 1 tonne of manure dry matter per 500 m³ of biogas with 50% methane content (lower calorific value of methane 35.818 MJ/ m³). The energy potential of biogas shown above can be used to generate around 325 GWh/a of electricity.

2.3. Solid household waste

In 2004 the quantity of solid household waste in Sofia was 361 700 tonnes/a (according to Sofia Municipality). The average lower calorific value of household waste in Bulgaria is about 1 000 kcal/kg. The energy equivalent of solid household waste from Sofia is about 36.300 toe/a.

⁴ Large farms are those breeding over 20 cows or buffalo, over 200 pigs or over 10 000 chickens

⁵ Figures supplied by the Ministry for Agriculture and Food

⁶ It is assumed that cows and buffalo spend about half of the year outside farms, so the quantity of manure collected is about 50 % of the total quantity

2.4. Landfill gas

Table 5: Collectible landfill gas quantities at some landfills in Bulgaria and energy potential values, 2006

| Landfills | Landfill gas quantities, m ³ /a | Energy potential* toe/a |
|--------------------|--|-------------------------|
| Sofia-Suhodol | 14 211 053 | 6 080 |
| Vratsa | 853 678 | 360 |
| Plovdiv-Tsalapitsa | 6 955 200 | 2 980 |
| Sliven | 2 004 480 | 860 |
| Burgas-Bratovo | 4 228 200 | 1 810 |
| Varna-Vaglen | 1 710 000 | 730 |
| Shumen | 1 879 200 | 800 |
| Razgrad | 1 252 800 | 530 |
| Silistra | 1 252 800 | 530 |
| Rousse | 3 382 560 | 1 450 |
| Total | 37 729 971 | 16 100 |

Source: National Long Term Program to encourage the use of biomass for the period 2008-2020

The maximum possible electric generation is about 58 GWh/a.

2.5. Gas from waste water treatment plants

According to information from the National Statistical Institute, 69.2 % of the country's population is using sewerage systems (about 5 200 000 residents), of which as few as 39.9 % use waste water treatment plants (about 2 075 000 residents). The specific quantity of sludge in treatment installations is 82 tones/day of dry matter per 1 million people, which is equal to about 62.1 tones of dry matter/a. In the anaerobic digestion of sludge, the gas derived (50% methane content) is 345 m³/tonne dry matter. If the entire quantity of sludge is anaerobically treated, the generated quantity of gas will be 21 424 500 m³/a with energy potential of about 9 100 toe/a and possible electric power generation of about 42 GWh/a.

This summarized information shows the importance of the energy potential of unused quantities, if this potential is utilized, it could cover about 9 % of the final energy consumption in Bulgaria. However at the moment there are no plants utilizing biogas from farming, yet and no refueling stations with biogas or biogas mixture with other fuels, too.

3. Biogas benefits and prospective

The biogas technologies might be the way for reduces the energy dependency of Bulgaria. They might help for reducing the waste in the country. The future of biogas in Bulgaria is

* The energy potential values were calculated at 50% methane content in landfill gas and lower calorific value of methane: 35.818 MJ/m³.

promising, because about 55% of the generated wastes are biowaste. Several biogas projects are under development and it is supposed that the realization of one installation will provoke the interest of the community and other projects will be developed.

4. National Policies

At the moment there is no existing legislative framework focused on biogas in Bulgaria. There is a Renewable and Alternative Energy Sources and Biofuels Act (biogas is defined as: “gas derived from biomass and/or biodegradable fractions of waste, which can be refined to the quality of the natural gas and be used as biofuel”), which regulates the public relations aiming to promote the production and use of electrical, heating and/or cooling power generated from renewable and alternative energy sources, as well as the production and use of biofuels and other renewable fuels in the transport sector. Biogas is mentioned in the Long – Term Programme to Encourage the Use of Renewable Energy Sources for 2005-2015, the Short - Term Programme to Encourage the Use of Renewable Energy Sources for 2007 and the National Strategy Plan for Rural Development for 2007-2013.

5. Barriers to biogas projects

The main barriers of biogas implementation in Bulgaria are given below:

- the farmers, the industries and the general public have low awareness about biogas technologies;
- insufficient information and knowledge of the applicable legislation and regulations and poor coordinating among the governmental and the non-governmental sectors;
- lack of sufficient information on relevant ongoing projects and difficult access to state support available for funding and co-funding;
- Bulgaria does not provide any financial incentives for the production of heat from RES.

The ways to eliminate those barriers are:

- ensuring of access to reliable information about the potential of RES, technologies in the field of RES and the environmental, social and economic aspects of using them;
- elaboration of new clear and focused legislative, regulative and legal frameworks and strategy for implementation of biogas technologies;
- implementation of preferential policies for the RES development;
- set up of new suitable and sustainable financial environment;
- providing state support for the implementation of projects and to overcome any difficulties in terms of funding and co-funding;

- facilitating the access to EU funding opportunities in the field of biogas technologies;
- clarifying the procedure for the allotment of grants to SME's working in the field of RES;
- development of action plan, which have to include approach and instruments for implementation of biogas.

6. Public Policy Measures to Support Biogas

6.1. Regulatory Measures

In order the share of RES and especially the share of biogas to be increased, it might be useful if the Bulgarian government work out a clear policy for the sustainable use of RES on economically vital basis, optimal use of the existing resources, favorable sustainable financial backgrounds and preferential policy aimed at their development.

Policy priorities in the energy sector are reflected in the National Plan for Economic Development of Bulgaria and the Energy Strategy of the country and are in harmony with the requirements of European directives. Energy Act regulates government and the system of public relations in its policy to promote use of renewable energy sources. Currently it is preparing a draft law to encourage the use of RES.

Main priorities of the Bulgarian economy and energy are:

- sustainable economic development;
- competitiveness of the Bulgarian economy;
- security of energy supply;
- encouragement of the investment process;
- social stability;
- environment friendly production of goods and services;
- optimal utilization of the potential of local and renewable energy resources.

Sustainable energy development in Bulgaria can be achieved only by combination of measures introducing RES with measures, which increase EE.

6.2. Administrative Measures

It was adopted Regional Development Law, which set requirement municipalities and districts in Bulgaria to develop or unified already elaborated municipal plans for regional sustainable development, according to its requirements. The plans have to include

activities related to the utilization of local resources and the implementation of RES and EE measures.

Availability of Municipal / Regional Development Plan and Programme for implementation of the municipal / regional development plan can ensure the inclusion of planned programs and activities in the First National Energy Efficiency Action Plan (2008-2010), in Short- and Long-Term National Energy Efficiency Programme and in National Long-Term Programme to Encourage the use of renewable energy sources (2005-2015).

6.3. Incentives

At the present moment there are no incentives and methods, which stimulate the biogas technologies in Bulgaria. The only one incentive is that the biofuels are not subject of the present Excise Tax since 2005.

6.4. Other Measures (eg. education, awareness, R&D)

At the moment in Bulgaria there is lack of qualified experts in the field of biogas, it is difficult to provide occupational qualification for the staff and the process for such occupational qualification is too slow. There is a need for promoting company.

7. Conclusion

In conclusion, we can summarize that Bulgaria is a country with large potential for biogas production, but the existing legislative framework is inadequate. The information concerning biogas technologies is insufficient and scattered among various institutions and organizations.

To overcome all problems concerning the biogas implementation in Bulgaria it is necessary active involvement of all state institutions, the general public and the non-governmental institutions. Information about biogas Programmes, contests, coming initiatives and deliverables from already completed initiatives (seminars and conferences), concerning the development of biogas technologies, have to be provided.