



Republic of Serbia
Autonomous Province of Vojvodina
Provincial Secretariat for Energy and
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BIOGAS PLANT – GUIDELINES FOR FEASIBILITY STUDIES INCLUDING AN EXAMPLE FOR ONE BIOGAS PLANT

– A B S T R A C T –



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On request and with the financial support of Provincial Secretariat for Energy and Mineral Resources, during year 2011, the following publication has been created:

STUDY OF POTENTIALS AND POSSIBILITIES FOR BIOGAS PRODUCTION AND UTILIZATION IN AUTONOMOUS PROVINCE OF VOJVODINA

Aim of the study was to analyze biogas technology, its applicability in Serbia and Vojvodina, define potentials for biogas production, and to inform competent institutions and the general public. Study is available for the interested at web site of the Secretariat, psemr.vojvodina.gov.rs under section Studije-potencijali. In the meantime, the project within IPA Cross-border Co-operation Programme with partner from Hungary was granted:

Establishing the cross-border development of biogas industry via joint determination of biogas potentials, education, research and innovation.

Results of this, ongoing project, are publications **Biogas Technology** (Martinov i dr, 2012a) and **Biomethane** (Martinov i dr, 2012b), which informed, in a short and clear form, general public and potential investors.

These publications have indicated the fact that the biogas production and utilization has great importance for Serbia and Vojvodina, according in meeting the goals set in Directive 2009/28/EC (Anonym. 2009) and the Energy Law of the Republic of Serbia (Anonym. 2012), which relies on the Directive. Biogas is an important renewable energy source, with distinct positive effects on the environment, especially in the case of waste disposal. The greatest potential is in agricultural branch, but not, as it is general opinion, in the use of animal excrement– manure, but energy crops. Using of energy crops as substrates is a complex problem, related to the price of these substrates, oscillations of the prices of agricultural products and competition with food production. An important positive effect, in that sense, is the engagement of agricultural resources and support to rural development.

In previous publications, the complexity of production and utilization of biogas is underlined as well. Biogas plants are complex production units, in other words– kind of factory, which demands responsible operation in all its phases, and the appropriate knowledge and skills of those who operate and work on them. The problem of appropriate placement of energy is emphasized. This especially applies to the use of thermal energy, which amount is approximately quantitatively equal to electrical power.

Requirements for feasible investments in biogas plants were achieved only with the adoption of the Regulation on the status of eligible electricity producer (Anonym, 2009c), and Regulation, which defines the higher price of electricity obtained from renewable energy sources the so-called feed-in tariffs (Anonym, 2009c). The result is a great interest for the construction of biogas plants, as well as the realization of a few of them. In the year 2012, the first agricultural biogas plant has been put into operation in Vojvodina. The investor is a company Mirotin - Energo from Vrbas.

During the year 2012, once again the feed-in tariffs were considered and their changes implemented. At the time of finalizing of this publication, the new regulation has not yet been officially announced, but the prices are known. According to the Regulation, the price are slightly reduced for capacities up to 200 kW_e and slightly increased for capacities over 1 MW_e. Based on the feed-in tariffs that are proposed, the cost for a plant with 150 kW_e would be 15.66, for the capacity of 300 kW_e– 15.24, 14.40 for the 500 kW_e,

and finally for 1 MW_e and the increasing power of 12.31 ct/kWh_e. Another novelty is the introduction of feed-in tariffs for biogas plants that use substrates of animal origin– the slaughter house waste, and the price is 12.31 ct/kWh. For biogas plants that use sludge from waste water purification the electricity price is 6.91 ct/kWh_e and for those that use waste 8,57 ct/kWh_e.

Provincial Secretariat for Energy and Mineral Resources recognized the need to continue activities in this field, and the study that gives potential investors guidelines to consider the possibilities of investments in biogas plants. In addition, the results of this study should be useful and relevant to the general public as a source of information on biogas technology and the technical and economic feasibility of biogas production and utilization.

The aim of the study is to show the complexity of biogas production and utilization, with emphasis on the possible barriers and mistakes that could have significant consequences after building of a biogas plant. It should be a support to make the right decisions, for example, the withdrawal of investments in biogas plants according to technical conditions and financial justification.

According to the Law on Planning and Construction, the preparation of prefeasibility study is required, and then (conditionally final) feasibility study, which include general and preliminary design, which analyzes the technical aspects of investments. This is followed by obtaining permits, development of and other capital project, relating to large investments. The team, in completion of the study, has led the principle to minimize costs, or to make decisions timely, if the investment is not feasible, prior to the greater investments.

In accordance with the above mentioned principle in this study, it was suggested that the activities begin with a kind of self-evaluation, after which follows the decision to continue or withdrawal of activities. Self-evaluation is carried out by a potential investor, and therefore the costs are minimal.

Although it is not obligatory in mentioned Law, because the laws primarily cover the legal aspects, the preparation of the technical feasibility study is to be recommended. An institution with the necessary knowledge and experience creates it, and it is even better that a potential investor manages its creation in collaboration with professional consultants.

According to the mentioned Law, it is also not obligatory, at the beginning of investments consideration, to conduct financial appraisal of planned investment. Its creation is necessary and desirable, and it may be conducted by a potential investor with the assistance of a professional consultant. In this study, a software tool **BiogasPro** has been developed and its use is described in detail. These documents, technical feasibility study and financial appraisal of investment, should be useful for making decisions either to continue or to abrupt activities regarding of investment of a biogas plant. This publication and a software tool as well, are available on the website of the Department of Environmental Engineering and occupational safety and health, Faculty of Technical Sciences Novi Sad, www.izzs.uns.ac.rs.

Furthermore is necessary engagement of a licensed project engineer. Construction of biogas plant is not a common job for project engineers. There is almost no plant of the same or very similar configuration. Technical feasibility study, including financial appraisal, are outstanding basis for preparing the prefeasibility study, and a kind of a general project. Therewith, the work of the project engineer is significantly shortened, whereby the costs as well. A potential investor has a much better insight into the techniques and proposed

solutions, and financial indicators. Software tool **BiogasPro** can be used in this phase as well. Previously prepared materials make it easier and accelerate the development of (final) feasibility study with a preliminary project. Therefore, the costs are significantly reduced, and the statements clearer and more plausible.

In the Appendixes is attached is an abridged version of the technical feasibility study and financial appraisal of the investment for one biogas plant, in the configuration and of structure the same as the prefeasibility study. One of the major constraints for the achievement of profitable investment and operation is the use of feed-in tariffs. Unknown fact is the price of electricity after the contract period, which is twelve years. If the life of the project would be only twelve years, results of the financial appraisal will be certainly negative. Uncertainty for agricultural biogas plants represents also pricing of agricultural products, which in recent years increases significantly. Only a small number of potential investors can count on the use of manure in the mixture of substrates above 50 %. Other substrates are coming from agriculture, and their costs are linked to the prices of agricultural products.

Of great importance is placement of thermal energy. Even in planning phase of the construction of biogas plant it must be taken into account, and its potential impact and significance assessed. In the mentioned example for a biogas plant, it was assumed that as substrates, beside manure, mainly crop residues are used. Additional calculations have shown that for intensive use of energy crops, profitability could be achieved only if about 30 % of thermal energy is used and the price of electricity would have been higher by about two cents per kWh than those outlined by the new Regulation.