

INCREASING ACCEPTANCE FOR BIOGAS APPLICATIONS

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ABSTRACT

As a renewable energy source, biogas has clear environmental advantages. This article and the project *BiogasAccepted* focus more specifically on the topic of acceptance of biogas operations in selected European Regions. Within the *BiogasAccepted* project there were four deeply analyzed cases in Poland where the three branches: networking, public relations and the use of questionnaires tool, were implemented. The case studies present different investment development stages – an advanced project without a building permit, one almost being installation, and two plants under construction. All of them were sized from 30 kW_{el} to 2.3 MW_{el}. The public acceptance varied from perceived neutrality to impending protests.

INTRODUCTION – BIOGAS AS A RENEWABLE RESOURCE IN EUROPE

With more and more attention being paid to renewable energy in the modern world, its different forms have sparked greater interest and research activities. As a renewable energy source, biogas has clear environmental advantages, described here by the European Union (Directive 2009/28/EC).

“The use of agricultural material such as manure, slurry and other animal and organic waste for biogas production has, in view of the high greenhouse gas emission saving potential, significant environmental advantages in terms of heat and power production and its use as biofuel. Biogas installations can, as a result of their decentralised nature and the regional investment structure, contribute significantly to sustainable development in rural areas and offer farmers new income”.

For example, the typical greenhouse gas emission savings are between 80-86% for biogas as a compressed natural gas produced from municipal organic waste, wet or dry manure while CO₂ savings from ethanol produced from wheat is estimated at 32% (Directive 2009/28/EC).

In order to comply with the Kyoto Accord and United Nations Framework Convention, the European Union has recognized the necessity to focus on the increased use of renewable energy, energy savings, and energy efficiency. Currently, the EU has set its target to have a 20% share of all energy to be from renewable sources by the year 2020. To supplement this goal, they are also aiming to have 10% of all transport fuels as biofuels and cut greenhouse gas emissions by 20% from 1990 levels.

Beyond the environmental benefits of renewable energy market development, the EU has also recognized its potential for “positive impact[s] on regional and local development opportunities, export prospects, social cohesion and employment opportunities, in particular as concerns SMEs and independent energy producers” (Directive 2009/28/EC). The majority of biogas producers are SMEs or independent energy producers

in fact, and therefore the benefits that the EU recognizes can have a significant impact from biogas applications.

On the other hand, these lofty goals are behind schedule, reaffirming that more action needs to be taken on the dissemination and acceptance of renewable energy technologies. The reasons behind the lagging dissemination of biogas applications include: producers having little knowledge on the topic, a lack of economic incentives for investment, high feeding in prices for biogas and electricity, and costly bureaucratic procedures. Many issues also arise at the production site, as the local community has to be convinced that biogas is the way of the future.

Everyone interested in promoting biogas has to cope with these problems. Promoting biogas is not only in the interest of current and future operators, but also national experts, multipliers, energy consultants, market actors, and policy decision makers.

This article and the project *BiogasAccepted* focus more specifically on the topic of acceptance of biogas operations. Although to some, a lack of acceptance might seem to be nothing more than an unwanted side-effect of production, efforts to increase acceptance can have more benefits than originally expected. Local acceptance issues can be costly for the plant owner and all actors that wish to further biogas development. For example, regular disturbances, negotiations, and public relations issues can not only decrease market potential, but also decrease the amount of time that is available to focus on the business itself. By clearing up acceptance issues early and in a timely fashion, the biogas plant operator can shift its focus to where it should be – ensuring that her or his biogas operation is running as efficiently and effectively as possible.

By establishing a good relationship with neighbours, the plant owner not only creates a more comfortable working environment, but also sets

him- or herself up for a dialogue that can work in much more proactive ways. For example, should further problems occur, neighbours might talk with the plant owner so that the problem can be worked on directly, as opposed to complaining to the community and causing a greater disturbance.

This type of two-way dialogue has the potential to be extremely beneficial for the biogas operator, as it can help in political lobbying by impacting policy decisions.

Additionally, changes in policy can even affect public opinion, going beyond their obvious economic benefits. This is another reason why involving political actors can be important not only for the future of legislative conditions, but neighbour opinions and acceptance as well.

OBJECTIVES AND POTENTIALS FOR BIOGAS IN POLAND

The current biogas production in Poland is 5515 TJ, of which 1432 TJ is from landfills, 3976 TJ is from sewage sludge, and 107 TJ is from agricultural biogas plants (stated in statistics as "other installations"). Figure 1 shows that the Polish biogas profile's size and structure differs from the average EU structure. It is obvious that Poland's total biogas production is relatively low and has a low volume of biogas from agriculture (its share is less than 2% of the total).

Poland is a country with a significant agriculture sector. The biogas potential has already been recognized and in 2008, the Ministry of Economy and Ministry of Agriculture and Rural Development started preparing a development program entitled "Innovative Power-Energy Agriculture." Its main objective is to create the

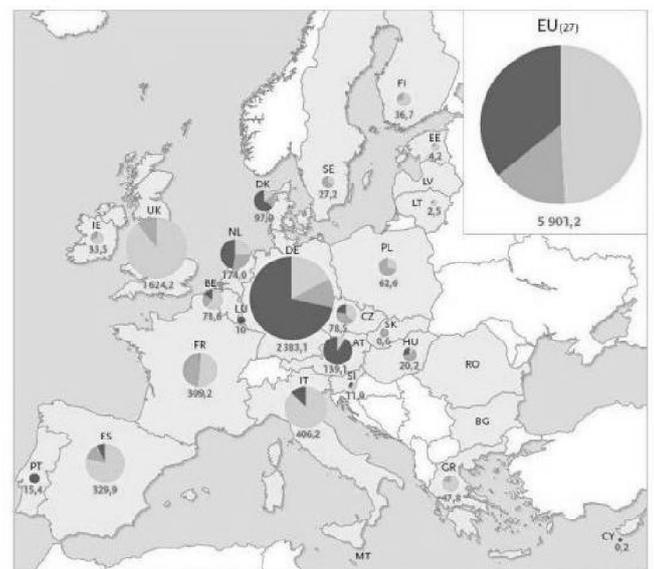
right conditions to encourage the development of installations for producing agricultural biogas. This in turn will be used to generate heat and electricity.

The significant energy potential of Polish agriculture offers chances for the development of biogas in Poland which are expected to be capable of annually generating 5-6 billion cubic meters of biogas that fulfils the parameters of high-methane natural gas. (Program Innovative Power-Energy Agriculture, Ministry of Economy, Warsaw 2009).

The "Innovative Power-Energy Agriculture" program also encompasses a number of legislative changes, including amendments to the 1997 Energy Law. These deal mainly with certificates of origin, quality issues, and a range of technical and legal matters.

The Agricultural Biogas Development Plan does not explicitly favor specific substrates. Thus far, the feasibility analysis and practical experiences indicate that the use of sludge and animal organic waste definitely improve economical performance. Moreover, biogas from livestock manure has numerous environmental advantages such as the reduction of methane and CO₂-emissions, reduction of emissions of particulate matter and nitrous oxides, reduction of odors.

The commercial conditions for agricultural biogas plants that use a co-generation unit have not been proved to be sufficiently cost-effective from a financial point of view. Currently, it is most profitable to build large (over 500 kW of power), centralized agricultural biogas plants with a minimum 75% subsidy share on the scale of the whole investment.



Primary energy production of biogas of the European Union in 2007 (in ktoe)
 Legend: Landfill gas, Sewage sludge gas, Other biogases (decentralised agricultural plant, etc.)
 5 901,2 Red figures show total production in ktoe

Figure 1. Primary energy production in Europe
 Source: Biogas Barometer, EurObserv'ER, 45, 2008

The key success factors for building profitable agricultural biogas plant are: financial subsidies, higher income from selling energy, and cheap substrates.

HINDRANCES FOR THE DIFFUSION OF BIOGAS APPLICATIONS IN POLAND

The ambitious targets outlined in the mentioned Program need to be implemented. In reality a number of technical, socio-economical, legal and administrative hindrances need to be overcome. For technical barriers like a lack of knowledge or only a few specialised companies offering equipment, technical service, and assistance will be overcome relatively quickly. The most troublesome are socio-economical, legal and administrative impediments; for example long administrative procedures for legal approvals of installations. Moreover, the most severe barriers for potential investors and plant operators are economic ones. There is a need to improve the profitability of biogas installations, especially for those applications that offer the greatest environmental benefits. In Poland there are two types of certificates of origin issued for electricity from cogeneration: 1) certificates of origin for electricity generated in installation of fuelled gas, or with installed capacity below 1 MW (so-called "blue" certificates), and 2) certificates of origin for electricity generated in the remaining cogeneration sources (so-called "red" certificates). National Report, The President of The Energy Regulatory Office in Poland, Warsaw 2009.

Finally, mental barriers are often surrounding serious social conflicts. There are examples of protest committees who have delayed or even halted the investment process altogether. Such protests took place for example in: Nowa Kazmierka:

(<http://pleszew.naszemiasto.pl/wydarzenia/978941.html>),
Wies Kosowska:

(<http://www.zycie-siedleckie.com.pl/sokolow-podlaski/5-sokoow-podlaski/1370-co-na-to-inwestor.html>).

Any such activity is characterized by the strong, active leaders and accompanying strong emotions.

BIOGASACCEPTED

An EU co-funded project, BiogasAccepted works to improve acceptance for biogas applications in selected European Regions. It began work in October 2007 and will complete its 30-month duration in March 2010. The partners for this project are:

- Italy (Treviso) – Fondazione Nord Est
- Spain (Barcelona) – University of Barcelona
- Poland (Warsaw) – Institute for Fuels and Renewable Energy
- Hungary (Budapest) – Hungarian Biogas Association
- Austria (Schlierbach and Steyr) – Studia and Profactor

- Slovakia (Komarno) - Research Realization Institute of Renewable Energy Sources, Ltd.

Following a participative process where customer and stakeholder demands of biogas applications were identified, a tool for biogas acceptance was developed. Available on the project's website (www.biogasaccepted.eu), this tool includes a questionnaire survey (available in seven languages) that can be used to measure the acceptance of the application's neighbours. Following the completion of the surveys, our partners inputted the figures and received a detailed, automated analysis on what the level of acceptance was at the site, as well as how to use the results to create a more positive image of the plant.

The results of the surveys will be presented at local events with end-users, neighbours, suppliers, and other stakeholders in attendance. Here, local experts will lead educational discussions on the benefits of biogas technology, and the plant owners will have an opportunity to speak about their facilities and efforts that will be made to increase acceptance. In addition, each partner will hold a workshop to inform and educate renewable energy specialists, biogas lobbyists, and other potential users on the tool's benefits.

Another facet of the project has been the round table discussions that have been organized to increase dialogue and interaction between those in the biogas industry. Each country held two round table discussions that focused on contacting key regional players to discuss and take action on unfavourable policies. Overall, they were considered a successful way of networking with other biogas actors as well as brainstorming for solutions to problems that the industry faces.

The project chose three types of biogas applications from which the online questionnaire tool is based: CHP (Combined Heat and Power), Grid (feeding into the natural gas grid), and Vehicle (to be used for vehicle fuelling.) With these 3 types of biogas applications, important European goals for renewable energy may be reached. For example, the EU states that the energy used in heating is nearly equal to that of electricity and transport combined. Acceptable biogas operations that produce these types of energy are particularly beneficial and can greatly contribute to a more environmentally-friendly future.

STRATEGIES TO INCREASE ACCEPTANCE

Increasing the acceptance of a neighbouring community is often a holistic process that involves different, but coordinated, efforts. The BiogasAccepted project has focused in particular on three branches to achieve positive results: networking, public relations, and the use of the BiogasAccepted online questionnaire tool.

First, networking can be extremely valuable in a number of different ways. By combining efforts,

a coordinated group of biogas promoters can achieve much more than a single plant owner would on his or her own. This can help a great deal in lobbying the government and technology transfer. Additionally, it can be extremely valuable to establish good contacts with other organizations that can aid in problem-solving or provide start-up information, such as the local chamber of agriculture, biomass or biogas associations, or energy providers. In Poland, the national biogas association is Polskie Stowarzyszenie Biogazu (<http://pba.org.pl>) and the biomass association is Polskie Towarzystwo Biomasy (<http://www.polbiom.pl/>).

Public Relations (PR) work is important for all types of business. However, biogas is often surrounded by negative perceptions and stigma, and therefore it can benefit even more by the ameliorative effects that PR work can have on these acceptance issues. The BiogasAccepted project in particular hosted local PR events on the subject that was described earlier. However, there are many other effective ways to promote the fuel; some ideas include creating a biogas unit for local school classes, hosting the community for a tour or open house of the plant, or even launching

a media campaign using radio, newspaper, or television advertisements.

Finally, the use of the BiogasAccepted online questionnaire tool can provide the plant operator with the information necessary to target specific issues of acceptance.

The responses are given in a detailed report and that also comprise an output of the following seven dimensions: renewable energy attention, biogas interest, biogas project acceptance, regional climate, demands to the region, individual values, and individual commitment. A comparison between the dimension figures and benchmarks provided by the tool can point the user to specific actions to improve the local climate for the biogas plant. For example, if the figure for biogas project acceptance is low, then the benefits that this plant might have for the region should be communicated to the neighbours. The questionnaire action has many benefits that it can provide for its users, but sufficient preparation should be done in order for it to have the maximum positive effect on acceptance.

Table 1. Overview of Actions for Different Instalments

Source: *Increasing Acceptance for Biogas Applications. A Handbook for Biogas Promoter. Baaske et. Al., 2010* (The Handbook is an output of the BiogasAccepted project and can be downloaded also in Polish from the website: <http://www.biogasaccepted.eu/>).

	Networking	Public Relations	Online Questionnaire Tool
Installation capacity			
Micro-installations < 150 kW	YES	MODERATE	NO *
Medium 150 kW – 1 MW	YES	YES	YES
Large 1 MW – 2 MW	YES	YES	YES
Very large > 2 MW	MODERATE	MODERATE	NO
Placement in region			
In direct vicinity of households	YES **	MODERATE	MODERATE ***
Up to 500 m from households	YES	YES	YES
More than 500 m from the nearest building	YES	YES	YES
At industrial sites	YES	MODERATE	MODERATE
Type			
Agricultural biogas plant	YES	YES	YES
Biogas produced at a Waste water treatment plant	MODERATE	NO ****	MODERATE ****
Biogas at a landfill	MODERATE	NO ****	MODERATE ****
Timing			
Prior to plant construction or upgrade completion	YES	MODERATE	YES
Plant has been running for less than three years	YES	YES	NO
Plant has been running for more than three years	MODERATE	YES	YES
Local Climate			
Positive	YES	MODERATE	MODERATE
Undecided	YES	YES	YES
Negative	YES	YES	NO *****

* Focus Group is recommended

** Face-to-face talks are important to establish rapport

*** The issue may consider only a small number of residents

**** Typically installation is localized in a remote area and acceptance problems may not be due to biogas in particular, but the size of the industrial development

***** Some type of conflict resolutions should take place before a questionnaire is acceptable.

RECENT EXPERIENCES ON IMPROVING ACCEPTANCE IN POLAND

Within the BiogasAccepted project there were four deeply analyzed cases in Poland where the three mentioned branches (networking, public relations and the use of questionnaires tool) were implemented. The case studies present different investment development stages – an advanced project without a building permit, one almost being installation, and two plants under construction. All of them were sized from 30 kW_{el} to 2.3 MW_{el}. The public acceptance varied from perceived neutrality to impending protests.

The applied approach is presented in Table 1.

Research, consisting of meetings with local stakeholders, surveys, and round table meetings allowed us to formulate some general conclusions for Poland:

- Both investors and local authorities treat the acceptance issue seriously. The environmental law, which gives significant power to potential opponents of biogas plant, constitutes a framework for public discussion.
- The size of installation and substrates used are important for residents. Larger sizes typically attract more controversy and protests. For substrates, waste from livestock raises more concerns, especially when a large volume is planned to be transported from a far distance (In rural areas where biogas plants are located there are narrow roads not prepared for heavily transport).
- Interviewed people said that biogas plants' most negative impacts are traffic nuisance, bad smells, and increased tensions with neighbors.
- There is concern that the public emotions associated with the construction of biogas plants are used by local leaders or politicians for political gain.
- Informal contact tends to be more effective than official contact, and the earlier work is started on public acceptance, the better.
- There is still need for promotional and educational actions, though it is still unclear as to who will be responsible for these

RECENT EXPERIENCES WITH ACCEPTANCE IN OTHER EUROPEAN COUNTRIES

The BiogasAccepted surveys have thus far reported on various levels of acceptance in the six European countries, but overall acceptance has been improved in the individual cases. The following are some examples of the experiences that the BiogasAccepted project partners have had as they attempted to increase acceptance of local biogas applications.

The odour emitted from biogas plants is a common and recurrent basis for acceptance issues in neighbouring communities. In one case in Austria, a plant owner was having acceptance problems because of his plant's odour, but was able to create a more positive climate with effective PR efforts.

After consulting the legal requirements for biogas plant odour, he discovered that his plant was emitting

odour on fewer days than the legal maximum. Upon communicating this to the local citizens, he received far fewer complaints and the neighbours seemed to respect that he was easily complying with the law. The farmer was also able to convey the plant's potential to help the community reach its energy-independent goals, a goal that was very important for the citizens and consequently increased their positive association of the plant.

In another Austrian case, the communication that started prior to the plant's completion was met with a very positive reception. First, the neighbours were surveyed and then an event was held where the benefits of the plant were advocated. This type of proactive approach helped to answer the questions that the neighbours had, and also made them feel more personally invested in the plant's success. Since its construction, the owner has enjoyed a very positive local climate and relationship with his neighbours.

At times, it is not the neighbours but the local government that makes it difficult for the biogas plant to operate. In one case in the Italy, there were no problems with neighbours as the plant was located in a farming region, but the local government created bureaucratic obstacles that the plant owner had to overcome. These obstacles stemmed from a lack of education on the benefits of biogas, highlighting the importance of providing this information to the politicians and other leaders.

In Spain and Slovakia, the actions of the project have not only created a greater understanding of the regional biogas plants, but have sparked an interest for farmers to create their own biogas plants. Upon attending biogas events, these farmers further understand the economic and environmental benefits that biogas has, and have begun the processes to construct biogas plants on their farms.

As important as it can be to educate the active adult neighbours of biogas plants, the benefits from educating children can often have an even greater impact. In Hungary, an extensive education program was undertaken to help children to understand biogas technology and its potential to positively effect the environment.

Children represent an open-minded, interested audience that can then pass that information on to their parents; actions that were witnessed in the Hungarian campaign. In addition, these actions will have longer-lasting on the future of biogas production and community involvement.

CONCLUSION

The ambitious targets for the development of agricultural biogas plants in Poland, outlined in the Program "Innovative Power-Energy Agriculture", need to be implemented in order for a greater level of success to be achieved for biogas in the country. In reality, however, there are a number of hindrances that can be grouped into three categories: technical, socio-economical, legal and administrative. Recent studies show that in commercial conditions, agricultural biogas

plants using a co-generation unit are not sufficiently cost-effective without subsidies, higher selling prices, or decreased substrate costs. It is best, from both an environmental and economic perspective, for biogas operators to combine and use all available organic matter as basing biogas installations solely on energy crops may be not the best solution due to the risk of growing prices for biomass. BiogasAccepted not only enabled case studies in Poland to formulate general recommendations, but also provided a tool to investors and biogas plant operators for increasing social acceptance for their installations.

If there is a continued focus on acceptance and favourable legislation for biogas installations, the future for biogas will be very bright.

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