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Report on barriers for biogas implementation in Greece

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1. Introduction

This report was compiled in the frame of the BIG>EAST project (EIE/07/214), which is supported by the European Commission within the Intelligent Energy for Europe programme.

The objective of this report is to identify the barriers (mainly the non-technological ones) for the development and implementation of a biogas project in Greece. The pages that follows attempt to illustrate the main barriers that a biogas project may face during the design, development and implementation phase.

The scope of this report is assisting all the involved parties in understandings which are today the most important barriers and how they can affect the whole lifetime of a biogas project. Furthermore this work aims to become a useful tool and help the policy makers and biogas market actors on coordinated initiatives in order to reduce, eliminate or even remove them (at least the most crucial of these barriers).

The report is one of a series of six reports dealing with the target countries of the BiG>East project: Bulgaria, Croatia, Greece, Latvia, Romania, and Slovenia. The target group of this report is mainly policy makers, politicians, biogas stakeholders, researchers, Renewable Energy Sources investors and the general public.

The barriers identified are grouped and are presented into the following three general categories:

- Market Barriers
- Financial Barriers
- Other Barriers (eg. Economic, Social, Legal & Administrative).

2 Market barriers

2.1 Awareness about the use of biogas potential

Nowadays the biogas exploitation is a well known and well established technology in the cases of Wastewater Treatment Plants (WWTP) and Sanitary Landfills. However, there is still lack of knowledge and information not only to the farmers but also to the industries (owners) and the general public about the possible energy exploitation of wastes, their final uses of biogas (eg. electricity, heat, injection to the natural gas grid, transport fuel) and their benefits.

Generally, the Anaerobic Digestion (AD) technology is used mainly as a waste treatment method but not accompanied with biogas and energy production (at least not in a wide extent at the moment). The general approach is that the waste are disposed after some treatment (aerobic or anaerobic) than the adaptation of a well know and integrated technology (AD) for parallel biogas production and the substrate use as fertilizer.

Furthermore, the wastes disposal (eg. manure) creates so far only a few problems compared to what happen to the other EU Member States (eg. Weste Europe). In parallel in most of the cases the «polluter pays» principle is not efficiently applied although the Greek environmental legislation is very strict.

2.2 Awareness about available biogas technologies

The main market for biogas production in Greece is the electricity market (WWTP and landfill gas) and the heat market is a small one (internal use to the AD plants for the process heat). Nowadays there is a mature «Energy Market» in Greece concerning the AD technology (eg. technology vendors, plant designers, operators). Nevertheless what is needed is the further strengthening and growth of the local energy industry (this will promote the implementation of biogas projects and will reduce the high investment costs).

2.3 Waste management & supply (“fuel availability”)

In most of the cases Local and National Authorities are responsible for the collection, treatment and final disposal of sludge and municipal solid wastes and management in Greece. In these cases the «raw material flow» is stable and guaranteed (small seasonal fluctuation due to tourism).

On the contrary, agricultural and animal wastes are a matter of special concern due to the high potential and their spatial distribution almost alllover Greece. In some cases there is still lack of knowledge about the technical potential of wastes in a certain area and their biogas exploitation alternative. Parameters like stable supply of raw material and feedstock composition are fundamental for the biological process and biogas production. In some cases the seasonal production of some wastes like agro-industrial residues (eg. citrus processing industries, or olive oil mill residues) is crucial for the successful implementation of a biogas scheme and needs very careful examination.

In such cases long-term contracts between biogas plant operators and feedstock suppliers must be guaranteed and the use of different wastes (eg. agro-industrial waste with animal manure) is necessary (Co-fermentation with other raw material).

In any case farmers' involvement in a biogas project even in a Centralized Anaerobic Digestion (CAD) plant is important for the success of AD schemes (eg. supply of the raw material, receive the fertilizer, operate or participate in the biogas plant). Their involvement in an AD scheme depends on the waste management alternatives too.

2.4 Electricity Market Liberalization

In Greece the energy sector is one of the most dynamic and important of the economy (like in the most other OECD countries). Beyond that, the production, consumption and general the energy management at national level has become one of the most prominent issues of our times.

Greece seeks to become an energy centre in the region and is increasing infrastructure interconnections with its neighbours. In the last years, the country has also made significant progress in reforming its electricity and gas markets. Energy diversification has improved, with natural gas becoming increasingly important in the energy supply. Significant challenges for the future, however, remain.

The development of a liberalized electricity market in Greece suffered a significant delay due to ineffective market design adopted by Law 2773/1999, harmonizing the national legislation with Directive 96/92/EC. The Directive 2003/54/EC found the Greek electricity market development well behind, compared to the situation in other member states¹.

Even though many of the market reform laws required by the EU are now in place, The Public Power Corporation (PPC) still dominates the electricity generation in Greece. A fully competitive energy market will guarantee the consumers benefits.

Although the electricity market is fully liberalised since 1st of July 2007 also for the households the process is rather slow.

¹ Regulatory Authority of Energy (2006), Annual report 2006 to the European Commission, Athens, www.rae.gr

2.5 End users related barriers

- **Heat Market, end users and infrastructure.** The heat market is a limited market and the concept of district heating is not widespread in Greece. The thermal energy produced in Greece cover mainly household needs and industrial thermal needs (when they have such needs). Therefore there is no specific price for heat (Law 3468/06 set no price for the heat). It is worth mentioning that approx. 50% of the energy production from biogas is heat.
- **Bio-methane production (purification, possible injection to the natural gas grid).** Purification and injection of biogas to the grid is something new (must be further examined) although according to Law 3428/27.12.2005 «Liberalization of Natural Gas Market» (Official Gazette 313/A/2005), article 39, the use of Natural Gas Systems is also allowed for the transmission of biogas.
- **Transport fuel (logistics, existing transport infrastructures).** There is a limited knowledge in this field (natural gas is used as a vehicle fuel in a small fleet of public busses in Athens). The use of biogas as vehicle fuel needs the strong promotion from the gas companies (eg. build new filling stations) and the state support (eg. no taxes, reduce taxes to car owners, etc.). Additionally, Municipalities or major enterprises can play an important role promoting biogas to their buss fleets (eg. using local regulations and policies, public awareness, corporate social responsibility).
- **Development of Compost market** is needed for the use of the digestate as fertilizer or compost (market development for by-products).

3 Financial barriers

Financing the investments of Renewable Energy Technologies (RET) remains a major and first priority issue. Nowadays, more and more possible investors are willing to create green investments. The access to financing resources and the development of adequate financial instruments are only two of a series of many parameters dealing with a biogas project financing.

3.1 Availability of funding

Currently, among others, there are two main state financial-support instruments that provide substantial public subsidies to RES investment projects:

- The so-called «National Development Law» (Law 3299/2004 as was modified by law 3522/2006, Article 37, Official Gazette 276 A', December 22, 2006)
- The Greek Operational Programme for Competitiveness, one of the eleven (11) National and the thirteen (13) Regional Operational Programmes, in which the Third Community Support Framework (CSF III; 2000-2006) for Greece is divided (the Operational Programme “Competitiveness & Entrepreneurship” is scheduled to continue for the period 2007-2013).

National Development Law

This Law covers all private investments implemented in Greece (dealing with all sectors of economic activity). Regions facing certain problems like low incomes per capita or high unemployment rates receive higher investments subsidies compared to others. Thus, this instrument has a strong regional character (Greece is divided in 3 zones). Investments in RES installations (both electricity- and heat- producing ones) have a special status under this Law. Proposals for private investments can be submitted to the National Development Law at any time. The Law does not have any total budget cup, thus there is (theoretically) no limit in the number and budget of proposals that can be funded.

National Operational Programme for Competitiveness - NOPC (CSF III)

The Operational Programme “Competitiveness” (OPC)² that uses funds from the Community Support Framework III provides public funding for RES and energy saving, substitution and other energy-related actions as high as Euro 1.644 billion. Public aid accounts for 30% of the eligible cost of the projects and goes up to 60% (in certain projects). Grants were awarded to RES projects by NOPC following rounds of public calls for RES investment proposals and subsequent competitive evaluation of the submitted proposals (per round). A summary of RES funded projects from the CSF III is given below (**Table 1**).

² See website of Ministry of Development www.ypan.gr

Table 1: Summary data of cost and capacity of RES funded from the 3rd CSF

	Wind	Small hydro	Photo-voltaics	Bio-mass	Total
Number of investments	51	27	91	3	172
Total budget in million Euro	549.59	122.20	38.30	25.70	735.79
Total public expenditure in million Euro	175.40	49.70	17.30	10.30	252.70
Total installed electric power in MW	554.69	88.40	4.32	17.30	664.71
Annual power production in billion kWh	1,392.30	318.70	5.32	136.30	1,852.62

Source: Ministry of Development³

In Greece it seems that from a farmer point of view and despite the existence of public subsidies the Finance options but also the high investment costs are crucial issues and of high risk.

³ 4th National report regarding the penetration level of RES up to the year 2010 (article 3 of Directive 77/2001/EC).

4 Other related barriers

4.1 Economic barriers

Energy price

In case of Greece energy prices are low compared to EU average prices. For a Greek consumer with annual consumption between 2,500 and 5,000 kWh the payment for 100 kWh is approximately €10 and the Eu-27 average price is €16.03⁴.

The new law for RES (law 3468/2006) is dedicated to the promotion of RES and in order to speed up the licensing procedures and to reform the electric energy production from renewable energy sources. The law sets the new environment in the electricity generation, the guaranteed market price is increased and the market time expands from 10 to 20 years. Furthermore, the licensing deadlines are being reduced. Although the new pricing tariff system for electricity production from RES and CHP systems set a tariff of 73€/MWh (€75,82/MWh for the year 2007) for biogas plants the electricity prices are rather low. A higher electricity price must be examined based on the form of Biomass (there is no differentiation according to biomass form).

New pricing tariff system for electricity production from RES and CHP systems

Generation of electricity from:	Price of energy (Euro/MWh)	
	Interconnected System	Non-interconnected islands
(a) wind energy	73	84.6
(b) wind energy from sea wind farms	90	
(c) hydraulic energy exploited in small-scale hydroelectric plants with an installed capacity up to fifteen (15) MW _e	73	84.6
(d) Solar energy utilized in photovoltaic units with an installed capacity less than, or equal to one hundred (100) kW _{peak} , and which will be installed in a lawfully owned or possessed property or in adjacent properties of the same owner or lawful possessor	450	500
(e) Solar energy exploited in photovoltaic units with an installed capacity of over one hundred (100) kW _{peak}	400	450
(f) Solar energy exploited in units employing a technology other than that of photovoltaics with an installed capacity up to five (5) MW _e	250	270
(g) Solar energy exploited in units employing a technology other than that of photovoltaics with an installed capacity of over five (5) MW _e	230	250
(h) Geothermal energy, biomass, gases released from sanitary landfills and biological treatment plants and biogases	73	84.6
(i) Miscellaneous RES	73	84.6
(j) High-efficiency cogeneration of heat and electricity	73	84.6

It is worth mentioning that this new law sets no specific provision and price for heat, although approx. 50% of the energy production from biogas is heat.

⁴ Eurostat (2007) Electricity prices for domestic consumers in EU.

Other economic barriers

In some cases the fluctuation of the feedstock availability and use and the seasonal operation of the agro-industrial plants in Greece have a direct influence both in the capital costs and the plants revenue. Thus, the risk of feedstock availability reflect to the economical indicators too and a more concrete and secure business proposal should be examined (eg. alternative feedstock sources, co-digestion, long-term contracts for feedstock supply).

Among other the following barriers affect direct or indirect the economical viability of an AD project:

- High investment costs.
- High cost technologies can be difficult developed in to the Greek agricultural sector due to the farm size.
- Project profitability (practically income mainly from electricity).
- Lack of Green Certificates income.
- Lack of «Gate Fees».

4.2 Social and environmental barriers

Stakeholders involvement

During the lifetime of a biogas project (eg. permission, construction and operation phase) a wide range of involved parties (eg. authorities, developers, sub-contractors, feedstock providers, farmers) are participated in one way or another (direct or indirect) in the project development. These parties often have different aims and perspective for the project implementation. Furthermore in cases like centralized AD plants or co-digestion of different feedstock the co-operation between more than one stakeholders and even their support in all project phases are crucial and some times difficult to be built. Thus, among other, the next elements are necessary to be ensured:

- Clear roles, responsibilities and benefits to every single project party.
- Foundation of a project Co-ordinator (even in the case of a farm plant).
- Stakeholders' commitment and involvement from the early stages of the project development.
- Stakeholders support during the project lifetime (plant planning, construction and operation).
- Communication between the project developers and the project beneficiaries.

Experience in biogas projects & public acceptance

During the 80's a few efforts for biogas energy exploitation applications were carried out in Greece, the feedstock for them being in principal animal excrements and wastes from food processing industries, such as oil olive mill wastes. Some of these efforts were demonstration projects that after the initial enthusiasm and insurance of scientific support were fallen into disuse⁵.

⁵ BOUKIS I. AND A. CHATZIATHANASSIOU (2000) State of Biogas production, energy exploitation schemes and incentives in Greece, 1st World Conference on Biomass for Energy and Industry, pp. 1346-1349.

During 2007 in Greece fifteen biogas plants were in operation⁶. The produced biogas derives mainly from landfills, wastewater treatment plants and a couple of industrial applications. Most energy was produced in the area of Athens due to the operation of the Municipal Wastewater Treatment Plant (WWTP) of Psytallia and the Sanitary landfill (SL) of Ano Liosia, which treat Greater Athens liquid and solid wastes respectively. Although Greece has a promising potential of organic wastes and especially animal manure currently there is no farm scale biogas plant in operation. The penetration of Anaerobic Digestion schemes in Greece concerning farm scale applications (biogas exploitation from animal manure and agricultural residues) is still difficult.

The main factor for future successful implementation of a farm scale biogas projects that must be further considered (impact of human factor on the implementation of new biogas projects) is the lack of successful demonstration project in the agricultural sector (past unsuccessful attempts). The NIMBY (not in my backyard) syndrome is still strong.

Environmental issues

- The «polluter pays» principle only during the last years has been incorporated into the Greek environmental legislation.
- Externalities are not assessed and monetized (eg. eutrophication, groundwater pollution, replacement of fossil fuels).
- Possible Environmental impacts of the plants and abatement measures (eg. odour control, aesthetics, proper siting etc.). Environmental impacts of a biogas plant are site specific but in the most of the cases the proper planning, construction and operation of the plant ensure “environmental compatibility”.

4.3 Legal & Administrative barriers

The role and the penetration of biogas in the future depends mainly on the economic, institutional and political priorities. The new RES Law in Greece (Law 3648/06) is a very clear signal for further expansion of RES although there is no special provision for biogas. What is needed is:

- A clear institutional and political commitment concerning the exploitation of biogas as a promising, sustainable energy and environmental choice.
- Further improvement of RES regulatory and legislative environment.
- Further administrative simplification and coherence.

Number of Authorities involved

Although the new law (law 3648/2006) sets a new reality in the electricity generation, and among others, simplifies the licensing procedures, the regulatory framework for the promotion of biogas must further be improved taking into consideration the needs for environmental protection and the promotion of energy exploitation and efficiency (eg. Kyoto Protocol, EU Directives like 2001/77/EC, 2003/87/EC, 96/61/EC).

⁶ CRES Energy Policy and Planning Division Database.

A Strategic biogas Plan must be incorporated within the National and Regional Energy and Environmental Policy. The Agricultural Policy (Ministry of Agricultural Development and Food), Environmental Protection (Ministry of Environment) and Energy Investments (Ministry of Development) concerning biogas exploitation should be further coordinated.

Permit procedure

As it is already mentioned the new RES law simplifies the licensing procedures. The projected timetable after the activation of the new RES law in Greece is as follows:

- installation permit in less than 1 year (compared to the 3 years).
- less bureaucracy since the associated bodies is shortened.

A «Biogas Guide» would be useful for the general public, the RES investors and the public Administration and Authorities.

RES Spatial Planning

The Greek Special Framework for the Spatial Planning and Sustainable Development for the Renewable Energy Sources-RES⁷:

1. Identifies criteria and guidelines for the site allocation of RES projects, per RES category and type of geographic area, with emphasis on wind systems.
2. Facilitates permitting authorities as well as interested investors by settling competitive and contradictory land uses so as to ensure sustainability of RES investment as well as their harmonious incorporation within the natural and human environment.
3. Determines the key prerequisites for the harmonisation and coherence between all other spatial and urban plans subject to the Special Framework for RES, contributing at the same time to the achievement of the targets set under national and EU policies.
4. Determines the percentages for the contribution of each RES to achieving by 2010 a total installed capacity of 3,869 MW as follows: wind systems- 87%, small hydro-9.4%, biomass-2.7%, geothermal energy-0.4%, PVs- 0.5%.
5. Includes an Action Plan containing range of practical measures, activities and actions required for the full and effective implementation of the Special Framework as well as their respective sources of finance.

For biogas plants the most suitable sites are considered those located near to the «feed-stock» production and availability. The Plan sets some general criteria in order to exclude some areas or land uses but doesn't recommend specific sites (eg. like in wind parks).

The Framework is in its last phase before entering into force after a period of public consultation (draft Common Ministerial Decree).

⁷ Source: Hellenic Ministry for the Environment Physical Planning and Public Works

5 Conclusions

The implementation of biogas projects demands careful planning, taking into consideration technical, social (information of all involved parties) environmental and financial factors. Some times is difficult to develop a biogas project due to the variation of the sites characteristics and feedstock availability. But in most of the cases the non technological barriers are referred as the most crucial for the project development.

Although social pressure, economic conditions and legislation improved the framework for biogas production, there are still barriers to overcome in Greece, especially for the materialization of small scale biogas plants. The main barriers are public perception, experience and awareness mainly on farm scale and industrial biogas applications, lack of heat and compost market, high investment costs and project financing and revenues and the licensing procedure.

- **Awareness:** Nowadays there is still lack of knowledge and adequate information not only to the farmers but also to the industries (owners) and the general public about the possible energy exploitation of wastes, their final uses (eg. electricity, heat, injection to the natural gas grid, transport fuel) and benefits. Public Awareness in all levels is needed.
- **Costs and revenues:** Biogas projects still need high investment costs. Taking also into consideration that a) project financing remains a major concern, b) the revenue comes mainly from the new pricing tariff system for electricity production for RES, c) externalities are not assessed and monetized, d) there is no “gate fees” in Greece, e) the «polluter pays» principle is not efficiently applied, further improvement of the financial and economical instruments for the support of RES and especially biogas project are needed (eg. examination of differentiation of public funds, introduction of tradable green certificates, higher electricity price according to the form of Biomass). This will attract new biogas projects.
- **Market issues:** Nowadays there is a mature “Energy Market” in Greece. Despite this, the development of a full liberalized electricity market in Greece suffered a significant delay. Apart to the need of Full Liberalization of the Electricity Market, elimination of end users barriers is needed (eg. development of heat market, biogas use as a transportation fuel, injection to the natural gas grid etc).
- **Institutional & Regulatory issues:** Although the new RES law (law 3648/2006) sets a new reality in the electricity generation, and among others, simplifies the licensing procedures, the regulatory and institutional framework for the promotion of biogas must further be improved taking into consideration the needs for environmental protection and the promotion of energy exploitation and efficiency (eg. Kyoto Protocol, EU Directives like 2001/7/EC, 2003/87/EC, 96/61/EC). Moreover, in political level a stronger commitment concerning the exploitation of biogas as a sustainable energy and environmental choice is needed. This commitment will affect the other levels too (eg. regulatory, institutional, administrative, financing etc).

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