

European
BIOENERGY Networks



Innovative solutions for **solid**, **gaseous** and **liquid** biomass production and use

EUBIONET – Biogas

Contract No: 4.1030/S/01-1000/2001

Project period 2.1.2002 - 30.3.2003

Final report

EUBIONET – Biogas

General considerations

Targets and tasks

The activity of the **EUBIONET – Biogas** network was concentrated on dissemination of information about new and innovative ideas and technologies related to biogas production as well as the transfer of the existing mature and well established technologies, knowledge and know how. The focus of the activity was on topics like:

- Quality management of digestate and treatment of animal by products in AD plants
- Biogas upgrading to N-gas quality and future production of fuel cells
- Farm scale biogas production systems

At the same time, active participation and engagement in the national biogas sector and all the important national biogas activities and events had high priority for the activity of all the country members of the network **EUBIONET – Biogas**. The target groups were various biogas actors and interested parties from all EU and candidate countries, but interested people from all over the world were welcomed to attend the organised events and to benefit from the dissemination of knowledge and information.

The European biogas sector contributes to the realisation of a range of environmental and socio-economical goals, such as:

- Fulfilment of the Kyoto protocol of reduction of emission of GHG.
- Renewable energy production (mainly combined heat and power production – CHP)
- Ensuring an optimal and safe recycling of suitable organic waste and by-products from agriculture, food and pharmaceutical industries, catering and households and
- Advantages for farmers via higher nutrient efficiency, better distribution and less loss of nutrients in the farm cropping systems.
- Reduced risks of pathogen contamination and odour nuisance from slurry application.
- Employment in rural areas (managing, back-up and logistics) and technology export within EU and from EU countries to the rest of the world

The activity of the network focused on the actual biogas situation in Europe, in terms of research and development, legislation and regulation, market penetration and utilisation of AD technologies, in particular utilisation and up-grading / conversion of biogas and recycling of digestate, with a broad pallet of aspects related to them. Within the above-mentioned areas, those topics that were identified as being innovative or of increased interest for the biogas sector in the member countries and generally in Europe were targeted by the activity of the network. As an example, issues like the changing laws and regulations for the delivery of electric power produced from biogas plants, delivery of upgraded biogas into the available distribution grids, evaluation of separation processes for upgrading biogas, characterisation and measuring of the upgraded biogas quality, methane conversion to hydrogen, biogas vehicle fuel were focused upon. The interest for separation of slurry and digestate was increasing in Europe during the last years and the main techniques are taken from the industry sector and developed to be suitable for liquid digestate. Issues related to optimisation of microbiological activity in the digester, aspects of work safety and security, factors of risk, preventing exposure to harmful substances in organic wastes/animal wastes, managing the quality of digestate, rights and responsibilities of biogas plant operators etc were further more targeted.

In terms of activities, the focus of the first period of activity was on networking and broad collaboration with the member countries and with different biogas actors worldwide. An important event of this kind was the **European Workshop: Anaerobic Digestion – Biogas**, organised and carried out at the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection at Amsterdam RAI, in June 2002. The workshop focused on **recent development within the area of biogas from anaerobic digestion in EU, on some of the remaining technical, economical and legislative barriers, as well as the new EU regulation concerning animal waste not intended for human consumption. The strategies for a widespread penetration of the biogas on the European energy market were discussed as well.**

A common **EUBIONET web gate** and awareness leaflets and post cards were produced in collaboration with the **two sister EUBIONET networks - Solid biofuels and Liquid biofuels and the EUBIONET-Biogas** web page was launched, creating an excellent platform for raising awareness and continuous dissemination of biogas knowledge, new, innovative ideas and pioneer technologies as well as existing, mature technologies.

The second period was dominated by the organisation of three structured biogas study tours and training actions in **Sweden, focusing on technologies for gas upgrading and utilization, in Denmark, focusing on separation and volume reduction of digestate and in Germany, focusing on decentralised agricultural biogas sites with different bases of substrate.** Within the supporting program an overview on the actual situation in research, legislation and utilization of anaerobic digestion in those countries and in Europe was given. Overall 73 participants from Europe and Asia took part in this two-day study tours. The positive feedback showed, that the programs did live up to the expectations of the participants. The high turnout as well as the fact more international requests for such tours emerged as a consequence of these international contacts, proves the high utility and need of such arrangements.

Achievements and results

- The EUBIONET–Biogas network have proven to be an excellent way to improve communication between the different partners, giving the opportunity to gain experience with new problems and solutions, and promoting a good level of mutual understanding and collaboration.
- EUBIONET project has given the network members an opportunity to work with other interested parties in the sector to progress the development of biogas development in their countries and in Europe.
- Discussions, dissemination of know how, knowledge and information to biogas plant producers as well as biogas plant owners and the premises for developing new projects were created.
- Many places, educational institutions (universities, technical institutes and high schools) were involved by introducing biogas topics on the teaching curriculum, aiming to prepare potential biogas plant operators and future biogas specialists.
- Biogasification got a lot of publicity. The use of biogas as vehicle fuel was demonstrated by various awareness campaigns and the potential of biogas for future utilisation for the production of fuel cells were highlighted.

- The EUBIONET–Biogas web page, linked to many other biogas relevant web pages, is an excellent platform for a continuous dissemination of biogas technologies and knowledge.

National report – Austria (EUBIONET – Biogas)

EUBIONET-Biogas in Austria has been concentrating on the changing laws and regulations for the delivery of electric power produced from biogas plants as well as the delivery of upgraded biogas into the available distribution grids. For the upgrading of biogas several separation processes (absorption, adsorption and gas permeation) have been evaluated. Furthermore activities have been in the characterisation and measuring of the upgraded biogas quality. Discussions with and information distribution to biogas plant producers as well as biogas plant owners and new developing projects has been organised. The involvement of high schools in teaching of potential biogas plant operators have been introduced and started.

Country	Work carried by NCs for activity	National work
[Austria]	<ul style="list-style-type: none"> ▪ Advising of organisations in the field of energetic use of biogas as well as upgraded biogas ▪ Teaching of high school and university students ▪ Information distribution of the international conferences, workshops and study tours 	<ul style="list-style-type: none"> ▪ evaluation of the general conditions of the distribution of biogas based electricity and upgraded biogas ▪ development of a process simulation tool for the investigation of various biogas process configurations including upgrading processes ▪ evaluation of biogas upgrading processes ▪ characterisation and measuring of upgraded biogas quality ▪ start of teaching of biogas plant operators on high school level ▪ teaching on biogas processes on university level ▪ national information management

Publication:

Harasek M., Mairitsch K., Friedl A.: Evaluation of the potential of biogas upgrading; Proceedings 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection, 17-21 June 2002, Amsterdam, The Netherlands, 938-941

National report – Denmark (EUBIONET – Biogas)

The activity of the Bioenergy Department / SDU Denmark has been concentrating on the co-ordination of the activity of the network EUBIONET – Biogas. Apart from this, a major attention was accorded to the organisation and carrying out of the common event, the European workshop: Anaerobic Digestion – Biogas at the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection Amsterdam RAI, in June 2002. Furthermore, the organisation of the biogas study tours and training actions in Sweden, Denmark and Germany dominated the activity of the second period.

At the same time, active participation and involvement in many important national biogas activities and events had high priority for the activity of the Bioenergy Department /SDU.

There are 20 centralised biogas plants and about 50 farm scale plants in Denmark today. The total manure based biogas production increased by more than 6-fold during the last 10 years and is now around 1,5 PJ. The total biogas production is of 3PJ/year. A large number of farm scale plants were established the last period of time. No centralised biogas plants were establishing since 1998 but the planning of 12 future centralised co-digestion plants is in various stages of development.

The Danish biogas sector and the Danish government had recently reached an agreement regarding the electricity price for the biogas plants. According to this, there will be a price guaranty of 0.60 DKK/ kwh produced electricity for 10 years, for the biogas plants that are built before the end of 2007 and of 0.40 DKK for the plants built after that date.

The interest for separation of slurry/digestate was increasing in Denmark during the last years, after the Danish government informed that an exemption from the present harmony and land ownership requirement is under consideration for the farmers that separate their slurry. They will be allowed to increase the nr of LU on their farm without being obliged to buy the necessary land for the spreading of slurry. The present limit is of 250 LU/ha. This requires documentation that all separated nutrients are declared and optimally utilised in crop production.

Country	Work carried by NCs for activity	National work
Denmark	<p><i>First period 2.1—30.10.2002</i></p> <ul style="list-style-type: none"> ▪ Co-ordination activity of Eubionet-Biogas network ▪ Participation at the Eubionet stand at the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection in Amsterdam ▪ Organising and conducting biogas study tours from Japan, Thailand and China ▪ Organising the Workshop: Anaerobic Digestion – Biogas During the 12th European Conference in Amsterdam ▪ Interim reporting 	<p><i>First period 2.1—30.10.2002</i></p> <ul style="list-style-type: none"> ▪ Management and practical implementing of the EU animal waste directive. ▪ Evaluation of the general economical framework for the sale of biogas based electricity. ▪ Training courses for the plant managers ▪ National information dissemination
	<p><i>Second period 1.11.2002—31.3.2003</i></p> <ul style="list-style-type: none"> ▪ Organising an international Biogas study tour in Denmark at relevant biogas sites. ▪ Continuing co-ordination activity ▪ Contributing to the final reporting 	<p><i>Second period 1.11.2002—31.3.2003</i></p> <ul style="list-style-type: none"> ▪ National biogas economy seminar

National report – Finland (EUBIONET – Biogas)

In this report is given a short summary of the national activity of the Finnish Biogas Association within the EUBIONET - Biogas. Finnish Biogas Association has about 130 members. The work is volunteer work by the members. A short seminar on Biogas studies was organized for the members at the spring meeting of the Association. A plenary speech was given by the researcher, Ms. Hanna Huotari from VTT Processes. Related to the decision to build a 5th nuclear power plant in Finland, members of the Finnish Biogas Association was asked by the Parliament to give their views about the biogas energy production.

Possibilities of using biogas as fuel in cars and simultaneously avoiding high taxation by the state are studied. For this purpose Erkki Kalmari demonstrated the use of biogas fueled car to the public on a special campaign day (16th of December). Campaign proved succesful. Biogasification got lot of publicity. Biogas Association supported this campaign further by organizing web-pages of biogas fueled car.

Biogas Association supported the University of Joensuu in keeping the Web pages of the Association, printing of the Register of the National Biogas Reactor Plants in Finland, and posting it to the members. At the University of Jyväskylä the Association supported the study "Mapping the biogas potentials in Finland" and "The economics of biogas production in Finland".

An important task and contribution of the board members of the Finnish Biogas Association is to distribute up-dated information from the biogasification. As part of the Eubionet-project was organized three Study Tours by Swedish, German and Danish Biogas Associations. First tour, organized by the Swedish Biogas association at the end of January 2003 was attended by Bengt Juselius. The tour demonstrated the production and use of biogas in Skåne, Southern Sweden.

Second Study Tour, organized by the German Biogas Association in the middle of February, 2003, was attended by Päivi Lappi. This tour demonstrated the production and use of Biogas in Bavaria, Southern Germany.

The Third Study Tour, organized by Danish Biogas Association at the end of February, 2003, was attended by Kari Hänninen. The tour demonstrated the production and use of biogas in Southern Danamark. Three places were selected, each offering different kind of solutions in utilizing the biogasification process. Bengt Juselius and Kari Hänninen have already had the opportunities to distribute the recieved information in Finland. Additional important outcome of the study tours was the tightening contacts between the German, Swedish and Danish Biogas Association.

Country	Contribution to the NCs for activity	National work
Finland	<i>First Period 2.1.-31.10.2002</i>	<i>First Period 2.1.-31.10.2002</i> <ul style="list-style-type: none"> • -Two (2) letters to the members • -Preparation of three (3) oral presentations to be presented at the National Finbio Conference in Jyväskylä, November 14th. • -Web pages of the Biogas Association • -Preparation of the register of National Biogas Reactor Plants in Finland
	<i>The second period 1.11.2002-31.3.2003</i> <ul style="list-style-type: none"> • <i>National information to update project website</i> • <i>Study Tours to Sweden, Germany and Denmark</i> • <i>Country final report of EUBIONET Biogas</i> 	<i>The second period 1.11.2002-31.3.2003</i> <ul style="list-style-type: none"> • -Participation to the National Finbio Conference in Jyväskylä, November 14th. • -Commemoration of the 10-years activity of the Finnish Biogas Association, November 14th, • -Study tour to the biogas farm of Kalmari in Jyväskylä, November 14th. • -Printing of the register of National Biogas Reactor Plants in Finland, and posting it to the members. • -Use of biogas as car fuel, and posting to the members an article dealing with the biogas car. • -Mapping the biogas production potentials in Finland - Small meeting between farmers and biogas operators about biogas economy and feasibility, Kiuruvesi March 10th.

National report – France (EUBIONET – Biogas)

During the reference period, the French situation has moved. French regulations on feed-in prices have been published. For biogas it gives:

Biogas Landfill Gas	Biogas	Small biogas plant (electrical power between 3 and 36 kVA)
57.2 €/MWh (<2 MW) 45 €/MWh (>6 MW)	44.2 + energy subsidy	€/MWh Sell prices = buying prices (blue tariff: 78.9 €/MWh)

It's not a very effective incitement.

Different studies have been carried out on farm scale biogas plants, mainly by Aria scop and some other design offices, in the East of France near the German and the Belgian border. Three biogas plants are being built. The Claude Pierre's plant near Nancy is the most advanced one. Biogas will be used for heating and for electricity supply (cogeneration). Then, the focal point lies in the technical and economical conditions for feed-in. Procedures are not well fixed. Farm scale plants are using the same procedures as 1 MW plants.

The first tests are carried out on a dry fermentation biogas experimental plant at Lebb's farm (Midi Pyrenees). Two collective large biogas plants are planed in the Bretagne (French Brittany).

A workshop organised by EDEN on "Feed-in procedure for farm scale biogas" at the European parliament has had to be postponed as the speakers from the electricity companies of France and Germany have cancelled their participation at the last moment.

Our efforts focuss on biogas popularisation in the agricultural field and data dissemination together with Fachverband Biogas, our German partner. The training of students through the experiences of existing biogas plants in Germany and Luxembourg is part of this strategy of dissemination.

Country	Work carried by NCs for activity	National work
France	<i>First period 2.1—31.10.2002</i>	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> ▪ Mini study tour 17 and 18.07.2002 in Germany ▪ Dissemination of good experience: ▪ technical sheets, ▪ CD Rom. ▪ Starting up of a quarterly magazine "JOULE" n°0 ▪ Small meeting for developing relations between farmers and biogas operators (15 to 19.09.2002)
	<i>Second period 1.11.2002—30.3.2003</i>	<i>Second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> ▪ Newspaper the "JOULE", n°1. ▪ Meeting to built a local biogas farmers association in Nancy,16.01. ▪ Public Meeting in Douarnenez French Brittany,21.02.

National report – Germany (EUBIONET – Biogas)

The activities of GBA within EUBIONET-Biogas network were the dissemination of information on biogas technology at national and international level. Major milestones were the preparation of a presentation for the common event, the Biogas Workshop organised during the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection held the 12 of June 2002 in Amsterdam and the planning and implementation of workshops for AD-site operators on farm scale level.

The first of these operator workshops took place on the 15th and 16th of October 2002 in Freising. Pointed out by a commission of experts consisting of operators, planners and researchers the subject areas were: microbiological activity in the digester depending on the input and consequential measures for optimisation, aspects of security and safety at work, risk of harmful substances in organic wastes respectively their origins and avoidance including interpretation of analysis results as well as rights and responsibilities for biogas plant operators in the scope of legislation. With 22 participants and many more interested the workshop hit the requirements of the target group. Up to now two more workshops (Bavaria and Baden-Württemberg) according to this schema have been implemented and two more (Schleswig-Holstein and Mecklenburg-Vorpommern) are planned.

In February 2003 (14th and 15th) a two day study tour through Bavaria/ Germany enclosing seven decentralised biogas plants was carried out. The idea was to show AD plants with different input, size and technical solutions due to the treated substrates to an international audience. Within the supporting program an overview on the actual situation in research, legislation and utilization of anaerobic digestion in Germany was given. Overall 26 participants from all over Europe took part in this two day study tour. The positive feedback showed, that the tour program did live up to the expectations of the participants. The high turnout as well as the fact of another three international groups since February shows, that there is much interest in respectively a high demand for such tours.

Country	Work carried by NCs for activity	National work
Germany	<i>First period 2.1—31.10.2002</i>	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> ▪ Preparation of presentation for EUBIONET WS in Amsterdam, 12.06.2002 ▪ Planning and implementation of Workshop for AD-site operators at 15.-16. October 2002 in Freising, Germany ▪ Planning of study international study tour taking place in the first week of February 2003
	<i>Second period 1.11.2002—30.3.2003</i>	<i>Second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> ▪ International two day Study tour in Bavaria during the 14th and 15th February 2003

National report - Greece (EUBIONET- Biogas)

The actual share of renewables in Greece was 5.2% in 2000. A new indicative target has been set to generate 20.1% of electricity by renewables in 2010. The government recognises that the licensing procedures for renewables are still too complex, and it now plans to establish a “one-stop shop” for permits and licences. Considerable effort is also spent in identifying the potential of new energy sources.

In detail, renewable energy sources (RES) contributed 5.2%, or 1.46 Mtoe (61.1 PJ), to the Greek Total Primary Energy Supply (TPES) in 2000 (CRES, 2002).

Of this, biomass (mostly wood consumed directly in the domestic/residential sector) accounted for 67%, or 0.946 Mtoe (39.6 PJ). Domestic use of wood (burning of wood in open hearths for cooking, water and space heating) accounted for about 74% (0.70 Mtoe, 29.3 PJ) of total biomass energy production.

The remaining 26% (0.24 Mtoe, 10.0 PJ) was produced by the combustion of wood by-products and agricultural residues, and the utilisation of biogas produced in landfills, agro-food industries and municipal wastewater treatment plants. In total, approximately 2 730 plants operating on biomass resources have been recorded in Greece (2002).

Country	Work carried by NCs for activity	National work
Greece	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> ▪ National report of Greece for Biosurvey ▪ Greek information to Financial Guide 	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> ▪ Meeting with National team and others on biomass co-firing
	<i>Plans for second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> ▪ Final report of EUBIONET-Solid for Greece 	<i>Plans for second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> ▪ Meeting for biomass cogeneration ▪ Short report on biomass cogeneration in Greece ▪ CD guide on energy crops in Greece

National report - Ireland (EUBIONET- Biogas)

The EU funded EUBIONET project has given the Tipperary Institute an opportunity to work with other interested parties in the sector to progress the development of biogas development in Ireland. Key actions included delivery of a presentation at the Irish Biogas Conference and Study Tour organised by Sustainable Energy Ireland (SEI), input into the making of a 25 minute video on anaerobic digestion and chairing of the WFE-net workshop on biogas held at the 12th European Conference and Technology Exhibition on Biomass in Amsterdam. Work at the national level was carried out through the Irish Bioenergy Association with the input of strategic planning on the development of biogas in Ireland, while consultation and planning was also inputted to the board of (SEI). Over 50 students attended lectures on the potential for biogas in the context of sustainable rural development. During the project period there has been a steady number of queries dealt with on biogas. At least five biogas projects have now applied for planning permission to develop projects and these projects have also applied to the Irish Government's Alternative Energy Requirement competition.

The table below lists the work done by Tipperary Institute under the Gaseous activity of EU Bioclusters. Work has included promotion of the EUBIONET – Biogas project at the 12th European Biomass Conference in Amsterdam and promotion and presentation at the 2002 Irish Biogas Conference and Study Tour organised by Sustainable Energy Ireland (SEI). Work has been undertaken where possible through the Irish Bioenergy Association (IrBEA) for maximum effectiveness.

Country	Contribution of the NCs for activity	National work
Ireland	<p>First period 2.1.2002- 31.03.03</p> <ul style="list-style-type: none"> <li>▪ Staffing of the EUBIONET stand at the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection in Amsterdam on Thursday 20th June <li>▪ Chaired the WFE-net workshop (RWS3 – Anaerobic Digestion – Biogas) on Friday 21st June 2002 as part of the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection in Amsterdam <li>▪ Input into interim and final report 	<p>First period 2.1.2002-31.03.03</p> <ul style="list-style-type: none"> <li>▪ Attended and presented a paper entitled “Applying European success to create an Irish anaerobic digestion market” at the SEI organised Irish Biogas Conference and Study Tour, 11-12 April 2002, Johnstown Castle, Wexford. Over eighty key industry participants and potential developers attended. Also attended and imputed to a strategy workshop on the development of the biogas sector in Ireland as part of this event. <li>▪ Provided case study material on AD in Europe to the SEI Biomass Specialist for an industry presentation. <li>▪ Reviewed content, provided comment/feedback and supplied photographs of biogas plants for the making of a video on anaerobic digestion in Ireland. Part funded by Kilkenny County Council and Waterford Institute of Technology. <li>▪ Reviewed and provided feedback on draft work on headings for the ALTENER funded Regional Anaerobic Digestion Groups (RAGS) project. <li>▪ Consultation and input made on strategic policy for the development of biogas in Ireland carried out with a member of SEI Board. <li>▪ Acted as working member of the public relations committee to the Irish Bioenergy Association and attended three meetings of the association’s Management Committee and three strategic planning meetings (see http://www.irbea.org). <li>▪ Answered general queries on anaerobic digestion including: Information to accountancy firm Deloitte and Touche on options for a client for funding of an AD project, information to Herr Ltd. on small scale AD options, information to McGill Environmental System (Ireland) Ltd. On operating principles for AD, contact made with managing director of Farmatic Biotech Energy UK Ltd. Information pack sent to waste disposal firm – Ryan Brothers Ltd. Thurles on the background to AD. Answered request for information on AD received from John Gunnell final year quantity surveyor student at Dublin City University. Prepared specific information pack and discussed AD with Tadgh Hayes, Tipperary Farmer. <li>▪ Attended a strategy and planning workshop to look at the potential for an AD project in Glenstal Abbey, Co.Limerick. <li>▪ Participated in a meeting between the IrBEA and the Irish representative to the IEA Bioenergy Agreement ExCo. <li>▪ Promotion of the EUBIONET project by making postcards available at a three day conference “Ireland’s Transition to Renewable Energy” held in Tipperary Institute 31st October to 2nd November (see http://www.feasta.org). <li>▪ Researched, compiled and delivered lectures on approaches to AD at the EU level to; 22 Certificate in Renewable Energy Students, 15 Waste Management Certificate Students and 9 Rural Development Degree year students.

National report - Italy (EUBIONET – Biogas)

Monitoring of national situation has been performed in co-operation with the Research Centre for Animal Production (CRPA) of Emilia-Romagna Region.

In Italy the production of biogas in waste treatment plants is sufficiently spread. The annual production of energy from manure is roughly 8 Mtoe/year (334.9 PJ).

Roughly 5 Mtoe/a (209.3 PJ) are produced from municipal wastes. In 1998 the following situation was assessed: Biogas production from organic residues present in controlled municipal dumps: 79 plants, 116 MW installed and 478 800 MWh produced electricity; Biogas production from activated sludge from waste-water treatment: 4 plants, 4 MW installed and 4 800 MWh produced electricity; Biogas production from animal manure: 5 plants, 2.5 MW installed and 7 000 MWh produced electricity; Biogas production from agrofood-industrial wastes: 2 plants, 2 MW installed and 4 500 MWh produced electricity.

Within the National programme on Biofuels-PROBIO projects have been funded to develop small biogas plants in mountain areas.

Country	Work carried by NCs for activity	National work
Italy	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> • Participation at Amsterdam Meeting • Contacts with Valle d'Aosta Region for a Biogas plant in Alpine Mountains 	<i>First period 2.1—31.10.2002</i> <ul style="list-style-type: none"> • Exchange of information with the National Co-ordinator of AD network on Biogas • Request on work progress of biogas plant in Alpine Mountain
	<i>Second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> • Establishing information networks • Italian contribution to the final reporting • Organising briefings for exchange of informations ▪ Participation in the EUBIONET Meeting held in Bruxelles on March 2003 	<i>Second period 1.11.2002—30.3.2003</i> <ul style="list-style-type: none"> • Meetings with the scientific institutions (about 8) and companies (about 11) involved in the biogas sector • 7.3.2003 Attending the Conference: "Il biogas energia alternativa: prospettive in zootecnia" in Verona

National report - Portugal (EUBIONET – Biogas)

The potential for biogas production for energy purposes is increasing every year in Portugal. An increasing number of houses are being connected to the wastewater treatment plant (ETAR system), and an increasing number of ETARs are recovering biogas for energy production. In parallel with these waste treatment improvements, increasing volumes of solid waste are being sent to the controlled landfills, as opposed to alternative methods of waste dumping. Consequently, the landfill gas potential is also increasing significantly.

The EUBIONET–biogas in Portugal has been concentrating on disseminate information and knowledge transfer on this topic. In this context, we can underline the realization of an international workshop concerning the experiences and potential of anaerobic digestion in Europe, in co-operation with the European Network AD-Nett.

This workshop offered a good opportunity to divulge information concerning the biogas technology and it was felt that its main objective was fully achieved by the technical and general public.

Also several reunions were made between CBE and some municipalities that are very interested in solving their environmental problems.

In spite of a general lack of confidence in AD solutions, these meetings have proven to be an excellent way to improve communication between the different partners, giving the opportunity to gain experience with new problems and solutions, and promoting a good level of mutual understanding.

Country	Contribution of the NCs for activity	National work
Portugal	<ul style="list-style-type: none"> ▪ Interim report contribution ▪ Country final report of EUBIONET-Biogas. 	<ul style="list-style-type: none"> ▪ Organisation of one seminars concerning the experiences and potential of anaerobic digestion in Europe: “Experiências e Potencialidades da Digestão Anaeróbia na Europa”, 18/19 April 2002. ▪ Promotion of meetings with municipalities to discusses the use of AD technologies to solve some environmental problems in their counties. ▪ General dissemination information.

National report - Sweden (EUBIONET – Biogas)

In Sweden approximately 200 wastewater plants and landfills produce 1.2 TWh/year of biogas. In addition to these there are 10 biogas reactor plants treating approximately 200 000 tons waste yearly, of which 15 000 tons/year are organic waste from households. In order to run the biogas plants in an efficient way there are four projects going on at the universities in Uppsala, Linköping and Lund. There is also one project at a small high tech company, Anox AB, in Lund. All the projects are aiming to develop knowledge how to run reactors efficiently. The research group in Linköping also tries to find technique to extract hydrogen from the process.

At the last year one research programme has started to develop improved technique for end users and filling stations for biogas as fuel for vehicles.

At the beginning of year 2003 one study tour was arranged in the southern part of Sweden. The main goal was to show technique for upgrading biogas to fuel.

Country	Contribution of the NCs for activity	National work
Sweden	<i>First period 2.1-30.10.2002</i> <ul style="list-style-type: none"> ▪ Coordination of Swedish activities ▪ Planning of study tour 	<i>First period 2.1-30.10.2002</i> <ul style="list-style-type: none"> ▪
	<i>Second period 1.11.2002-30.3.2003</i> <ul style="list-style-type: none"> ▪ Planning of study tour ▪ Study tour 	<i>Second period 1.11.2002-30.3.2003</i>