

GBEP Working Group on Capacity Building for Sustainable Bioenergy

Activity Group on Biogas

At the 8th Meeting of the Working Group on Capacity Building (WGCB) held in Rome on 1 December 2016, the Partners and Observers agreed that biogas was an important topic where there was the potential for GBEP to add value. This short note has been prepared by the GBEP Secretariat, with input from several Partners and Observers, as was agreed at the meeting, in order to explore the potential for GBEP in this area and to highlight activities that could be carried out in a possible Scope of Work of a new WGCB Activity Group (AG). Discussions among Partners and Observers could be held electronically and, if considered appropriate, an AG could be approved remotely and start working prior to the GBEP regular meetings in November 2017.

Background

Biogas is a mixture of gases (primarily methane and carbon dioxide) produced from the digestion of organic matter by microorganisms under anaerobic conditions. Energy from biogas is defined by IEA Bioenergy as ‘energy from biological conversion of organic waste’¹. There are four stages in biogas systems: feedstock supply, biogas production, digestate utilization and biogas utilization².

Biogas has great potential in a broad range of contexts, given that there are a wide variety of feedstocks that can be utilized, including crops, agro-food industrial waste, sewage, animal waste, agricultural by-products and residues, and energy crops. Furthermore, biogas production can occur at a wide range of scales, from small, farm-scale biogas digesters used for heat, cooking and electricity, to combined small-scale or large-scale (industrial) plants where biogas can be upgraded to biomethane for supply to the national grid and to be used in gas-vehicles, or where combined heat and power units (CHP) can be used to provide heat and electricity to the local area. From the second half of the 2000s, biogas upgrading to biomethane has become an attractive option to exploit the versatility of this renewable fuel. Biomethane can be a valid fuel for vehicles – many car manufactures offer flex fuel automobiles that can use biomethane and virtually any petrol engine can be retrofitted to run on methane – but possibly even more interestingly, biomethane can be injected into the national natural gas grid for transport, storage and flexible use. Supporting policies and technical improvements are still necessary in this field in order to express the full potential of this technology.

Biogas has also been described as a win-win strategy because it has the ability to tackle many issues concurrently. Besides energy production, the biogas benefits may include: agricultural

¹ <http://www.ieabioenergy.com/task/energy-from-biogas/>

² Hijazi, O., Munro, S., Zerhusen, B., & Effenberger, M. (2016). Review of life cycle assessment for biogas production in Europe. *Renewable and Sustainable Energy Reviews*, 54, 1291-1300.

residues and organic waste management, including sewage treatment; reduction of greenhouse gas and air pollutant emissions; reduction of nutrient leaching into water bodies; and nutrient recycling, via digestate use, that allow the substitution of chemical fertilizers and promote soil fertility and enhancement of soil carbon content. It can therefore help to accomplish improvements in livelihoods, human health and ecosystems. Biogas production can also contribute to improve sanitation processes, since it has the potential to be a commercialized by-product (i.e. in the processes of liquid effluents treatment, MSW treatment and disposal in landfills). In addition, energy costs can be substantially reduced and, moreover, sales of the energy produced from biogas can contribute to the economic feasibility of these plants. Promotion of these economic externalities are important for supporting the utilization of biogas, mainly in developing countries.

Biogas has a large potential to make an important contribution to global bioenergy production. Biogas currently makes up four percent of biomass sources for heat generation and 20 percent of biomass sources for electricity generation³. However, the global potential could be as much as six percent of global primary energy supply⁴. The countries with the greatest power output from biogas are currently in Europe; those with the greatest number of plants are Germany, Italy, France, Switzerland, Czech Republic, United Kingdom, Austria, Sweden, Poland and the Netherlands⁵. However, there is also substantial biogas production in other countries (i.e. Bangladesh, China, India, USA and Vietnam), and serious potential for growth in the future. For instance, the greatest use of small-scale biogas digesters for cooking and heating is in Asia, with 100 million people in China and 4.83 million in India with access to biogas⁶.

Although biogas has great potential, its production is not without its challenges. In general, a challenge is to promote a holistic approach and to integrate biogas production with the agricultural system to ensure sustainability of the entire value chain. In particular, at the small-scale level, biogas plants can be a costly investment and government subsidies and technical support are often required to make it feasible. As well as the economic challenges, there are safety concerns where quality control is not carried out properly. Due to these challenges, where it is possible, there is a general shift towards larger-scale biogas plants. However, large-scale plants also face problems of feedstock supply issues, similarly to small-scale, such as competition for other uses of feedstock, affordability, and logistical challenges. There are further challenges in terms digester operations (e.g. environmental and occupational safety), gas leakages and applications of biogas.

Some of the challenges of the production of biogas can be overcome by enhanced technology. Biogas technology has improved extensively in developed countries, while in many developing countries there still exists room for further technical capacity enhancement to ensure that biogas systems are utilized to their maximum potential. In particular, there are areas for improvement

³ REN21, 2016. Renewables 2016 Global Status Report (Paris: REN21 Secretariat) Available at: <http://www.ren21.net/status-of-renewables/global-status-report/>

⁴ http://www.worldbioenergy.org/sites/default/files/wfm/Factsheet_Biogas.pdf

⁵ <http://european-biogas.eu/wp-content/uploads/2017/01/Graph-1-Number-of-biogas-plants.png>

⁶ REN21, 2016. Renewables 2016 Global Status Report (Paris: REN21 Secretariat) Available at: <http://www.ren21.net/status-of-renewables/global-status-report/>

in the efficiency of biogas plants, technical capacity for the management of plants, and the distribution of digestate. Technology transfer and capacity building (including South-South cooperation) will be particularly important to ensure that the biogas pathway can contribute fully to sustainable development and the fulfilment of the Sustainable Development Goals.

The enabling environment can have a large impact on the feasibility of biogas production. On an industrial scale, policies to support biogas are typically required to make it competitive with conventional energy carriers or to internalize the financial benefits of biogas production in other sectors (e.g. waste disposal, manure and sewage management). Furthermore, the climatic conditions of an area can also influence the feasibility and effectiveness of biogas.

Scope for GBEP

As the key international platform on sustainable bioenergy, GBEP can make an important role in the exchange of knowledge, skills and technologies around biogas and its sustainable production and use. GBEP is a mature initiative with substantial experience and expertise in raising awareness and building capacity at both institutional as well as technical level. An AG on biogas has the potential to collaborate with, or complement the work of, other initiatives working in this area, such as IEA Bioenergy (specifically Task 37 – Energy from biogas, and Task 43 – Biomass feedstocks for energy markets), the Global Methane Initiative, the European Biogas Association (EBA) and REN21. GBEP can also bring together many stakeholders to facilitate this exchange and foster collaboration, including capacity building in some developing countries.

Potential Scope of Work

As highlighted above, GBEP has significant capacity to act as a global forum for the exchange of information on biogas by involving many stakeholders from both public and private spheres. This can contribute to capacity building and facilitation of technology transfer, as well as informing stakeholders of the trends in the market, the research and the investments in this area. The following could be potential outputs of this AG.

- A stock taking document about:
 - ongoing global biogas activities – research, state-of the art, best practice;
 - the environmental, social and economic sustainability of different scales of biogas under different conditions, including potential competition with other uses of biomass and residues;
 - good practices and lessons learnt from successful examples of sustainable biogas schemes to assess their replicability; and
 - the economic and non-economic barriers to uptake and scaling-up of sustainable biogas systems (at both small and commercial scales) with a view to identifying how these barriers can be mitigated or removed.
- A webinar could be organized on the recommendations of the stock taking report.
- A workshop on the findings related to the above points and possible ways forward in order to review existing policies and regulatory frameworks through multilateral discussions and

to facilitate exchange of information and technological expertise between public and private actors.

- A virtual group of country experts with the purpose of developing a spatio-temporal model of energy systems for the analysis of sustainable value chains and definition of the possible end uses of the biogas according to the potentials of generation, technical and socio-economic and environmental viability and local/regional infrastructure.
- E-learning webinar series to disseminate best practices, technical knowledge and capacity. The first series of webinars represents a generous contribution of expertise from Consorzio Italiano Biogas (CIB), and could be regionally focused, so to cover different priorities, feedstocks, climatic conditions and enabling environments. The two regions could be Africa/Asia and Europe/Americas. Each e-learning series could consist of two webinars, to focus on different scales of biogas production and their relative strengths, weaknesses, opportunities and threats. A further two-hour e-learning webinar has been generously proposed by CIBiogas-ER (Brazil) to share their experience in the domain of biogas. These webinars would have no cost implications for GBEP or for participants. Further webinars could be contributed by other national and international private sector associations with clearly defined target groups to safeguard efficient spending of resources. South-South cooperation could play a significant role in this subject.

This Activity Group should be led by a GBEP Partner or Observer. The role of the AG leader is to contribute to the coordination of the work of the AG, starting from the discussion and definition of the Scope of Work, to participate in the organization of meetings and events, to chair and moderate the discussions during said events, and to report to the GBEP WGCB on the implemented activities. ***The activities proposed above represent potential opportunities for GBEP to contribute to the biogas sector and should be seen as a list from which activities can be selected depending on available funding.***

Members and contributors

GBEP Partners and Observers are invited to express their interest in and become members of the AG. In order to maximize value and outcomes of the AG, organizations and experts who are not directly GBEP Partners or Observers but could contribute knowledge and experiences should also be invited, subject to approval by GBEP.