dena
German Energy Agency

biogaspartner

Biomethane: The energy system's all-rounder.

Contents.

The efficient use of biomass is essential.

Biomass is a finite, but widely available resource. It is vital for human and animal food production and is characterized by numerous industrial applications in sectors such as paper, wood, and furniture manufacturing. In addition to such material applications, biomass also plays an important role in the future realization of a sustainable energy system, and is of particular importance to the provision of heat, electricity and fuel in the context of Germany's energy transition.

The substantial impact of biomass on our daily lives combined with the finite nature of the resource, has made efficiency maximization of paramount importance.

One of the most auspicious applications of biomass is the generation of biogas. By mid-2012 roughly 7,300 plants exist, in which biogas is created through the fermentation of biomass. There is currently technology available on the market, which allows biogas to be upgraded to the quality of natural gas – so-called "biomethane" or "bionatural gas" – and to be injected into the grid. This process allows for the replacement of conventional natural gas in many areas, thus making an important contribution to climate protection. Currently, more than 90 plants feed biomethane into the natural gas grid. Several other projects are currently being planned or constructed. For a more detailed overview visit: www.biogaspartner.com.

This brochure provides you with important facts about biogas injection. Allow yourself to be convinced of the virtues of Biomethane, the energy system's all-rounder.

Biomethane protects our climate.

Biomethane extracted from biomass can replace fossil-based natural gas. It can in this way abate the emissions from green house gases, and thus achieve an important contribution to a sustainable and environmentally friendly energy economy.

CO_2 emissions resulting from the burning of fossil-based energy sources are known to be a primary cause of global warming. Natural energy sources like biomethane release only as much CO_2 as is absorbed from the atmosphere by plants as they mature. Thereby, the ideal circumstances of climate-neutral energy consumption become conceivable.

The utilization of agricultural waste by biogas generation can make a further contribution to climate protection. The fermentation of liquid manure and the subsequent output in the field reduces the potential of global warming. This positive consequence is unique to biogas production. It is for this reason that biogas and biomethane can be seen as having a more positive influence on the global climate balance than other forms of biomass currently in use.

Biomethane stabilizes the energy system.

The supply of biogas and biomethane can be maintained year-round. Slurry, manure and organic waste resulting from food processing continue to accumulate. Similarly, harvested biomass is stored in silos designed to be large enough to maintain the necessary supply of energy from biogas throughout the year.

Thus, the production of biogas and biomethane makes an important contribution to a stable and reliable energy supply. The regularity of supply has the ability to balance the fluctuating electricity production originating from alternative renewable energy sources such as wind and photovoltaic.

This advantage is increased by the ability to inject the gas directly into the existing natural gas grid and to use it independently from its production location. Thus, biomethane plays an important role in the context of Germany‘s energy transition.

Biomethane reduces import dependency.

Some 97 per cent of Germany's oil and over 85 per cent of the country's natural gas is imported. A large portion of these imports originates in countries whose future political stability remains incalculable. In light of such deterministic geopolitics, the strategic relevance of a secure energy supply has increased in Germany and the EU.

Biomethane is created from indigenous, renewable resources and organic waste products. Legitimate prognoses project a sufficient amount of resources for biomethane to supply ten percent of Germany's current demand for natural gas by 2030. These calculations take into consideration Germany's overall energy goals for the future. This state of affairs would allow the country to import less natural gas, and to significantly increase energy security.

Biomethane stimulates regional development.

The production of biogas from regional resources creates jobs, especially in agriculture, supply logistics, engineering, plant construction and maintenance.

This allows local farmers to profit in particular from resulting developments in related “non-food” sectors of local economic development. These sectors provide increased planning security and create an opportunity for alternative sources of revenue.

As plant operators or partial plant owners, the commercialization and injection of biogas allows farmers to become direct beneficiaries of overall regional economic prosperity. Technology-related occupations in Germany are created, not only to satisfy domestic demand for German biogas technology and German know-how, but also in the German export market.

Biomethane is eco-friendly.

A variety of organic materials can be used in biogas plants exclusively, or in combination with others, without substantial technical alternation to the facility. Typically, crops commonly used for the generation of energy are processed together with biogenic waste, thus providing site-specific adaptability of the energy mixture used.

The cultivation of energy crops is generally associated with the formation of monoculture. However, due to the diversity of resources that can be used for the production of biogas this is no longer a necessary concern. Moreover, farmers tend to be interested in cultivating a large variety of plants in order to ensure fertility of their cropland.

Existing research projects in this area focus primarily on the implementation and accelerated cultivation of various energy crops. Furthermore, new cultivation methods are being field-tested, and thereby adapted to local conditions.

The production of biomethane necessitates comprehensive understanding of the preservation of biodiversity contextualized within a multifaceted landscape. The cultivation of fuel crops for the production of biogas is capable of being integrated into existing agro-ecosystems, and provides opportunities for the responsible use of natural resources.

Biomethane secures patterns of material flow at the local level.

The generation of biogas creates a simple and ecological means of harnessing the solar energy preserved within plants, and thereby sustaining the circulation of nutrients locally.

Anaerobic digestion of biomass generates biogas, which can be converted into energy. A digestate is created as a byproduct comprised of all non-digestible substances and all mineral deposits contained within the biomass. In addition to basic nutriment composites found in plants, such as nitrogen, phosphorus and calcium, unused trace elements are measurable as well.

Biogas plants are always located in close proximity to areas where biomass is cultivated. This circumvents the need for energy-intensive transportation of energy crops to the plant location, and minimizes the cost of redistributing the byproduct throughout surrounding cropland. The byproduct can be used as a commercial fertilizer, thus reducing the costs associated with the regular purchase of manufactured fertilizer. The use of all biogas byproducts ensures the optimization of the value-added chain of this resource.

Biomethane comes from natural processes.

The technical procedure for creating biogas reflects a natural process sequence. Naturally occurring bacteria break down the biomass in the fermenter, similar to the way nutrients are digested in the stomach of a cow. As the bacteria separate the natural fibers of the biomass, biogas emerges as long molecular strands of hydrocarbon. These strands are comprised of roughly 55 percent methane with the remaining percentage represented in great part by carbon dioxide, as well as minimal amounts of trace gases such as ammonium and hydrogen sulfide.

Unlike in the case of the cow's stomach, technical processes capture the biogas generated preventing it from entering the atmosphere.

The energy source in biogas is methane. Once biogas is sufficiently processed to the quality and purity of natural gas it can be injected directly into the natural gas grid. The release of carbon dioxide resulting from the subsequent burning of biomethane is counterbalanced by the retrieval of carbon dioxide from the atmosphere during energy crop cultivation, thus neutralizing atmospheric effects of the process as a whole.

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Biomethane exhibits a versatility of application.

Biomethane is more flexible in its application than any other renewable source of energy. Its ability to be injected directly into the existing natural gas grid allows for energy-efficient and cost-effective transport. This allows gas grid operators to enable consumers to make an easy transition to a renewable source of gas.

The diverse, flexible spectrum of applications in the areas of electricity generation, heat provision, and mobility creates a broad base of potential customers. Biomethane can be used to generate electricity and heating from within smaller decentralized, or large centrally-located combined heat and power plants. It can be used by heating systems with a highly efficient fuel value, and employed as a regenerative power source in gas-powered vehicles. The utilization of biomethane as a source of energy is a crucial step toward a sustainable energy supply.


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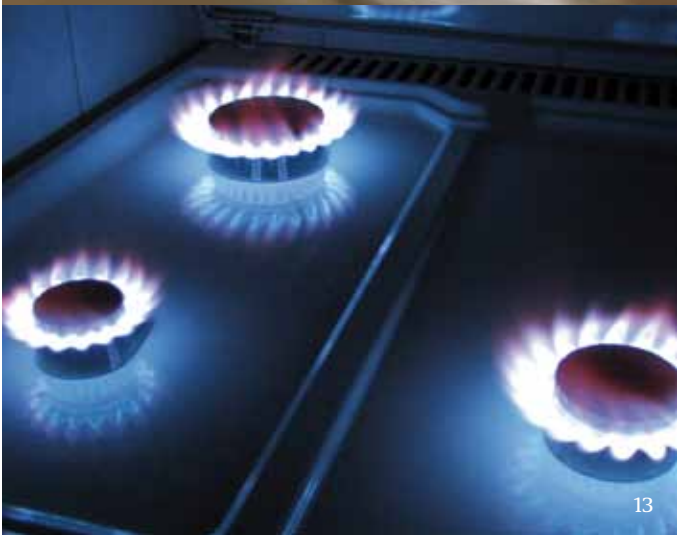

Biomethane supports efficient combined heat and power systems.

Of the estimated 7,300 biogas plants in operation in Germany by mid-2012, only a small portion utilized the energy content of their biogas efficiently. In the majority of cases, biogas was only used for electricity production. The production of heat, which represents some two thirds of biogas energy output, remained unused due to a lack of viable heat-related applications in the site area.

The upgrading and injection of biogas into the natural gas grid allows biomethane to be brought to other areas, in which the heat generated can be used alongside the electricity generated. The heat generated from biomethane can be used for all forms of household, commercial and industrial applications. These so-called combined heat and power systems are, from the perspective of climate protection, the most efficient applications of biogas and biomethane.

The conversion of biogas to biomethane only makes sense in cases where the plant is of a minimum size. New and existing small-scale biogas plants have the option to transport biogas generated, by way of a micro-gas grid, to a larger, more centralized location where the biogas can be processed and fed into the central grid.

Biomethane is a highly efficient biofuel.

Biomethane can play a crucial role in the development of biofuels due to its high energy output per hectare of arable cropland. The complete utilization of the plant generates a high output comparable to the projected future output of Biomass-to-Liquid (BTL) fuels (see graph).

The production of first generation biofuels (biodiesel, bioethanol and vegetable oil) is solely based upon the oil, sugar or starch content of plants. Biomethane production can increase the value of first generation biofuels if the remaining byproducts (mash, straw/mulch) are utilized.

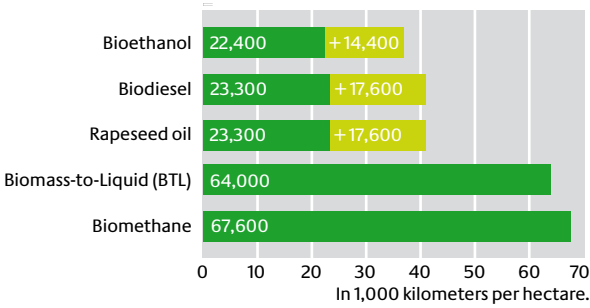

Figure: Yield of biofuels in km per hectare

Source: FNR

In comparison to second generation BTL-biofuels, which will only become commercially viable in the future, biomethane is an existing way to fuel gas-powered vehicles without technical modification.

Biomethane brings partners together.

In addition to fully developed technical conceptualizations, the success of biogas injection projects heavily depends upon the development of a practical business model. Having affiliates in the related fields of agriculture, plant construction, and areas of business, such as finance and energy economics, provides an opportunity for the consolidation of know-how and capital for purposes of project realization. This consolidation facilitates a synergistic relationship among professional actors throughout the added-value chain. These actors represent the key to further optimization and exploitation of potential for efficiency. The participating affiliates profit from a lasting return on their investment.

The early integration of external actors such as local administrators, residents and environmental organizations can help subjugate conflicts of interest, establish common goals, and develop comprehensive solutions. Central to this process is the exploitation of all merits of the injection of biogas in order to ensure a lasting contribution to the development of a sustainable energy system.

Biomethane is the smart option for the future.

In addition to current methods of biomethane generation based on anaerobic biomass digestion, other ways of biomethane production are subject to extensive research:

The acronym SNG stands for “Synthetic Natural Gas”. It can be created using coal, lignite or biomass (Bio-SNG). In contrast to biogas production from anaerobic digestion, the biomass in this case is metabolized with thermo-chemical processes. After the gasification of organic materials, the gas is converted into synthetic gas, methanized and eventually processed into its final form, in which it can also be directly injected into the natural gas grid. In contrast to anaerobic digestion, Bio-SNG primarily employ wood and other solid forms of biomass such as miscanthus or straw.

Yet another interesting option is the “power to gas” concept. This turns renewable power from wind or photovoltaic plants into gas. Hydrogen is produced from excess power with the help of water electrolysis. The hydrogen can then in part be directly injected into the natural gas grid or can be further converted into synthetic gas. In case of a higher power demand, the gas thus stored in the natural gas grid can again be converted into electricity. Or it can be used for heat generation or as fuel. Hydrogen can also be used for industrial purposes. Thus, power to gas links both our power and gas infrastructure.

The parallel use of these methods for biomethane productions presents an interesting option for the future. The combination allows all possible raw organic and waste materials as well as wind and solar power to be efficiently converted into a natural gas substitute which can be used in the gas grid. The current generation of biomethane based on anaerobic digestion therefore is the first step toward developing a comprehensive strategy for climate-friendly, renewable gas injection. This strategy will allow renewable methane to play a central part in a sustainable energy system.

The “biogaspartner” project.

The Deutsche Energie-Agentur GmbH (dena) – the German Energy Agency – has worked together with its business affiliates to develop the “biogaspartner” project. The scope of the project involves the bringing together of market actors from across the value chain for biogas injection. The dena’s role is to act as a neutral moderator, responsible for creating a platform for the acquisition and filtration of information concerning biomethane. This includes the national and international dissemination of information to relevant actors. The project’s market-oriented approach aligns with the government’s goal of establishing biogas injection into the natural gas grid as a component part of the future energy mix. For more information visit www.biogaspartner.com.

www.biogaspartner.com
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- Windwärts Energie GmbH

biogaspartner

The platform for biogas grid injection:
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