

Biogas in Denmark

- status, barriers and perspectives

SUMMARY

Results of work by the Biogas Taskforce up to December 2013.

Expected biogas expansion

With the current framework conditions, the Biogas Taskforce expects biogas production to more than double before 2020, from 4.3PJ to around 10PJ. An important driver of this expansion is the energy agreement's increased operating support for the use of biogas for electricity generation and upgrading, which achieved approval for state aid in November 2013. Another driver has been the investment support scheme, which was established in 2009 as a part of Denmark's Green Growth Strategy. However, so far, final decisions have only been made in a limited number of projects, corresponding to a production expansion of roughly 1.5PJ. Therefore the assessment is uncertain.

Furthermore, known plans exist for a number of plants, and if these plans are realised production could be increased to around 15-16PJ. It cannot be predicted when these plans will be realised and it is uncertain whether they will be realised within the current framework conditions. An assessment of this can be made during 2014, at the earliest. The Biogas Taskforce considers it unlikely that all the known projects will be realised. However, it is likely that new projects will appear instead.

Barriers to expansion

Existing barriers are related to biomass, finding customers for the gas, operating finances and financing. Furthermore, biogas is subject to extensive energy regulation as well as environmental and agricultural regulation. Planning new plants is therefore time-consuming and challenging for both players and the authorities.

The financial situation of biogas plants is still uncertain, despite the raised price supplements. This is linked to the fact that some of the new price supplements are being phased out and will disappear completely after 2020, if the price of natural gas develops as expected. Upgrading and grid connection are relatively costly. Furthermore, biogas plants have difficulties obtaining a sufficiently high price when selling biogas for CHP. Consequently, they rarely achieve the full value of indirect subsidies for this use.

With regard to expanding biogas capacity, it will be difficult to find suitable biomass to supplement slurry in order to achieve adequate gas production. Deep litter and straw are considerable elements in plans for both existing and new biogas plants. This type of biomass could potentially replace energy crops and industrial waste as the basis for biogas expansion, however specific long-term operational experience and documentation for the economic durability of these raw materials are still lacking.

The cost of producing biogas is typically DKK 130-142 per GJ, and DKK 154-166 per GJ in upgraded form. As fuel solely for heat production, biogas is therefore not a financially competitive solution for enterprises compared with alternatives such as heat pumps, solar heating, chip-fired boilers and geothermal energy.

The role of biogas in energy supply

The Biogas Taskforce has through model based calculations analysed economic aspects of providing biogas for electricity and heat production both directly and upgraded through the natural gas grid. The calculations have been made both with applicable taxes and subsidies (corporate economy) and without taxes and subsidies (socio economy). The calculations with taxes and subsidies reveals that existing sales conditions and the subsidy system provide the greatest incentive for upgrading and connection to the natural gas grid. The majority of new projects are predicted to do this and large upgrading projects are underway.

Direct use of biogas for the production of electricity and heat is economically challenged by various factors. More wind power and falling electricity prices mean fewer operating hours for the gas engines at small-scale CHP plants. Consumption of natural gas is falling. The heating plants are transitioning as far as possible to other renewable energy types. They are reluctant to commit to gas if it entails prices at the same level as natural gas. When the basic support for small-scale natural-gas-fired CHP plants lapses from 2018, the plants' finances will be impaired. This, in turn, will reduce the possibilities for selling biogas for CHP.

Calculations without taxes and subsidies reveals that, provided natural gas can be displaced for a sufficient number of operating hours each year, direct use of biogas, without upgrading, is the socio-economically cheapest way in which biogas can be used to produce electricity and heat. Near 2035 as wind power gradually becomes dominant in the energy system, the flexibility and storage possibilities provided by the natural gas grid will become valuable and increasingly outweigh or exceed the cost of upgrading biogas and injecting it into the natural gas grid. The results depend on the assumptions about technology and especially fuel prices and in practice, local conditions play a significant role in deciding whether biogas should be upgraded or not.

The Biogas Taskforce has not examined whether the storage and flexibility of the natural gas grid could be achieved at a lesser cost through low-pressure grids, seasonal and short-term regulation of biogas production, and storage in low-pressure storage facilities.

The industry is a potentially suitable buyer of biogas in the future. However, the increased operating support for industrial process purposes has not yet been state-aid approved by the European Commission. Furthermore, the operating aid for industrial process purposes is predicted to play a limited role as an incentive to use biogas in industry because it is not as high as the support for electricity generation and upgrading.

In the long term, the transport sector is a relevant buyer of upgraded biogas. Here, biogas will be a particularly suitable fuel in heavy-duty transport, which is difficult to convert to electricity. Biogas can only displace fossil energy in the transport sector to the extent that the sector has converted to gas. Alternatively, biogas can be transformed to liquid fuel in the form of methanol. The economic aspects of selling biogas to the transport sector have not been analysed by the Taskforce. However, in general, it is assessed that sales to the transport sector are unlikely to be of decisive financial significance for biogas plants in the short term.

Proposals from the stakeholders

The Biogas Taskforce has had close collaboration with a number of biogas stakeholders. These have prepared a number of proposals for initiatives that could help further promote biogas expansion. These proposals include proposals aiming to increase the availability of biomass; proposals to promote the sale of biogas to CHP through the natural gas grid and to the transport sector.

Furthermore, there are proposals to improve the operating support and financing of plants e.g. in the form of new possibilities for loans from the state and slower gradual reduction and/or improved price index regulation of subsidy rates. The majority of the proposals will lead to additional costs for the state or consumers.