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# Biogas as a renewable energy source in South Africa

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**A**s the effects of climate change become progressively pronounced, the need to shift towards sustainable and green practices proves even more crucial. Since fossil fuel-driven activities make the largest contribution to greenhouse gas emissions, it follows that green energy production be at the forefront of sustainable development efforts. This is all the truer in the South African context since the country is riddled with energy supply challenges. At present, the South African renewable energy space is dominated by solar energy largely

because the country receives abundant solar radiation, and the technology has become more affordable over the years. However, although it is still in its infancy in South Africa, biogas is a promising bioenergy that could contribute significantly to the country's renewable energy sector.

A renewable energy source, biogas is produced through anaerobic digestion of organic matter. The resulting gas can be used directly for heating purposes or upgraded to produce electricity and fuel. Biogas

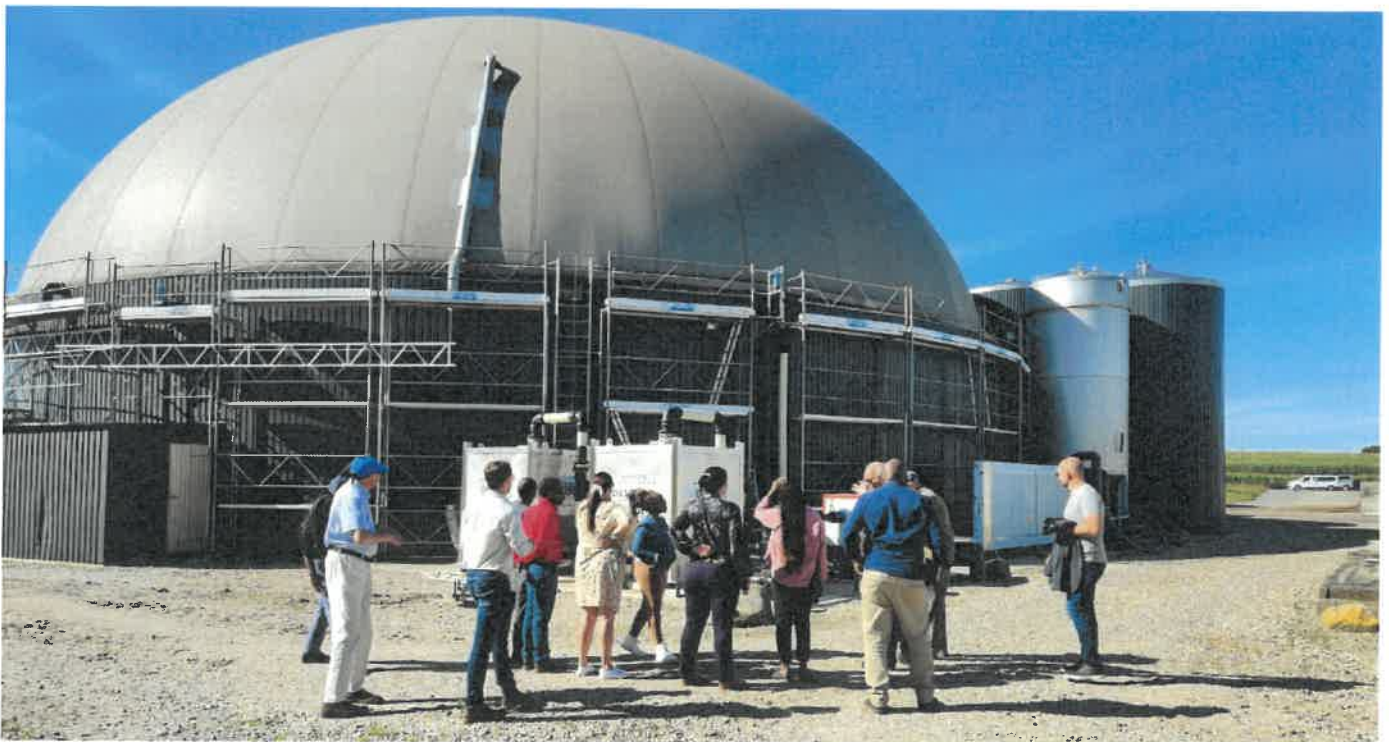


Figure 1 The South African delegates outside Vestergaard Bioenergy biogas plant in Bjerringbro, Denmark



**Figure 2 The South African delegates with the Danish stakeholders at the Danish Biogas Industry Association offices.**

digesters range in scale from household level to industrial sized plants. Biogas has a dual advantage in that it not only produces clean energy, but it can make use of waste material to do so. Any organic material can be used as feedstock for biogas digesters, including fresh animal manure, crop residue, organic food waste and other organic waste. Feedstock can also be combined in varying proportions. Another advantage of biogas digesters is location diversity. In rural areas, especially farms, organic remains from farming activities, organic waste from agro-processing, and animal manure can be used as feedstock. In urban areas, feedstock can come from domestic, restaurant and supermarket organic waste and other organic waste from industrial processes. This means that large-scale biogas production can reduce the amount of organic matter that ends up at landfills in urban areas. This is in line with the global shift towards circular economies. The circular economy model promotes using what is traditionally viewed as waste from processes as resources for other processes. The results of the circular economy model are reduced reliance on raw natural resources and reduced waste generation.

Denmark has established itself as a global leader in promoting green technological advances that drive the shift towards a circular economy. Biogas plays a significant role in the country's green technology endeavours.

It serves as a renewable energy source and a vital means to manage agricultural and organic waste. The biogas produced by large-scale plants is fed into the national gas grid and is used within Denmark for heating, manufacturing processes and in power plants. Denmark also exports some of the natural gas it produces. The digestate that is produced as a by-product is used by farmers to fertilise their fields. The digestate has a higher nutrient content and reduced odour compared to using raw animal manure. To ensure economic feasibility, the biogas plants are in agricultural regions in proximity of the existing natural gas pipeline. This ensures that the farmers supply the biogas plants with feedstock and can collect the digestate in a financially viable manner. Success of the Danish biogas model is driven by the country's supporting policies and regulations which aim to reduce agricultural and organic waste.

As part of information dissemination and international collaboration, the Danish Trade Council coordinated a study tour to Denmark from the 3rd to the 7th of September 2023. Delegates from South African organisations that are in the biogas space participated in the tour. The purpose of the study tour was to expose the South African delegates to the innovations and policies that are crucial to the development and operation of large-scale biogas digesters. On the first day of



**Figure 3** The team at Biofos Avedore – The largest wastewater treatment company in Denmark.

the tour, as an introduction to the biogas sphere, the team visited The Danish Biogas Industry Association. During the visit, biogas related policies and regulations, industry developments and market drivers, and organic material recycling in Denmark were discussed. Thereafter, an organic waste treatment plant and a wastewater treatment plant were visited. The second day comprised visits to leading biogas companies that provided an insight into the technical aspects of biogas production. The team then visited a farm-based biogas plant at the Grasten Agricultural College. The digester converts cow and pig manure to energy that is used on campus. On the third day, the team visited Aarhus University where the university's research and development biogas plant were demonstrated. Afterwards, the team had a site visit to another farm-based biogas plant which produces energy for a nearby dairy plant. On the last day of the tour, the team had a wrap up session. In the session, the team reviewed key take-aways, knowledge gaps and the future of biogas in South Africa and Denmark. The study tour was an essential experience for the South African delegates as it provided practical insight into the technical, political, and social aspects of biogas production from experts in the field. Access to such expertise is vital to

accelerate growth of the South African biogas market.

In South Africa, development of the biogas market is championed by the Southern African Biogas Industry Association (SABIA). SABIA was established in 2013 and it serves to advance the establishment of a thriving and sustainable biogas industry in the country. The association offers membership to all biogas affiliated stakeholders ranging from students, individuals, small/medium enterprises, corporate companies, government and non-government organisations, and academic institutions. SABIA offers stakeholders access to information about the sector through newsletters, webinars, and conferences. Members also get the opportunity to network with experts in the biogas sector.

Biogas as an energy source is a relevant solution to modern energy supply challenges in South Africa. Biogas production can be used to achieve multiple sustainable development goals as it addresses renewable energy production, organic waste reduction, and job creation and skills development.

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