"BIOGAS HAS HUGE POTENTIAL AND CAN MAKE A SIGNIFICANT CONTRIBUTION TO ADDRESSING THE MAJOR ENVIRONMENTAL CHALLENGES OF OUR TIME. WHAT WE NEED NOW IS MORE CERTAINTY IN THE SYSTEM AND MORE ACKNOWLEDGMENT AND SUPPORT FOR THE MULTIPLE BENEFITS THAT BIOGAS OFFERS SO THAT FINANCIAL INCENTIVES ARE BASED ON SOLID SCIENCE AND ECONOMICS. THERE'S A GREAT DEAL OF HIGH-QUALITY RESEARCH THAT HAS BEEN CARRIED OUT THAT CAN HELP PRODUCE A STEP CHANGE IN THE ROLLOUT OF BIOGAS WORLDWIDE."

Dr. Rafal Lewicki, Enviraf Ltd

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For further queries, please contact:
David Newman, World Biogas Association
info@worldbiogasassociation.org

WORLD BIOGAS ASSOCIATION

312 Canterbury Court
Kennington Park Business Centre
1-3 Brixton Road
London SW9 6DE

worldbiogasassociation.org
info@worldbiogasasscoiation.org

Special thanks to:
Dr Rafal Lewicki, Enviraf Ltd
rafal.lewicki@enviraf.com
UK +44 7976 72 69 61 PL +48 691 264 217

ENVIRAF LTD

WBA

WORLD BIOGAS ASSOCIATION

ANAEROBIC DIGESTION MARKET REPORT POLAND

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Introduction

With a population of 38 million, Gross Domestic Product (GDP) growing at 3.9%, almost half of all land used for agriculture (World Bank, 2015), and being a net energy importer, Poland has the feedstock, workforce, growing economy, and commitment to environmentally sustainable growth needed to foster a thriving biogas sector. Agricultural biogas plants in particular, supported by a new energy auction, are expected to drive biogas growth in Poland.

Current status

- There are currently 301 digesters with a total installed capacity of 234 MW operating in Poland (Energy Regulatory Office, 2016).
- There is a fairly even distribution of plants running on wastewater/sewage, agricultural (by)products/residues, and landfill gas.
- Average installed capacity is less than 1 MW, with agricultural plants tending to be bigger than sewage and landfill-gas plants.
- There are no known plants that upgrade biogas to biomethane in Poland.
- Feedstocks for agricultural digesters in Poland constitute manure (25%), fruit and vegetable residue (20%), distillery waste (18%), maize silage (17%), and beet pulp (8%) (Agricultural Market Agency, 2015).

Potential

- The Polish economy needs energy and waste infrastructure to support its growth and abide by its greenhouse gas and waste management commitments. There is currently the potential to produce 2 billion m^3 of biogas or 1421 MW from waste streams: livestock manure (cows, pigs and poultry), sewage sludge, and food waste.
  - Current installed capacity is only 16% of current potential, meaning there is potential for the sector to grow six fold if all waste feedstocks become available and opportunities are taken from energy crops and crop residues.
  - Waste-based electricity production can power 2.3 million Polish homes every year, equivalent to 17% of all households.
- Total natural gas consumption in Poland is 17.66 billion m^3 (2014), waste-based biogas can substitute 11% of this.
- Of the 347 landfills accepting municipal waste, 303 capture landfill gas, though only around 100 produce energy from it. Landfill gas is primarily released directly into the atmosphere or flared. There are also 1,978 illegal dumps in Poland. There is therefore huge potential in the waste management sector for reduction in landfill gas emissions and conversion of this gas into energy (Central Statistical Office, 2016).
- There is an estimated potential of 5 billion m^3 of biogas in Poland,of which 1.7 billion m^3 could come from agricultural waste products (Biogas Action, 2016).

Drivers

There are a number of regulatory, political, and economic drivers for the biogas industry in Poland:

- **Paris Agreement:** Poland ratified the Paris Agreement on 7th October 2016 and as an EU Member State is obliged to contribute towards the EU target of reducing emissions by at least 40% by 2030. The greenhouse gas abatement benefits of anaerobic digestion (AD) can contribute towards achieving this target (European Commission, 2014).
- **Renewable energy targets:** Polish energy production is currently dominated by coal-based technologies, with renewable energy accounting for 11.54% of total energy used (World Bank, 2015). Poland aims to increase the share of renewable energy to 15% and that of biofuels to 10% of all transport fuel used in the country by 2020. Biogas and biomethane produced as a result of AD can contribute towards these targets.
- **Energy security:** Poland is a net energy importer. Energy from AD can contribute towards meeting both the baseload and peak energy requirements of a steadily growing economy like Poland.
- **Agricultural biogas plants:** The Polish Government aims to increase the installed capacity of agricultural digesters from 103 MW (as of 2016) to 480 MW by 2018 and 980 MW by 2020. While agriculture in Poland utilises close to 14.5 million hectares of land and employs around 11.5% of the workforce, it only contributes 2.6% to GDP, indicating low productivity in the sector (World Bank, 2015). Digesters recycling agricultural residues present an opportunity for increased employment and business in agricultural regions.
- **National Waste Management Plan:** Poland has adopted a target of reducing municipal biodegradable waste going to landfill to 35% on 1995 levels (Ministry of Environment, 2006). This ambitious commitment is likely to drive higher levels of municipal biodegradable waste collection and its treatment via AD.
- **Amendment to Renewable Energy Sources Act, 2015:** In order to facilitate growth in biogas alongside other renewable energy sources, the Polish government has introduced a new policy instrument in the form of energy auctions. The government expects to see new capacity in the following types of installation as a result (Filipowicz G, 2016):
  - Agricultural biogas plants (total of 70 MW installed capacity for all plants <1 MW and total of 30 MW installed capacity for all plants >1 MW)
  - Biogas installations at landfills (total of 5 MW installed capacity for all plants <1 MW)
  - Biogas installations at sewage treatment plants (total of 5 MW installed capacity for all plants <1 MW).

CURRENT DIGESTERS IN POLAND

Type of biogas plant	Number of plants	Installed capacity (MW)
Sewage treatment plant	107	66.110
Agricultural	95	103.234
Landfill	97	62.919
Others	2	1.704
Total	**301**	**234**

Barriers

There are multiple barriers holding back the Polish biogas market, which has a reported 500 projects in the pipeline (Biogas Action, 2016):

- **Uncertainty over financial incentives:** There has been a lack of guaranteed long-term and stable financial support for the energy (heat or electricity) that biogas plants produce. The recently introduced energy auction is designed to address this concern but its implementation has been plagued by delays and uncertainty.
- **Landfill regulations:** There is a lack of understanding of the connection between environmental control and renewable energy generated from landfill gas. There is a need for enforceable regulations that make landfill-gas-to-energy projects on existing landfills commercially viable and that minimise emissions of methane and other harmful trace components.
- **Issues with grid connection:** Biogas plants wanting to connect to the grid are not given priority or guaranteed a connection. The current estimate for acquiring a gas or power grid connection in Poland is over 150 days. This uncertainty over connection negatively impacts the financial feasibility of biogas projects.
- **Digestate use:** In Poland, digestate is classified as a waste and highly regulated. Detailed record-keeping requirements create barriers to its use an agricultural fertiliser (Wawrzyniak, A. and Zbytek, Z., 2015).
- **Permits:** Permitting procedure regarding location of agricultural biogas plants and the 'agricultural' status of the land is unclear and time-consuming.
- **Engineering:** Lack of financial incentives drives project developers into cheap solutions. This results in problems such as poor performance and odour emissions, discouraging the development of further plants.

CASE STUDIES

Skrzatusz Biogas Plant (Green Gas Grids, 2014):

- **Inputs:** Distillery slops, potato pulp, corn silage, carrot pomace, and other residues.
- **Outputs:** Electricity - 0.526 MW installed capacity is used onsite and exported to the grid; heat - 0.505 MW installed capacity is used onsite and exported to the distillery.
- **What is unique:** The plant imports and digests residues from a nearby distillery. The heat generated is used to run the plant's own operations and any excess is exported back to the distillery. Similarly, the plant processes farming residues such as potato pulp, carrot pomace and corn silage and uses the resulting digestate to fertilise the farmland, demonstrating a circular production process.

ZUH Wojciechowski Biogas Plant (European Commission, 2016):

- **Inputs:** Abattoir waste, maize silage, and sorghum.
- **Outputs:** Electricity 0.5 MW, heat 0.7 MW installed capacity. After meeting the heat and electricity requirements of the biogas plant and the abattoir, any excess power generated is exported to the electricity grid.
- **What is unique:** The digestate is used to fertilise the farmland that produces the maize and sorghum feedstocks. In addition to reducing its dependence on fossil-fuel-based energy, the company has eliminated dust emissions, reduced its carbon footprint by 23% and generated employment for 8 people directly and 20 indirectly.

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