



Ricardo  
Energy & Environment

# Anaerobic digestion facilities

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Ricardo Energy & Environment provides independent technical, market, regulatory and operational support to developers, investors, operators and customers of anaerobic digestion (AD) facilities.

Our specialist Due Diligence Team is able to provide support at all stages of your project.

We have a unique combination of policy and regulation insight, expertise in the low carbon energy sector, deep technical understanding of AD and associated processes, waste market and competitor knowledge, and expertise in the health and environmental impacts of waste management. This enables us to provide holistic advice that minimises risk and maximises the benefits of your project.

AD is at the core of the UK Government's waste policy and is the subject of significant financial support from government.

In its 2013 AD market report, the Green Investment Bank (GIB) identified an existing investment pipeline for AD consistent with a required capital investment of approximately £650 million.

We are actively supporting waste strategy and infrastructure development in the UK and internationally.

*"The principal underlying cause of a low operational performance is most likely to arise from feedstock and/or operational/technical reasons."*

**(Green Investment Bank, Anaerobic Digestion Market Report, 2013).**



## Benefits

### Financial

- Organic waste producers can use their waste to recover energy and resources, thereby generating value and avoiding costs for disposal.
- Renewable energy from AD attracts support under Government incentives, namely Contracts for Difference (CfD), the Renewables Obligation (RO) until 31 March 2017, Feed-in Tariff (FIT) and the Renewable Heat Incentive (RHI).
- Farmers can earn an income from waste streams including animal slurry.
- Producers of high-strength liquid wastes can avoid the high costs of trade effluent discharge.

### Environmental

- AD reduces the amount of biodegradable waste that is disposed of to landfill, reducing harmful landfill gas emissions.
- Biogas can be upgraded for use as vehicle fuel or injected

into the national gas grid, displacing gas produced from fossil fuels.

- Burning biogas in engines to generate renewable electricity and heat offsets the use of fossil fuels and significantly reduces carbon emissions.
- Using digestate as a fertiliser displaces the use of inorganic fertilisers, reducing the use of virgin raw materials.
- Digestate is pasteurised and can be safely applied to land.

Further development of AD capacity in the UK is essential to achieve the waste strategy targets of the devolved administrations and to deliver the commitment to work towards a zero waste economy in England. Developing, operating or investing in AD facilities requires a clear understanding of a wide range of issues. Our highly experienced, multi-disciplinary team provides a comprehensive range of services, making us an ideal partner in any AD project.

## What is anaerobic digestion?

Anaerobic digestion is a natural process in which micro-organisms break down plant and animal material (biomass) in the absence of oxygen. The micro-organisms digest the biomass and produce biogas, which is about 60% methane and can be used to generate renewable heat and power.

The leftover material from the process is known as digestate. This contains

valuable plant nutrients such as nitrogen and potassium, and can be used as a fertiliser and soil conditioner.

AD has been used to treat sewage sludge for over 100 years and can benefit a range of other sectors, particularly agriculture, energy, waste management, transport and food manufacturing.





# Our services

## Financial support

- Financial modelling to select the best option.
- Gate-fee modelling.
- Transaction due diligence.
- Economic assessment and advice on investment and funding options for community and farm-based schemes.

## Procurement support

- Business case development.
- Lenders' technical adviser.
- Technology options appraisal.
- Supplier selection and reference plant review.
- Contract preparation and technical contract review at all stages.
- Project monitoring.
- Risk assessment and mitigation.
- Independent testing.

## Environmental advice

- Environmental sustainability modelling, interpretation and benefits realisation.
- Statutory nuisance advice (for example, odour, noise, vermin).
- Emissions abatement advice.
- Bioaerosol assessment.
- Environmental impact advice.
- Habitats regulations assessment.

## Technical advice

- Technical due diligence and technology assessment.
- Expert witness services:
  - Process performance against guarantees.
  - Attendance at public and planning inquiries.
  - Disputes.
- Understanding of supporting infrastructure, including for pre-treatment, biogas utilisation, air emissions control, effluent treatment and digestate use.
- Post-commissioning advice and process optimisation, including microbiology and biogas generation rates.
- Innovative, low-emission engine technology for locations with air quality constraints.

## Regulatory support

- Policy support to optimise scheme benefits.
- Foresight in relation to Government incentives (RO, FIT, RHI).
- End of waste quality protocol and BSI: PAS110 implementation and compliance support.
- Planning, permitting and regulatory compliance support.

## Market assessment

- Identify and secure a continuous supply of suitable feedstock.
- Identify sustainable, local digestate markets.
- Identification and valuation of energy markets including electricity generation and combined heat and power (CHP), transport fuel and gas to grid.

*"Growth in the sector will be driven by a number of factors, including the availability of finance. . . GIB is actively investigating the opportunity to directly participate in up to £50mn of financing for AD projects."*

**(Green Investment Bank, Anaerobic Digestion Market Report, 2013).**

# Our track record

Ricardo Energy & Environment\* has supported the development of AD at a strategic and site-specific level for over two decades. Our work on behalf of Government led to the development of the UK's first farm-based AD projects. Since that time, we have continued to support Government on AD policy issues, including recently undertaking cost modelling for the Department for Environment, Food and Rural Affairs (Defra), and reviewing available and near-to-market AD technologies and supporting infrastructure for WRAP (Waste & Resources Action Programme).

We have supported a number of local authorities as procurement technical adviser to develop AD facilities, including Essex County Council, Cheshire East Council, North Ayrshire Council and the Tomorrow's Valley procurement hub of Rhondda Cynon Taf, Merthyr Tydfil and Newport City. The hub is part of the Welsh Government's Waste Infrastructure Procurement Programme, which won the 2013 Government Opportunities Excellence in Public Procurement, 'Collaborative Procurement Initiative of the Year' award. WRAP Cymru estimates that the 22,500 tonne per year capacity AD facility will save the hub Councils £2 million over the 15-year contract.

For private sector clients, our work includes identifying heat loads; assessing the feasibility of gas-to-grid applications; air quality and bioaerosol risk assessments; and technical, commercial and acquisition due diligence services. We undertake energy strategy development and business case development work for a range of clients to identify the applicability of technologies, including AD, to deliver required cost, carbon and policy outcomes. We have also delivered digestate market assessments, including supporting the development of compost and digestate markets in Welsh agriculture.

We have a large modelling team that advises on the availability and management of organic wastes. We maintain a proprietary web-based feedstock assessment model, FALCON (Facilities, Arisings, Locations, Contracts), which supports our bespoke feedstock assessment capabilities. We also have

extensive expertise in applying the Environment Agency's WRATE (Waste and Resources Assessment Tool for the Environment) life-cycle model to demonstrate environmental sustainability improvements of schemes, including developing bespoke models for AD solutions.

## Selected project experience

**Confidential lender** – Lender's Technical Adviser in relation to a long-term project finance facility to refinance the existing portfolio of AD assets of a leading UK developer and operator.

**Tamar Energy** – developed an operational mass balance to support process optimisation and reviewed the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) assessment to ensure ATEX compliance.

**Confidential investor** – technical due diligence of on-farm AD facility with biomethane injection to grid. Reviewed the agricultural AD and biogas upgrade technologies, including operating and maintenance aspects.

**ET Biogas Ventures Ltd** – prepared environmental permit applications for AD facilities, including site-specific risk assessments, odour impact assessments and odour management plans.

**Confidential law firm** – expert witness in relation to several large-scale mechanical biological treatment (MBT) with AD facilities where the expected performance had not been achieved.

**Essex County Council** – Technical Adviser for the procurement of wet and dry AD and in-vessel composting (IVC) facilities. Prepared outline business case (OBC) solutions, draft design, mass balance and specifications; evaluated bids; negotiated final contractor proposals.

**Confidential client** – technical due diligence of a novel enzyme, AD and mechanical treatment technology for residual waste treatment, including observing trials prior to potential deployment in the UK market.



For more information on how Ricardo Energy & Environment can support developers, investors, operators and customers of anaerobic digestion facilities, please contact us at [enquiry-ee@ricardo.com](mailto:enquiry-ee@ricardo.com) or +44 (0) 1235 753000