Anaerobic digestion

Snapshot: Anaerobic digestion (AD) plants have long been recognised as offering particular opportunities for generating methane-rich biogas from biodegradable waste. This biogas can be used in a range of renewable heat, renewable electricity and energy storage applications. The main waste streams for this biodegradable waste are municipal solid waste, commercial and industrial waste, agricultural waste and sludge from sewage treatment plants.

Over the last decade, the main activity in Scotland in AD has been on farm digesters and sewage sludge AD plants. However, larger scale municipal, commercial and industrial waste AD plants are emerging and are expected to become commonplace as landfill becomes a less viable option.

Whilst large scale AD is relatively new in the UK , with only around thirty plants at various stages of development, planning permission was recently granted for Scotland's largest ever AD facility at Pond Green Energy Park, West Lothian. This has a design capacity of 200,000 tonnes per year, is targeted to commence in 2012, with a total generating capacity of 4 Megawatts (MW) of renewable electricity and 6MW of renewable heat. There are only three of this scale which are operational throughout the UK.

Planning authorities role in dealing with proposals for anaerobic digestion (AD) plants, has been clearly set out in Scotland's Zero Waste Plan (ZWP) 2010 and they are expected to contribute to changing perspectives of waste, highlighting its potential as a resource. Authorities also have an obligation to identify an adequate supply of sites to deal with all wastes arising within Scotland (either by allocating specific sites or providing a clear, positive direction that employment and industrial land is appropriate). Therein, planning authorities are expected to provide a supportive spatial planning and policy framework for AD closely aligned with Annex B of the ZWP.

Suggested areas of focus for planning authorities*:*

- Using the locational criteria set out in Scotland's ZWP, provide greater clarity on where AD plants can be located;
- Use heat maps to link waste streams to sites of long term high heat demand;
- Detail criteria to be applied in assessing AD applications;
- Establish protocol for involving key consultees in spatial planning, policy making, pre-application work and applications for AD operations;
- Seek to secure 'sign up' from local communities, AD operators and other stakeholders at each stage of the planning process.
- Identify proportionate levels of information for pre-application discussions and applications;
- Ensure planning conditions and agreements for AD operations are reasonable and proportionate.

Opportunities within Planning Processes for Planning Authorities:

Stage in Planning Process	**Actions for AD**
Monitoring and Evidence Base and Main Issues Report (MIR)	• Secure data on waste streams from Scottish Environment Protection Agency (SEPA) • Determine numbers and location of operational and consented AD schemes in area using SEPA data (see useful references below) • Identify where there might be new opportunities to respond to

	Scotland's identified need for AD facilities • For Strategic Development Plan Authorities (SDPAs), consider if there is merit in shared strategic waste infrastructure across neighbouring Local Development Plan (LDP) authorities Involve key consultees for AD (including SEPA and Scottish Natural Heritage (SNH)) ideally at draft MIR stage • Consider if a significant shift in spatial planning and policy is required for AD, if there is a range of possible alternatives and if AD as part of a waste strategy merits consideration as a main issue in the MIR
Spatial Planning	• Consider if additional data is required to inform spatial plans (above and beyond the SEPA data mentioned above), such as: o current heat demand and hotspots; o infrastructure constraints (e.g. transport, grid) o proximity to sites which have potential for energy storage • Ensure that the above spatial data is used to progressively build a GIS map which identifies where there is the greatest potential for AD plants, in terms of operating efficiency and environmental constraints • For SDPAs, consult constituent LDP authorities on strategic choices and cross-boundary opportunities • Ensure full consultations are carried out with key consultees and local stakeholders on spatial plans for AD. Overcoming misconceptions on the impact of AD may be a challenge, notably in terms of air quality and environmental health
Drafting Development Plan Policy	• Ensure that AD policies: o control design to manage impacts and to promote efficiency; o recognise potential environmental benefits of reducing emissions from landfill; o recognise the potential economic benefits of decentralised electricity and heat; o recognise the public body duty to contribute to a response to all waste arising annually in Scotland; o consider cumulative impacts and decommissioning. • For SDPAs, ensure strategic guidance is provided on opportunities within the constituent areas • Consult key consultees for AD at an early stage of drafting policies
Development Plans Action Programmes	• Consider selecting an action officer within the planning authority to take forward development plan objectives for waste, including AD. Typically this might involve setting up a liaison group with key consultees and waste operators to prepare development briefs for sites, prepare local design guidance or to scope out ways to overcome local problems
Strategic Environmental Assessment (SEA) of Spatial Guidance and Development Plan Policy	• Ensure the SEA of the development plan explores the potential effects of AD as appropriate

Securing Sufficient Information to Determine Planning Applications	• Establish if supporting guidance adequately details typical information needs for pre-application discussion and planning applications • Ensure that information needs are proportionate: AD plants are typically below 20MW in scale and design statements will normally be a voluntary measure
Pre-Application Stage	• Ensure that key consultees for AD proposals are given the opportunity to be involved in pre-application meetings and site visits • Ensure that early advice is given on whether schemes require an EIA
Determining Planning Applications	• Ensure that key consultees are involved in meetings and site visits on the application to minimise impacts and to help ensure that constraints are overcome where possible • Technical information and guidance on typical issues associated with AD are provided below for planning authorities to draw upon in determining applications and designing appropriate local solutions

Technical information for AD

Process: AD is a managed biological process and a method of waste treatment in which biodegradable waste such as sewage sludge, suitably treated municipal solid waste (MSW), commercial and industrial biodegradable waste and farm slurry is broken down by naturally occurring micro-organisms in the absence of oxygen to produce a gas (sometimes referred to as "biogas") with a high methane content. The methane can be used to produce heat, electricity, or a combination of the two.

Benefits: AD provides an alternative to large quantities of biodegradable waste going to landfill which, in the absence of landfill gas capture, would result in a significant amount of harmful greenhouse gases being released to the atmosphere. The biogas produced from AD can be used to supply heating systems within the site or beyond its confines via heat mains, or it can be used for combined heat and power (CHP) schemes, displacing the carbon dioxide-producing fossil fuels which might otherwise be employed. The gas can also be bottled, after cleaning, for use as a domestic fuel, or to power vehicles. AD maximises energy efficiency, requires the minimum pre-treatment of the gas.

By-Products: AD can reduce the volume of waste by approx. 60% *(Office of Deputy PM: Planning for Waste Management Facilities: a Research Study 2004)* and for all three types of the waste streams digestion can render waste less odorous and can remove harmful pathogens, a particular benefit in the case of farm slurry and sewage sludge. The options for after-use or disposal of the residual waste comprising liquors (a nitrogen-rich fertiliser) and solid organic materials are widened substantially.

Equipment: A typical AD plant will comprise waste pre-treatment equipment, a digester tank, buildings to house ancillary equipment such as a generator, a gas storage tank, a flare stack (to dispose of excess gas) and associated pipework. Amongst the most visible elements is the flare stack, used for burning off surplus gas, and typically this comes in two basic types: high level stacks, typically 6m to 10m high with a small diameter and low level stacks, typically 3m high with a larger diameter. The flare stack can be enclosed in an open-topped cylinder to provide visual concealment and heat insulation. If municipal soild waste (MSW) is digested, pre-treatment facilities may also be required to separate organic from inorganic waste. Plants which

use sewage sludge or farm slurry will require post-digestion equipment to treat the resulting liquors. Larger facilities will require more substantial equipment and on site staff facilities.

Plant containment: The ground around AD tanks and in waste reception areas require to be paved and bunded to prevent pollution from the accidental discharge of spilled wastes. A collection system will often be installed within and around the plant to enable spilled waters to be collected and pumped either directly into the digester, or into a mixing tank used to increase the water content of solid waste.

Typical Planning Considerations in Determining Planning Applications for AD

Locational considerations:. In most cases it will desirable for AD plants to be located as close to the waste source as possible. AD of sewage sludge currently takes place at many sewage treatment works and sewage sludge digesters will often be unnoticeable amongst the existing array of tanks and ponds. As farm slurry is the liquid form of manure, is highly odorous and it can be a pollution hazard particularly for water courses, its transportation, particularly through residential areas, would be undesirable, so on farms, small digesters tend to be proposed and these can usually be accommodated within the existing group of farm buildings. Centralised digestion facilities handling large quantities of agricultural wastes, sewage sludge or municipal solid waste have more potential to raise siting concerns. The largest quantities of MSW, which contains large quantities of food, garden waste, paper and packaging with a high organic content, tend to be generated in urban areas and there are sometimes economies of scale and efficiencies in combining with other waste streams.

Design Features to Mitigate Planning Considerations: Guidance on standard design features and approaches to mitigate a range of potential impacts such as traffic, emissions, dust and odours, noise and visual intrusion is provided in the *Office of Deputy PM: Planning for Waste Management Facilities: a Research Study 2004.*

Useful References:

The SEPA website contains a range of data, information and guidance on waste flows, waste management, waste infrastructure and capacity, and waste treatment. This includes:-

- Zero Waste Plan (as amended)
- Strategic Waste Management Review Report
- National Capacity Reports
- SEPA Waste Infrastructure Maps:

Paper on “Scotland’s Zero Waste Plan 2010 Planning Implications” Pollock and Newlands, RPS Planning and Development (Not available as a web resource)

Office of Deputy PM: Planning for Waste Management Facilities: a Research Study 2004