Appendix E

Grays Biogas Ltd
Mona AD Plant
Basic and Specific Measures To Improve Energy Efficiency

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Oaktree Environmental Ltd

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Located in Appendix N of the Management System)

Basic and Specific Measures to Improve Energy Efficiency

Introduction

The bio-fuel generated by the Anaerobic Digestion (AD) process qualifies for the issue of Renewables Obligation Certificates (ROCs) to the site for all electricity exported to the National Grid or used by third parties.

Basic energy efficiency measures.

Overall energy balance and the expected efficiency of bio-fuel production and electricity generation are set out in Table 1. below. These data will be compared to the actual records of production and use of energy obtained during plant operations.

Table 1: Energy Balance for Anglesey Ecoparc AD Facility

Inputs	Quantity	Units
Organic waste	40,000	tonnes
Imported Biomass	8,500	tonnes
Total BioFuel+Biomass	tbc	
Typical BioFuel Moisture Content	tbc	%
Combined BioFuel+Biomass Net Calorific Value	tbc	MJ/t ar
Total BioFuel + Biomass Net Energy Input	tbc	GJ/yr
Total BioFuel + Biomass Net Energy Input	tbc	MWh/yr
Outputs		
Predicted Gross Electrical Output	tbc	MWh/yr
Gross Electrical Conversion Efficiency	tbc	%
Net Electrical Output	*tbc*	MWh/yr

Tbc (to be confirmed by the Technical Provider on completion of final design).

For background detail of the Gas to Power project refer to Appendix N (Technical Proposal) of the Management System. Technical documents will be available in Appendix N of the Environment Management System.

As a new build project the installation of energy efficient equipment from lighting to motor drives will be a priority for the plant and supporting infrastructure alike. Consequently the opportunity for further significant gains in energy efficiency in the near future will be limited, the operator will keep abreast of changes in the energy efficiency of comparable plant and equipment used on the site and consider the case for replacement whenever new more efficient equipment becomes available or when replacement or additional equipment is required. An annual audit of the consumption will be undertaken which will include a breakdown of energy consumption by source. Details of the audit will be available to the regulator.

The audit will be used to identify potential measures to improve energy efficiency within the following:

- Operating and maintenance procedures;
- Site buildings; and
- Site plant and equipment.

All mobile and stationary plant and equipment utilised at the site will be subject to regular maintenance to optimise operating efficiency.

A record of fuel consumption will be maintained and will be used to identify any abnormal fuel consumption that requires investigation. Fuel use will also be reviewed as part of the annual energy consumption audit. All staff will receive appropriate training for operations at the site and this includes maintenance procedures and basic housekeeping (e.g. switching lights and equipment off when not in use). Should times with less input occur; modular equipment use will be reduced to keep the remaining equipment on full capacity. This allows operation with maximum energy efficiency. The above details and procedures are considered to meet the indicative BAT requirements within the Sector Guidance notes.

Specific Measures

As mentioned above as a new build the plant and associated infrastructure will be installed with energy efficiency in mind, leaving limited scope for immediate action to improve energy efficiency. Maintenance procedures will be geared to maintaining energy efficient working and replacement of consumables that affect energy consumption will be maintained under constant review to ensure as efficient or more efficient products are utilised when replacing consumable items.

If in auditing energy flows specific measures are identified which would improve efficiency they will be implemented and noted in the site log to ensure a continuation of that measure.

CHP Performance Data

Technical data of the unit

Electrical output:	2000 kW at a cos φ 1
Heat Output (without exhaust heat recovery)**:	1043 kW
Heat Output (with exhaust recovery)**:	1953 kW, at an exhaust heat exchanger of 180 °C
NOx emissions:	500 mg/Nm³ (@5% O_2)
CO emissions:	≤ 1400 mg/Nm³ (@5% O_2)

Design conditions		
Suction temperature / air humidity	°C / %	25 / 60
Site altitude:	m	100
Fuel data		
Fuel gas		Biogas
Methane number / lower heating value	- /	141/5.56
Gas density	kg/m³ NC	1.25
Unit		
Engine	TCG 2020 V20	
Alternator	Marelli MJB 560 LB4	
Voltage / voltage range	V / %	400 / ± 10
Frequency	Hz	50
Energy balance		
Electrical Output at cos φ = 1	kW	2000
HT mixture cooling water heat (± 8%)	kW	1043
LT mixture cooling water heat (± 8%)	kW	132
Exhaust gas temperature after heat exchanger	°C	180
Exhaust heat (± 8%)*	kW	910
Fuel consumption (+ 5%)*{LCV}	kW	4684
Electrical efficiency*	%	42.7
Thermal efficiency*	%	41.7
Total efficiency*	%	84.4

*Subject to ISO 3046 tolerances, at 1,000 mbar of air pressure, air temperature 25° C, relative humidity 60% and cos φ =1.

**+/-8% tolerances

2529 - Flow and Mass Balance Schematic - Base Case FOR PHASES 1&2