# Grid/Utilisation Compliance (AD): CHP, Electricity, or Biomethane

### **1. Introduction and Strategic Overview**

This document outlines the compliance procedures for the two primary energy offtake pathways for an Anaerobic Digestion (AD) facility: 1. **Electricity and Heat Generation:** Utilising biogas in a Combined Heat and Power (CHP) unit to export electricity to the grid and use heat on-site or locally. 2. **Biomethane to Grid (BtG):** Upgrading biogas to biomethane and injecting it into the gas distribution network.

Each pathway is governed by a distinct set of technical standards, safety regulations, and commercial agreements. The choice of offtake route for [Project Name] has significant implications for capital expenditure, operational complexity, and revenue streams. This protocol serves as the master guide for ensuring full regulatory compliance for the chosen pathway(s).

### **2. Part A: Electricity & Heat Offtake via Combined Heat and Power (CHP)**

This section details the compliance requirements for connecting a biogas-fuelled CHP unit to the local Distribution Network Operator’s (DNO) grid.

#### **2.1. Core Regulatory Framework: ENA EREC G99**

The primary governing standard is the **Energy Networks Association’s (ENA) Engineering Recommendation G99 (EREC G99)**. This document specifies the requirements for connecting any Power Generating Module (PGM)—in this case, our CHP unit—to the distribution network.

Compliance with EREC G99 is non-negotiable and is a prerequisite for receiving a **Final Operational Notification (FON)** from the DNO, which formally permits the export of electricity.

#### **2.2. Power Generating Module (PGM) Classification**

The first step is to classify the CHP unit according to G99 criteria, as the technical requirements scale with size and voltage.

* **Project Classification:** [Placeholder: Based on a CHP unit capacity of X MWe connected at Y kV, the PGM classification for this project is Type [A, B, C, or D]. This determination is based on the thresholds outlined in EREC G99.]

#### **2.3. G99 Compliance and Commissioning Pathway**

The process involves a sequence of application, technical validation, and commissioning steps performed in coordination with the DNO, [Placeholder: DNO Name].

| Step | Action | Key Details & Documentation | Status |
| --- | --- | --- | --- |
| **1. Application** | Submit Standard Application Form to the DNO. | Includes preliminary site plans, CHP specifications, and expected export capacity. | [ ] |
| **2. Agreement** | Negotiate and execute a **Connection Agreement**. | A formal contract detailing technical requirements, costs, and timelines for the grid connection. | [ ] |
| **3. Design & Install** | Finalise electrical design and install equipment. | All protection and control systems must meet G99 and DNO specifications. | [ ] |
| **4. Documentation** | Submit **Power Generating Module Document (PGMD)**. | A comprehensive document detailing the PGM’s technical specifications and compliance evidence (e.g., manufacturer’s type-test certificates). | [ ] |
| **5. Commissioning** | Conduct on-site commissioning tests. | The DNO must be given the opportunity to witness tests of protection systems and operational parameters. | [ ] |
| **6. Verification** | Submit **Compliance Verification Report**. | Formal report demonstrating that all G99 tests were successfully completed and passed. | [ ] |
| **7. Final Approval** | Receive **Final Operational Notification (FON)**. | The DNO’s official permission to commence continuous parallel operation with the grid. | [ ] |

#### **2.4. Key Technical Compliance Requirements (EREC G99)**

The CHP and its interface protection system must meet stringent technical criteria.

| Parameter | Requirement | Project Specifics / Action |
| --- | --- | --- |
| **Protection Settings** | Must comply with G99 Table 10.1 for Loss of Mains (LoM), over/under voltage, and over/under frequency. | [Placeholder: Confirm specific settings with DNO and program into the interface protection relay.] |
| **Fault Ride-Through** | The PGM must remain connected and stable during specified voltage dips on the grid. | Evidence to be provided via manufacturer’s type-test data or on-site testing. |
| **Frequency Response** | Limited Frequency Sensitive Mode (LFSM) is mandatory for PGMs >5MW. The PGM must reduce output in response to high grid frequency. | [Placeholder: Confirm applicability based on PGM Type and configure CHP control system accordingly.] |
| **Power Quality** | Harmonics, flicker, and voltage fluctuations must remain within the limits defined in ENA Engineering Recommendations P28 and G5. | Verified during commissioning tests. |
| **Islanding Protection** | Robust protection (e.g., RoCoF, vector shift) must be in place to ensure the CHP disconnects instantly if the grid is lost, preventing unsafe “islanding”. | Primary method to be agreed with the DNO. |

#### **2.5. Heat Utilisation: Records and Compliance**

Efficient use of heat from the CHP is critical for overall process efficiency and for qualifying for certain renewable incentives.

* **Principle of Beneficial Use:** All heat claimed must be used for an eligible purpose, such as maintaining digester temperature, pasteurisation, or heating buildings. Heat simply dissipated to the atmosphere is not considered beneficial.
* **Metering Requirements:**
  + **MID Class 2 Heat Meters:** Calibrated heat meters compliant with the Measuring Instruments Directive (MID) must be installed to measure all useful heat circuits.
  + **Schematic Diagram:** A detailed schematic ([Placeholder: Reference to engineering drawing number]) must show the location of all heat meters, pumps, and heat loads.
* **Heat Use Records:** A log must be maintained detailing:
  + Meter readings (kWhth).
  + The purpose/destination of the heat (e.g., Digester 1 heating loop).
  + Calculations demonstrating the heat was required and used effectively.
* **Heat Map:** A site “heat map” or energy balance diagram should be developed and maintained. This visual tool demonstrates how heat is generated and distributed across the site, providing clear evidence of beneficial use for auditors.

### **3. Part B: Biomethane Offtake via Grid Injection**

This section details the compliance requirements for upgrading biogas to biomethane and injecting it into the gas distribution network managed by the Gas Network Operator (GNO), [Placeholder: GNO Name].

#### **3.1. Core Regulatory Framework: GS(M)R**

The process is primarily governed by the **Gas Safety (Management) Regulations 1996 (GS(M)R)**. These regulations place a duty on the GNO to ensure that no gas is conveyed that could pose a danger to the public. As a gas producer, we must ensure our product consistently meets the quality and safety specifications required by the GNO.

#### **3.2. Biomethane Injection Compliance Pathway**

The process from production to injection is managed through a formal contractual and safety framework.

1. **Network Entry Agreement (NEA):** This is the foundational contract with the GNO. It specifies the technical, commercial, and operational conditions for injecting biomethane at a specific Network Entry Point.
2. **Safety Management System (SMS):** A comprehensive SMS must be developed, detailing all procedures for safe operation, maintenance, and emergency response related to the gas upgrading and injection process. **This SMS must be formally accepted by the Health and Safety Executive (HSE)** before injection can commence.
3. **Commissioning and Approval:** The entire injection facility, including gas quality analysis, odorisation, and metering systems, undergoes rigorous commissioning witnessed and approved by the GNO.

#### **3.3. Key Technical & Quality Requirements**

Biogas must be upgraded to remove CO₂, H₂S, water, and other contaminants to meet the biomethane specification.

**Gas Quality Specifications:** The injected biomethane must continuously meet the parameters set by the GNO in the NEA, which are derived from GS(M)R. Continuous online analysis is required, with an automated shutdown system to prevent off-spec gas from entering the grid.

| Parameter | Typical Limit (Illustrative) | Significance |
| --- | --- | --- |
| **Wobbe Index** | 47.2 - 51.41 MJ/m³ | Ensures appliances operate correctly and safely. |
| **Calorific Value (CV)** | > 37.0 MJ/m³ | Defines the energy content of the gas. |
| **Oxygen (O₂)** | < 0.2% (mol) | Prevents corrosion and explosive atmosphere risks within the network. |
| **Hydrogen Sulphide (H₂S)** | < 5 mg/m³ | Highly corrosive and toxic; must be removed. |
| **Total Sulphur** | < 50 mg/m³ | Protects network infrastructure and end-user appliances. |
| **Water Dew Point** | < -10°C @ 85 barg | Prevents water condensation and hydrate formation in the pipeline. |
| **Relative Density** | 0.55 - 0.70 | Affects flow dynamics and appliance performance. |

*Note: Exact limits are country-specific and will be defined in the NEA with [Placeholder: GNO Name].*

**Odorisation:** - Natural gas is odorised for safety to ensure leaks can be detected by smell. - Biomethane must be similarly odorised. Typically, this is performed by the GNO at the Network Entry Facility, but the producer must provide the necessary infrastructure and facilitate the process as specified in the NEA.

### **4. Part C: Common Compliance Elements**

#### **4.1. Fiscal Metering & Record Keeping**

Accurate measurement is essential for billing, regulatory reporting, and obtaining renewable certificates.

* **Electricity (CHP):** An **Ofgem-approved, export-grade fiscal meter** will be installed to measure the net electricity exported to the grid. Data from this meter forms the basis for Power Purchase Agreement (PPA) payments and REGO issuance.
* **Biomethane (BtG):** A **GNO-approved fiscal metering suite** will be installed at the Network Entry Point. This system measures the volume and energy content (via CV analysis) of the injected gas. It is the official “cash register” for gas sales and RGGO issuance.
* **Records:** All metering records, calibration certificates, and data validation reports must be securely stored and be available for audit for a minimum of [Placeholder: e.g., 7 years].

#### **4.2. Renewable Certificates**

Verifiable certificates are crucial for monetising the renewable attribute of the energy produced.

* **Electricity (REGOs):** For each MWh of renewable electricity exported, one **Renewable Energy Guarantee of Origin (REGO)** can be claimed via the Ofgem Renewables and CHP Register. These certificates are used by electricity suppliers to prove the renewable content of their energy mix.
* **Biomethane (RGGOs / RTFCs):**
  + **Green Gas Certification Scheme (GGCS):** By tracking the biomethane from production to injection, we can earn **Renewable Gas Guarantees of Origin (RGGOs)**. These are traded to gas consumers wishing to “green” their gas supply.
  + **Renewable Transport Fuel Obligation (RTFO):** If the biomethane is notionally allocated to the transport sector, it may be eligible for **Renewable Transport Fuel Certificates (RTFCs)**. As a waste-derived biofuel, it is expected to be “double-counted,” earning 2 RTFCs per unit of energy. This requires rigorous sustainability auditing under a DfT-approved scheme (e.g., ISCC).

### **5. Sources**

* biogas operations compliance document outline.md
* UK biogas energy offtake compliance CHP G99 GSMR.md
* DSEAR regulations biogas facilities risk assessment UK.md
* ISCC certification biodiesel UCO.md
* PAS 110 digestate quality standards UK.md
* UK RTFO biodiesel UCO.md
* UK EU biodiesel Used Cooking Oil UCO regulations.md
* cross-border waste shipment Annex VII documentation.md
* ADR transport UCO biodiesel regulations.md
* UK EU waste management legal frameworks.md
* REACH CLP regulations biogas biodiesel chemicals.md
* UK biogas Animal By-Products ABP feedstock regulations.md
* Health & Safety at Work Act HSWA requirements UK.md
* UK EU biogas food waste anaerobic digestion regulations.md
* EN 14214 biodiesel fuel standard.md
* UK Duty of Care waste management.md
* EWC LoW codes waste classification.md
* EU RED II RED III biodiesel UCO.md
* UK biogas environmental permitting Environment Agency NRW SEPA.md