

SHARPE PRITCHARD LLP

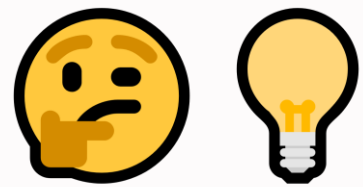
Anaerobic Digestion: Technology Overview




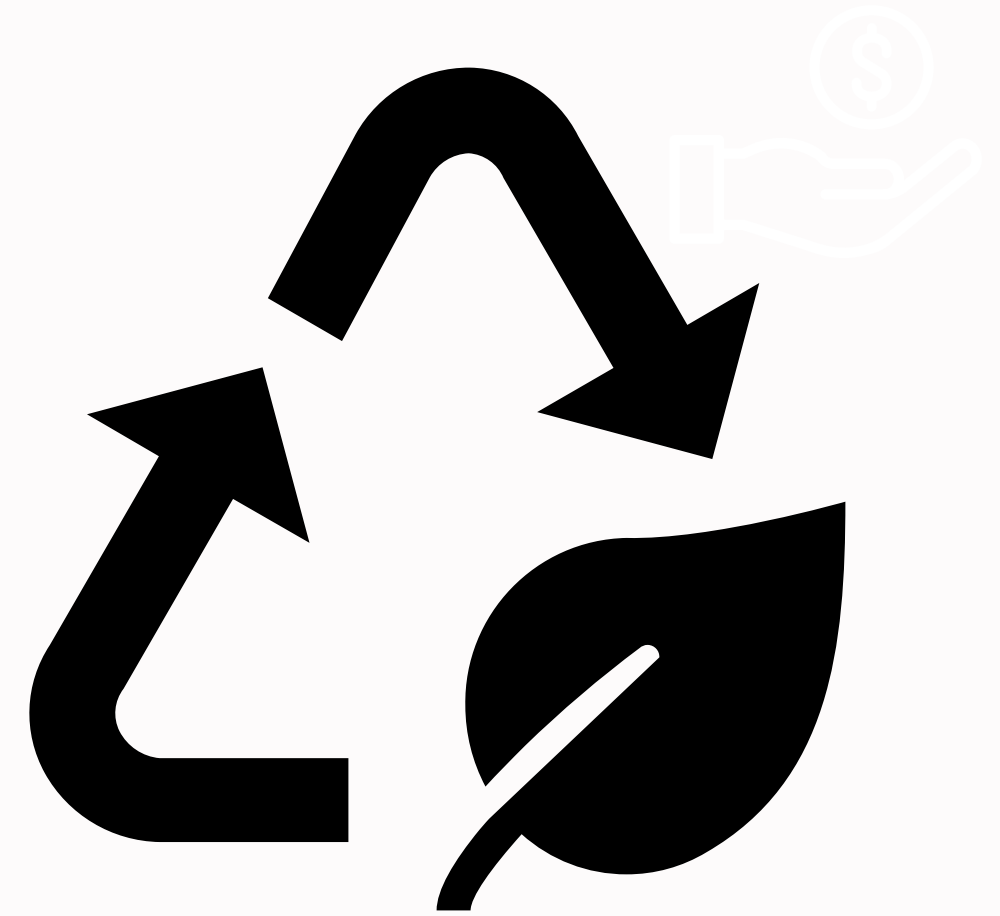
Steve Gummer (Partner)



What is Anaerobic Digestion (AD)?



- Anaerobic digestion (AD) is a **biological process** that breaks down **organic waste** in an **oxygen-free environment**, producing **biogas** (mainly methane) and **digestate**. This takes place in a **sealed, insulated container**, heated between **35°C–55°C** 



Types of Anaerobic Digestion

Organic Feedstock



✓ **Suitable:** Food waste, energy crops, crop residues, slurry & manure

✗ **Not suitable:** Wood waste (due to high lignin content)

Biogas



Composition: ~60% methane (CH₄) & ~40% carbon dioxide (CO₂)

Uses:

- 🔥 Injected into the gas grid
- 🔥 Burned for heat & electricity
- 🔥 Used as a transport fuel

Digestate



- ✓ Leftover organic material rich in **nitrogen & potassium**
- ✓ Can be used as a **fertilizer & soil conditioner**
- ✓ Typically **90–95%** of the original feedstock volume



Stages of Anaerobic Digestion



1- Pre-treatment

Sorting, shredding, wetting

2 - Digestion

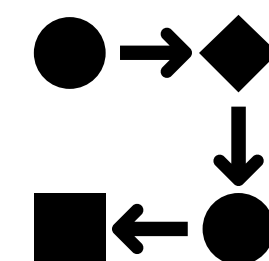
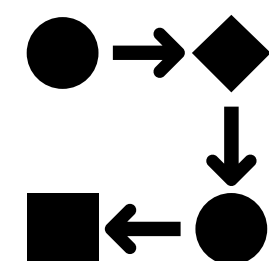
Heated & mixed to sustain bacteria

3 – Biogas Refinement

Removal of CO₂ & impurities

4 - Digestate Treatment

Pasteurisation (if required)



Types of AD Operators

 **Farm-based systems**

Using slurry and agricultural waste

 **Commercial-scale plants**

Handling large volumes

 **Community-based projects**

Processing local organic waste

Key Factors for AD Development



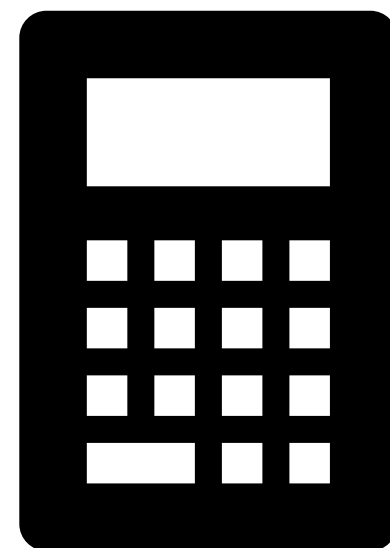
💡 **Success depends on:**

- ✓ The availability of feedstock 🌿 ♻️
- ✓ Local demand for digestate and energy 🔥
- ✓ Space and capital investment 🏗️

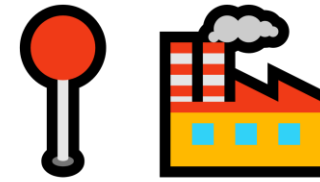


⚠️ **Challenges**

- 🚗 Some feedstocks contain trace elements that affect digestate quality
- ⚖️ A cost-benefit analysis is crucial for economic feasibility



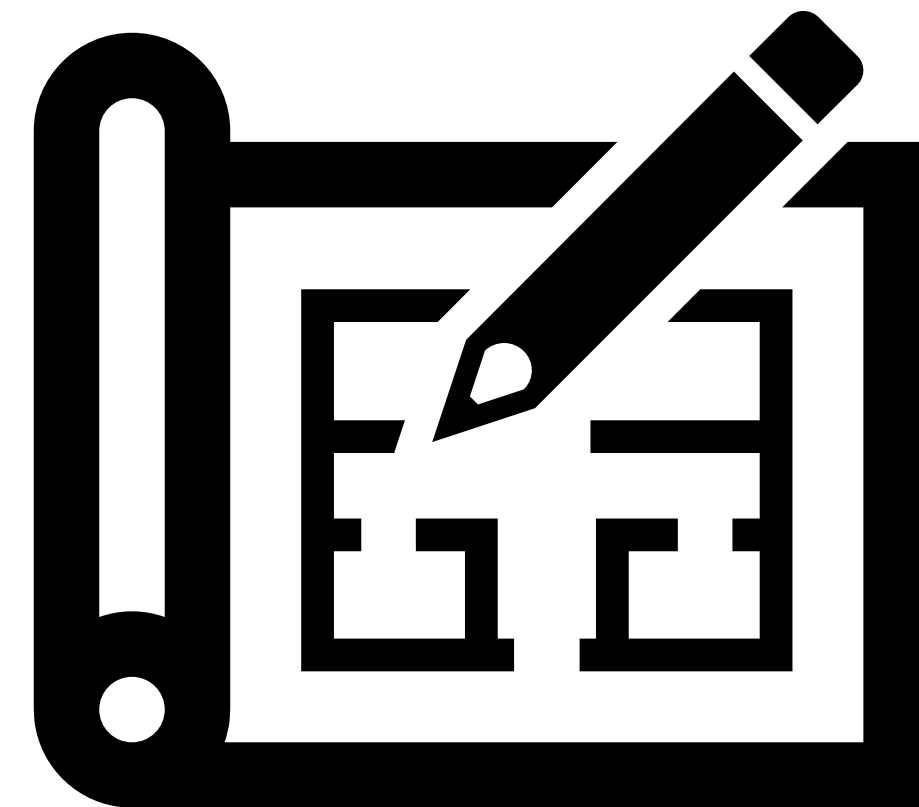
Siting AD Systems



- ✓ Close to feedstock supply A green tractor icon and a green seedling icon with a brown root.
- ✓ Near demand for digestate A yellow corn cob icon and a green tractor icon.
- ✓ Access to heat & power markets A yellow and orange flame icon and a yellow lightning bolt icon.
- ✓ Proximity to electricity/gas grid A black power plug icon.
- ✗ Avoid residential areas due to odour concerns A white house icon with a red roof and a yellow nose icon.


Planning & Environmental Considerations


- ✓ Positive Effects:
 - 🌱 Reduces greenhouse gas emissions
 - 🌿 Cuts farm odours & fertiliser use
 - ♻️ Reduces landfill waste
 - ⚡ Lowers fossil fuel dependence
- ⚠️ Challenges:
 - 🛢️ Spillage risks
 - 🔊 Generator noise
 - 🚛 Increased vehicle movement
 - 👁️ Visual impact



Economics & Costs of AD

Capital Expenditure (CAPEX)

 Farm-based (100 kW–1 MW): £500K–£2.5M

 Commercial (1–2 MW): £5M–£10M

 Grid connection costs can be significant

Operational Expenditure (OPEX)

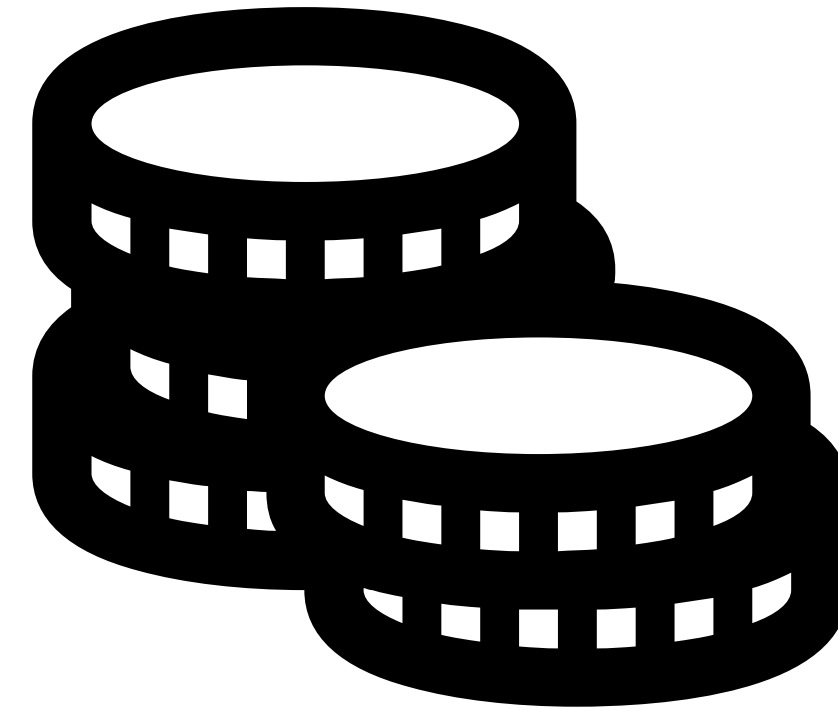
 Includes electricity, maintenance & spare parts

Revenue Streams

✓ Electricity & heat sales  

✓ Digestate sales  

✓ Gate fees for waste disposal 



Reliability Concern:

 If bacteria stop receiving feedstock, digestion halts  


 Restarting can take weeks, requiring long-term feedstock contracts 


Incentives & Support Schemes



 **Green Gas Support Scheme (GGSS)** – Supports renewable gas production

 **Smart Export Guarantee (SEG)** – Encourages small-scale energy generation

 **Renewable Heat Incentive (RHI)** – Payments for biogas combustion (closed 2021)

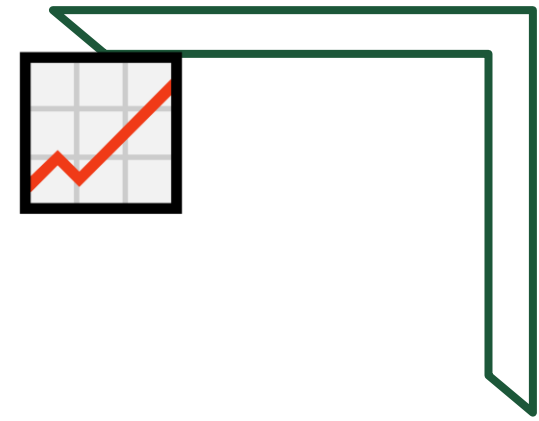
 **Renewables Obligation (RO)** – Previously required renewable electricity sourcing (closed 2017)

 **Feed-in Tariffs (FiT)** – Ended in 2019, replaced by SEG

 **Bonus:** CHP (Combined Heat & Power) from AD is exempt from the Climate Change Levy 



Technology Status & Diffusion



 The UK is shifting towards **waste recovery** instead of landfill

 **Landfill use dropped to 22% in 2016**, ahead of the **2030 zero food waste goal**

 AD helps by:

- ✓ **Reducing landfill pressure**
- ✓ **Generating revenue from waste**
- ✓ **Preventing methane emissions**
- ✓ **Lowering emissions from nitrogen fertilizers**



Final Thoughts: Why AD Matters?



- ✓ Generates green energy
- ✓ Cuts waste & emissions
- ✓ Supports the circular economy
- ✓ Provides multiple revenue streams

AD = A Sustainable Future!





Public Policy & Regulations for Anaerobic Digestion (AD) in the UK 1/2

In the United Kingdom, anaerobic digestion (AD) is governed by a **comprehensive framework** of public policies and regulations designed to ensure **environmental protection** 🌿, **public health** 🏠, and **operational safety** 🏭.

Key regulatory areas include:

1 Environmental Permitting Regulations (EPR) 🏭📄

AD facilities processing waste materials are subject to the **Environmental Permitting Regulations**, which require operators to obtain the **appropriate permits** based on the scale and nature of their operations. These permits ensure that facilities adhere to **standards that minimise environmental impact** 🌱. The **Environment Agency** provides specific **standard rules permits** for AD operations, such as **SR2021 No 6**, which outlines **conditions for facilities treating non-hazardous waste exceeding 100 tonnes per day through biological treatment processes like anaerobic digestion**.

📌 Source: GOV.UK

2 Animal By-Products Regulations (ABPR) 🐄🏭

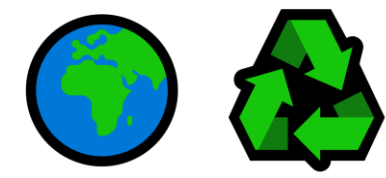
Facilities processing **animal by-products** must comply with the **Animal By-Products Regulations** to prevent risks to **public and animal health** 🛑. These regulations **categorize animal by-products into different risk levels** and stipulate specific **treatment standards for each category** when processed in **composting or biogas plants**.

📌 Source: WIKIPEDIA

3 Quality Protocol for Anaerobic Digestate 🌱✅

The **Quality Protocol** sets **criteria for the production and use of quality digestate** from the anaerobic digestion of **source-segregated biodegradable waste** ♻️. Compliance with this protocol ensures that the **digestate can be used without waste management controls**, promoting its use as a **valuable resource in agriculture** 🚜 and **land restoration**.

📌 Source: GOV.UK ASSETS



Public Policy & Regulations for Anaerobic Digestion (AD) in the UK 2/2

4 Smart Export Guarantee (SEG) ⚡💰

AD generators exporting **electricity to the grid** can benefit from the **Smart Export Guarantee**, which mandates that licensed electricity suppliers **offer payment for surplus energy** ⚡ fed into the grid.

To qualify, **AD operators must meet specific sustainability criteria** 🌍 and adhere to **reporting requirements** 📊 as outlined by Ofgem.

📌 Source: OFGEM

5 Secondary Containment Requirements 🏠🚰

Recent updates to the **Environment Agency's guidance** mandate that **all tanks and containers at AD facilities must be equipped with secondary containment systems** that comply with **CIRIA 736 standards**.

This measure aims to **prevent environmental contamination** 🌍 from potential **leaks or spills** 🛑.

📌 Source: SLR CONSULTING

6 Best Practice Guidelines for Crop Feedstocks 🌾📖


Industry bodies, including the **Anaerobic Digestion and Bioresources Association (ADBA)**, have developed **voluntary guidelines on best practices for using crop feedstocks in AD processes** 🌿.




These guidelines assist operators in **optimising feedstock use** 🚗 while ensuring **environmental sustainability**.

📌 Source: EUROPEAN BIOGAS ASSOCIATION



PAS 110: Key Standard for Anaerobic Digestion (AD)

The **Publicly Available Specification (PAS) 110** is a **key standard** in the **anaerobic digestion (AD)** industry, providing a **framework to ensure quality and safety** of digestate products.  

Developed by the **British Standards Institution (BSI)** and sponsored by the **Waste & Resources Action Programme (WRAP)** , PAS 110 aims to create a **consistent benchmark** for digestate, facilitating its **acceptance and use as a renewable fertilizer**  .







Scope and Purpose of PAS 110

PAS 110 sets out the **minimum quality requirements** for:

- ◆ **Whole digestate**
- ◆ **Separated liquor**
- ◆ **Separated fibre**

These are **derived from the anaerobic digestion of source-segregated biodegradable materials**. 

PAS 110 Objectives:

- ✓ **Ensure Quality and Safety**  
- ◆ **Defines strict input material controls and processing standards** to ensure digestate is **safe for human, animal, and plant health**.
- ✓ **Promote Market Confidence**  
- ◆ **A recognized standard builds trust among farmers, food producers, and retailers**, ensuring digestate is a **reliable and effective fertilizer**.
- ✓ **Facilitate Regulatory Compliance**  
- ◆ **Helps producers meet regulatory requirements and achieve 'end-of-waste' status**, **reducing waste management burdens**



Key Requirements of PAS 110

To comply with **PAS 110**, **AD** operators must implement several critical measures:

◆ Quality Management System (QMS)

✓ Operators must establish a **QMS** covering all aspects of the AD process, ensuring **consistent digestate quality**.

◆ Hazard Analysis and Critical Control Points (HACCP)

✓ A **HACCP plan** must identify and manage **potential risks** in the digestion process.

◆ Input Material Controls

✓ **Strict guidelines** determine **acceptable input materials**, requiring **source-segregated biodegradable inputs** to prevent contamination.

◆ Pasteurization Requirements

✓ Unless exempt, digestate must be **heated to at least 70°C for one hour** to eliminate pathogens.

◆ Regular Testing and Monitoring

✓ **Routine sampling and analysis** ensure compliance with **quality parameters**, checking **nutrient content** and **absence of harmful substances**.



Benefits of Achieving PAS 110 Certification

Market Acceptance

- Certified digestate is more likely to be accepted by end-users, expanding market opportunities.



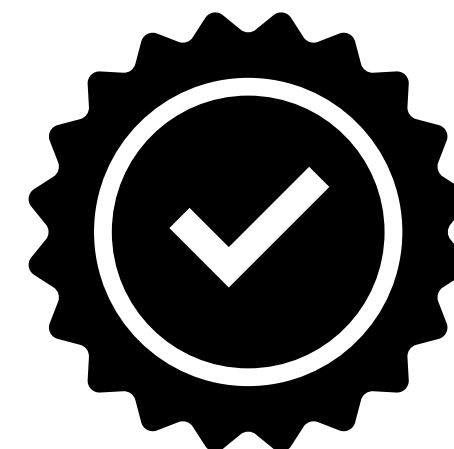
Regulatory Relief

- Certification can classify digestate as a product rather than waste, reducing regulatory constraints & costs.



Environmental Sustainability

- Promotes recycling of organic materials, enhances soil health, and supports sustainable agriculture.



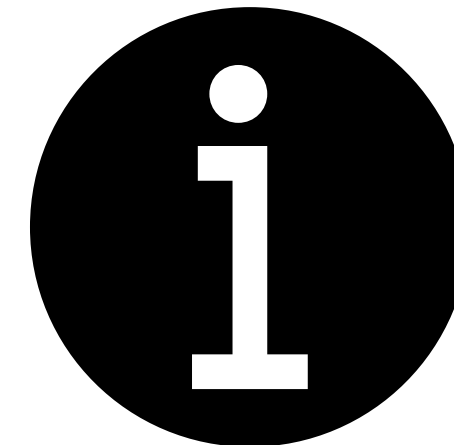
PAS 110 Certification: More Information

 For detailed information and access to the PAS 110 document, visit:

 [WRAP](#)

 The Biofertiliser Certification Scheme (BCS) provides further guidance & certification:









 [BIOFERTILISER.ORG.UK](#)





Conclusion: Why PAS 110 Matters?

By adhering to **PAS 110 standards**, **AD operators** can:

- ✓ **Enhance digestate quality & marketability**  
 - ✓ **Improve compliance & regulatory standing**  
 - ✓ **Support waste reduction & renewable energy goals**  
-  **PAS 110 ensures digestate is a safe, reliable, and valuable product for sustainable agriculture!** 

Expansion of Waste Collection Requirements in England and Wales (1/5)

Waste Collection Authorities (WCAs) in England previously had a duty to **separately collect at least two types of recyclable waste** from households (**Section 45A, EPA 1990**).

This requirement is now **expanding to six recyclable waste streams**.

- For details on the **implementation timetable**, see **Consultations and Simpler Recycling Policy**.
- In **Wales**, the **Senedd Cymru (Welsh Parliament)** has the power to impose a **similar duty** on WCAs (**Section 45B, EPA 1990**).

Environment Act 2021 – Section 57: Standardizing Waste Collection

- **Section 57** of the **Environment Act 2021** introduces a **consistent set of recyclable materials** that must be **separately collected** from **households and businesses**, including **food waste**.
- The **Environment Act 2021 (Commencement No. 9 and Transitional Provisions) Regulations 2024 (SI 2024/639)** commenced **Section 57** on **17 May 2024**, making **transitional provisions** for the introduction of **separate food waste collections** and **co-collection of food and garden waste**.

Expansion of Waste Collection Requirements in England and Wales (2/5)

Separation of Waste (England) Regulations 2024

The **Separation of Waste (England) Regulations 2024 (SI 2024/666)** took effect on **30 June 2024** to supplement Sections **45A, 45AZA, and 45AZB** of the **EPA 1990** (introduced by the **Environment Act 2021**).

● Key Requirements:

✓ WCAs must collect six recyclable waste streams separately:

- ✓ Plastic
- ✓ Paper and card
- ✓ Glass
- ✓ Metal
- ✓ Food waste
- ✓ Garden waste (*only when requested*)

✓ **Non-domestic premises** (e.g., schools, hospitals, businesses) must also separately arrange for collection of these six waste streams (except garden waste).

● Additional Regulations:






- ✓ Defines **types of recyclable household and commercial waste** to ensure collection consistency.
- ✓ **Expands the list of non-domestic premises** required to comply, including **places of worship, penal institutions, charity shops, hostels, and public meeting venues**.
- ✓ **Repeals Regulation 13** of the **Waste Regulations 2011**, replacing it with the **more stringent requirements** under the **Environment Act 2021**.
- ◆ These regulations follow **government consultations in October 2023 and May 2024** but **do not introduce exemptions** for co-collection of **dry recyclable waste streams** in a **single container** or for **food and garden waste** collection together.

Expansion of Waste Collection Requirements in England and Wales (3/5)

Draft Separation of Waste (England) Regulations 2025

 Laid before Parliament on 4 December 2024, coming into force on 31 March 2025.

Key Exemptions Introduced:

-  Allow collection of plastic, glass, and metal together in all circumstances, not just by exception.
-  Paper and card must still be collected separately, unless an exception applies.
-  Food waste and garden waste can be co-collected in all circumstances.
-  Micro-firms (fewer than 10 full-time employees) are exempt from separation requirements until 31 March 2027.
-  Waste collectors do not need to prepare a written assessment to apply these exemptions.

 These 2025 Regulations replace the draft Separation of Waste (England) (No. 2) Regulations 2024, which were withdrawn on 3 December 2024.

Expansion of Waste Collection Requirements in England and Wales (4/4)

Government Commitments and Simpler Recycling Policy

The measures align with the government's **Resources and Waste Strategy** and the **25-Year Plan for the Environment**.

◆ **May 2024:** Defra published updates on its "**Simpler Recycling**" reforms, including:

- ✓ **Exemptions for co-collection** of dry recyclable waste streams and food/garden waste.
- ✓ **Extension of separate collection rules to additional non-domestic premises**, such as **places of worship and penal institutions**.
- ✓ **New requirements for waste collectors to record co-mingling** as part of a **digital waste tracking system**.
- ✓ **Updated policy statement & statutory guidance under Section 45AZE of the EPA 1990** (*to be issued after the regulations are enacted*).

📅 Revised Timetable for Implementation:

Waste Stream	Households	Businesses & Non-Domestic Premises	Micro-Firms (Fewer than 10 Employees)
Dry recyclables (plastic, paper, glass, metal)	By 31 March 2026	By 31 March 2025	By 31 March 2027
Plastic film recycling	By 31 March 2027	By 31 March 2027	By 31 March 2027
Food waste	By 31 March 2026 (<i>unless transitional arrangements apply</i>)	By 31 March 2025	By 31 March 2027
Garden waste	By 31 March 2026	Not Required	Not Required
Residual waste (minimum collection standards)	By 31 March 2026	Not Required	Not Required

A New Project Agreement

- Basis of contract / assumptions made:
 - WIDP (with improvements)
 - assumptions - corporate finance, authority site, planning secured, single facility, collection and delivery
- Tried to simplify:
 - removed certain elements (e.g. persistent breach), clarified others (wipe clean, waste law list) and rationalised (e.g. definitions, compensation on termination, technical drafting in the main body)
- Lessons learnt / areas addressed:
 - maintenance, expiry and handback, remedies, insurance, joint certifier, improved provision of information / visibility for the Authority
- Modified key schedules (Contractor's Proposals, Change Protocol, Tests)
- Guidance notes



Conclusion

The **Separation Regulations 2024 and 2025** introduce a **more consistent and structured approach to waste collection** across **households, businesses, and non-domestic premises in England**.

- ◆ The reforms **support national recycling targets and reduce landfill waste**.
- ◆ **Businesses and local authorities must prepare for compliance deadlines to avoid enforcement action**.
- ◆ **Micro-businesses have extended deadlines until 2027** to transition to the new system.

 The new framework aims to make recycling simpler, improve sustainability, and ensure compliance with waste reduction goals!  

