

# IEA Bioenergy Task 37



## Country Report – September 2011

*Oliver Harwood*



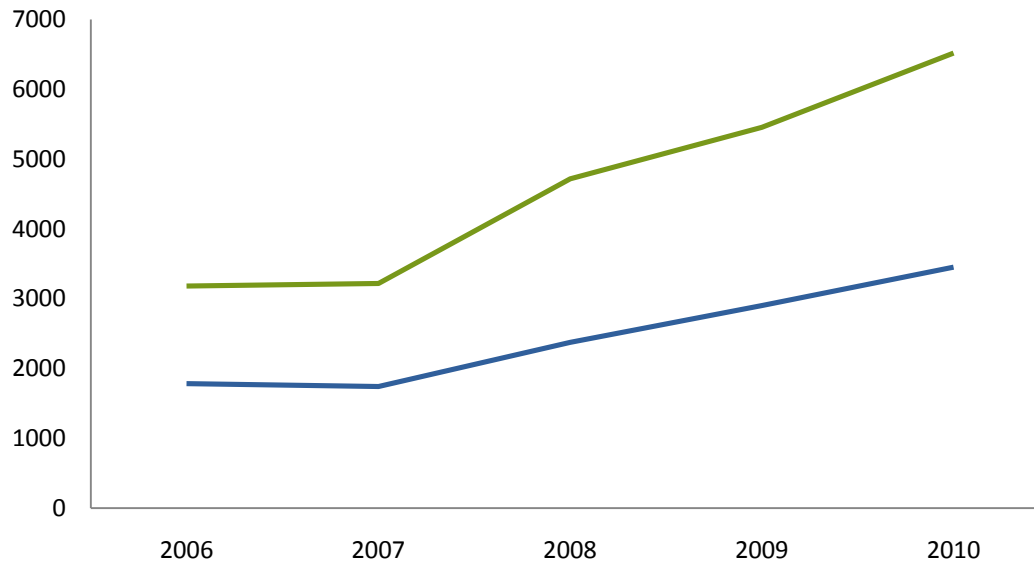
Working together for  
a world without waste



# Gas Production – Renewable fuels

GWh

	2006	2007	2008	2009	2010
Electricity	1783	1742	2373	2904	3452
Heat	1400	1477	2344	2553	3066

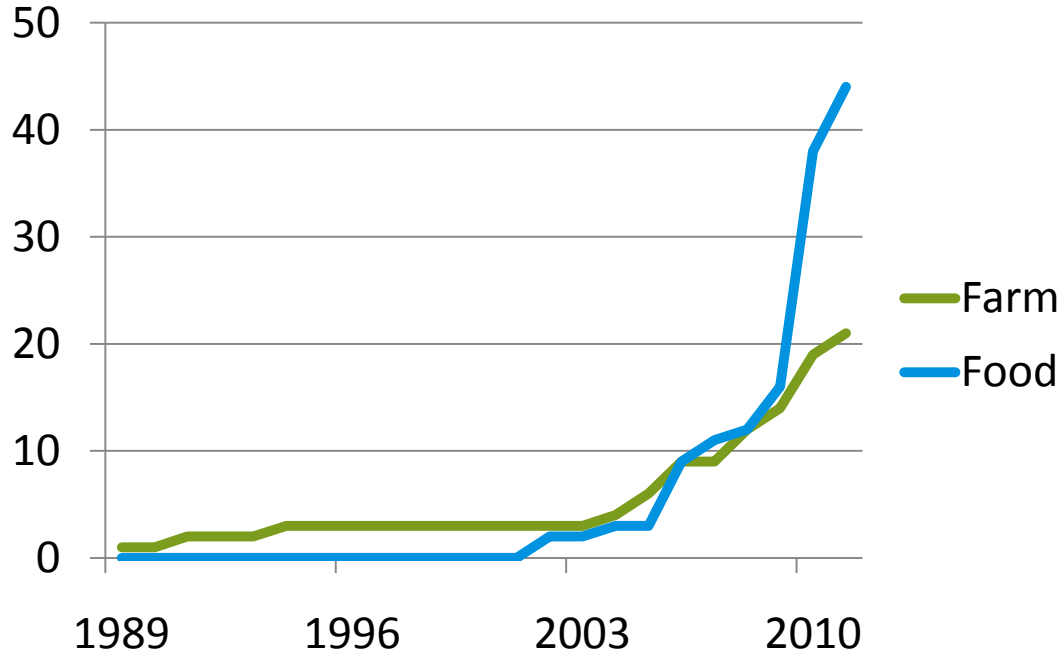


# Biogas plants in the UK

Type of plant	Number	Capacity
Farm and Food	65	51 Mw
Sewage sludge	146	189.2 Mw
Landfill		1054.6 Mw

Source: Decc Statistics 2011 & WRAP

# AD plants in the UK – food fed & farm fed only



UK AD growth – Operational Plants

# Economic Support - Funding

- WRAP - AD Loan Fund (England only)
- WRAP - eQuip
- WRAP - AD Challenge fund
- The AD Centre – Measure 3 Funding
- DARD – Biomass processing challenge fund
- Cadwyn Clwyd – Community and Agri energy project
- ZWS Support for enhancements to AD sites processing food waste
- Community Energy Scotland – Loans for feasibility studies for community AD

# Achievements so far – Funded plants

Project	Location	Funding source	Funding amount	Site capacity (tonnes)	Operational date	Grant awarded
Bank Farm	Montgomery, Powys	WRAP Capital (Wales)	£60,000	10,000	2008	31/12/2007
Staples	Boston, Lincs	ETF (DECC)	£2,003,000	40,000	24/02/2011	01/11/2009
BV Dairy	Shaftsbury, Dorset	ETF (DECC)	£1,736,211	65,000	01/11/2010	06/11/2009
Langage Farm	Plymouth, Devon	ETF (DECC)	£1,234,554	17,000	01/03/2011	16/10/2009
GWE Biogas	Driffield	ETF (DECC)	£2,395,000	50,000	03/03/2011	20/10/2009
Oxford Renewable Energy	Cassington	WRAP Capital	£1,553,672	40,000	28/09/2010	10/12/2009
Lower Reule Bioenergy	Gonsall, Staffs	WRAP Capital	£750,000	30,000	01/04/2011	25/11/2009
Local Generation	March, Cambs	WRAP Capital	£1,425,000	30,000	In build	10/12/2010
SSE Generation Ltd.	Barkip, Ayrshire	ZWS Capital	£2,200,000	75,000	Comissioning	11/06/2010
TEG Biogas	Glenfarg, Perthshire	ZWS Capital	£700,000	16,000	In build	21/10/2010
SWWS - Scottish Water Ltd.	Cumbernauld	ZWS Capital	£1,708,736	30,000	29/06/2010	2009
InSource Energy	Rogerstone	WRAP Capital (Wales)	£500,000	10,000	In Build	31/03/2011
Shanks	Cumbernauld	Scottish Government	£8,000,000	60,000	Operational	2010

# Economic Support - Incentives

- The Feed In Tariff (FIT)
  - There are currently 9 AD plants in receipt of the FIT, generating just over 8Mw

Tariff Pence per kWh	Plant size
14	<250kW
13	<251 >500kW
9	> 500kW

- Renewable Heat Incentive (RHI)

Tariff Pence per kWh	Plant size
T1 – 7.9 / T2 – 2.0	< 200 kWth
T1 – 4.9 / T2 – 2.0	>200 > 1000kWth
2.7	1000 kWthC
(Biomethane) 6.8	200kWth

# Incentives Cont.

- Renewables Obligation (RO and ROS)

AD	Number of ROCs
<500kW	2

- Northern Ireland main incentive scheme is NIRO

AD	Min	Max	NIRO (2010/11)	NIRO (Original)
	0kW	<=500kW	4	2
>500kW	<=5MW	3	2	
>5MW		2	2	

# Economic Data – AD Calculator



## Financial Summary Page

This page summarises the financial information

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P&L

### Profit and Loss

This is the P&L with 50% Finance repaid

#### Income

Electricity	£615,360
Heat	£29,744
Fertiliser Value	£55,200
ROCs	£0
Gate Fees	£20,000
Other Income	

**Total Income 720,304**

#### Costs

Energy Feedstock	£200,000
Labour & Management	£40,500
Power inc Capital Repayment	£173,875
General overheads	£68,200
Land, building	£6,000
Interest Payment	£58,050

**Total Costs 546,625**

**Profit/Loss 173,679**

### Statistics

Costs per kWh e	13.84	p/kWh e
Costs per m <sup>3</sup> Biogas	27.68	p/m <sup>3</sup>
Return on Capital	13.47%	

(profit and finance over capital)

**Total Capital Expenditure £1,720,000**

### Internal Rates of Return

	Internal Rate of Return	Return on Capital
At 5 years	-19.9%	13.5%
<b>At 10 Years</b>	<b>6.5%</b>	<b>13.5%</b>
<b>After term of loan (10 years)</b>	<b>6.5%</b>	<b>13.5%</b>
At full depreciation period (20th year)	14.7%	13.5%
At 20 Years	14.7%	13.5%

### Cost and Revenue of Marginal Tonne

This allocates costs per tonne. It highlights the costs and benefit of increasing capacity and feedstock tonnage.

Per Tonne	All
Feedstock Cost	£8.00
Operational	£9.53
Capital Cost	£4.34
<b>Total Cost</b>	<b>£21.87</b>

### Revenue

Biogas	£25.80
Digestate	£2.21
Gate Fees	£0.80
Other Income	£0.00
<b>Revenue</b>	<b>£28.81</b>
<b>Return £t</b>	<b>£6.95</b>

Costs & revenue per tonne

### Sensitivity

#### Revenue from Increasing Variables by 5% Rank

Variable	Change	Rank
Capital Expenditure	-£9,598	6
Feedstock Volume	£26,015	3
Electricity Price	£30,768	2
Heat Price	£1,487	4
Cost of Feedstocks	-£9,000	5
Capacity	£35,284	<b>1</b>

### Capacity Figures

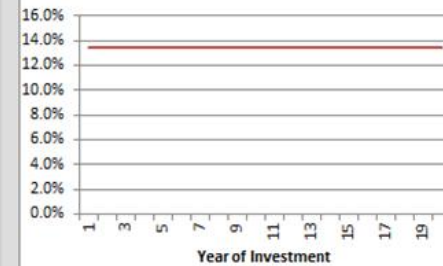
Plant Capacity	2,740 m <sup>3</sup>
Total capital cost of plant per m <sup>3</sup> capacity	£628
Capital depreciation £t feedstock pa	£4.34 t
Annual throughput per m <sup>3</sup> capacity	7.86 t
Annual operational cost £t feedstock	£9.53

IRR



Plant figures

### Return on Capital



# National Strategy - England

## AD Action plan

Knowledge  
and  
understanding

Smarter  
working  
models

Regulation and  
finance

## Increase in energy from waste through AD

Removing  
obstacles in the  
development of  
AD

Increased  
growth in AD

Allow  
communities to  
make the right  
choice

- Draft report on digestate circulated by WRAP looking at 7 different aspects of digestate quality and suitability for agriculture use.
- Agreed Baseline of the size of the industry due end of September (AD Portal)
- Due Diligence Templates
- All of the above will benefit the whole of the UK
- ADLF launched
- First plant received PAS110

# Wales - Overview

## One Wales Delivery Programme

Food Waste Treatment  
Programme

Establishment of 7 'HUBS'

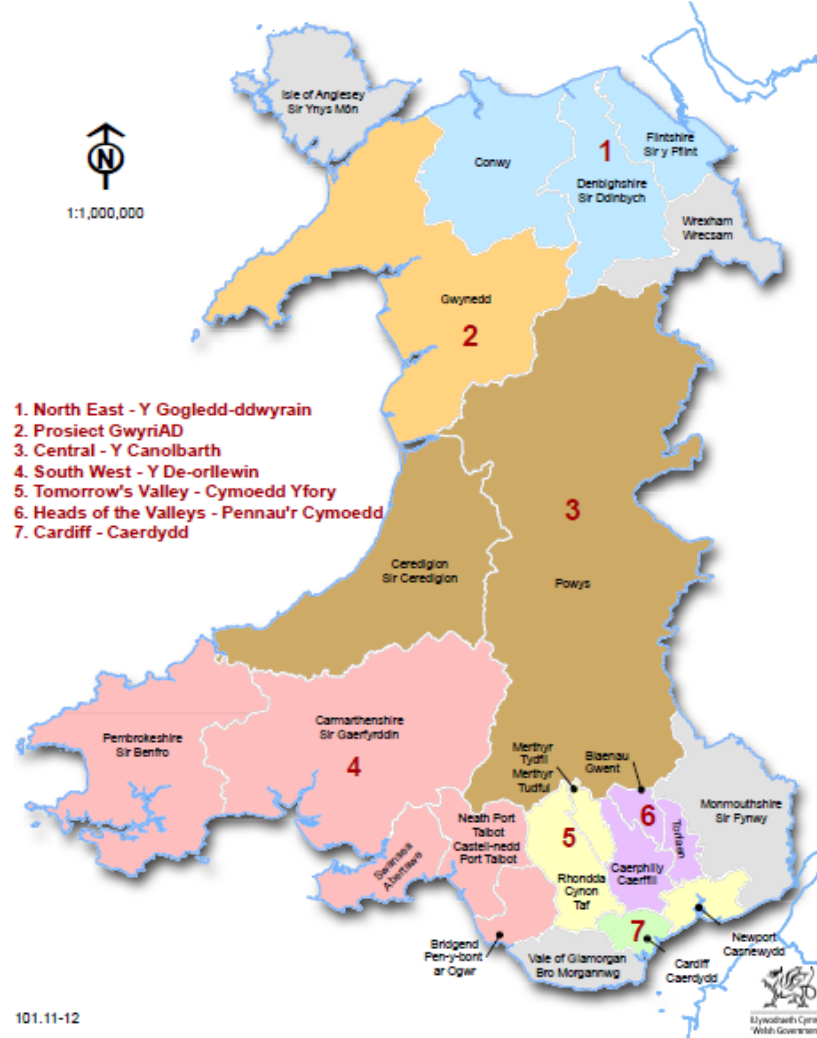
Anglesey, Wrexham and  
Monmouthshire - developing  
their own infrastructure

- Insource Energy (Newport) - first commercial AD facility (10 ktpa) commissioned summer 2011
- WRAP Cymru supporting WG Food Waste Procurement Programme in market development for digestate, including :
  - Market Needs In Wales report
  - Guide to the use of Biofertiliser from anaerobic digestion in Wales
  - Biofertiliser management: best practice for agronomic benefit and odour control report
  - Biofertiliser and Compost Trials on Mineral Extraction Sites report
  - Creating new quarry landscapes using quality compost and biofertiliser report
- EU ARID capital funding available now to support commercial AD infrastructure growth for SME's

# Wales - Hubs

Hubs	Participating Authorities	Tonnage Requirement per OBC
North East	Conwy Denbighshire Flintshire	c. 20 ktpa
Central Wales	Ceredigion Powys	c. 10 ktpa
Heads of the Valleys	Blaenau Gwent Caerphilly Torfaen	c. 22 ktpa
South West	Bridgend Carmarthenshire Neath Port Talbot Pembrokeshire Swansea Vale of Glamorgan	c. 70 ktpa
Gwynedd	Gwynedd	c. 10 ktpa
Tomorrow's Valley	Rhondda Merthyr Tydfil Newport	c. 18 Ktpa
Cardiff	Cardiff	c. 55 Ktpa

**Food Waste Treatment Procurement Hubs Configuration**  
**Trin Gwastraff Bwyd Ffiniau'r Canolfannau Caffael**



# Northern Ireland - Overview

DARD  
Action  
Plan  
2010

- Commercialisation of Renewable Energy
- Sustainable scale AD
- Heat Based Businesses
- Self sufficient Renewable Energy
- Integrated Business opportunities
- Implementation

- AFBI Demonstration project – DARD funded research into Farm scale AD
- Focus on Rural farm AD
- Biomass processing challenge fund (now closed)

# Scotland - Overview

## Zero Waste Plan 2010

70% recycling and a maximum of 5% to landfill by 2025

Landfill bans on particular waste streams

Source segregation and separation of wastes

Restrictions on inputs to EfW facilities

## Actions

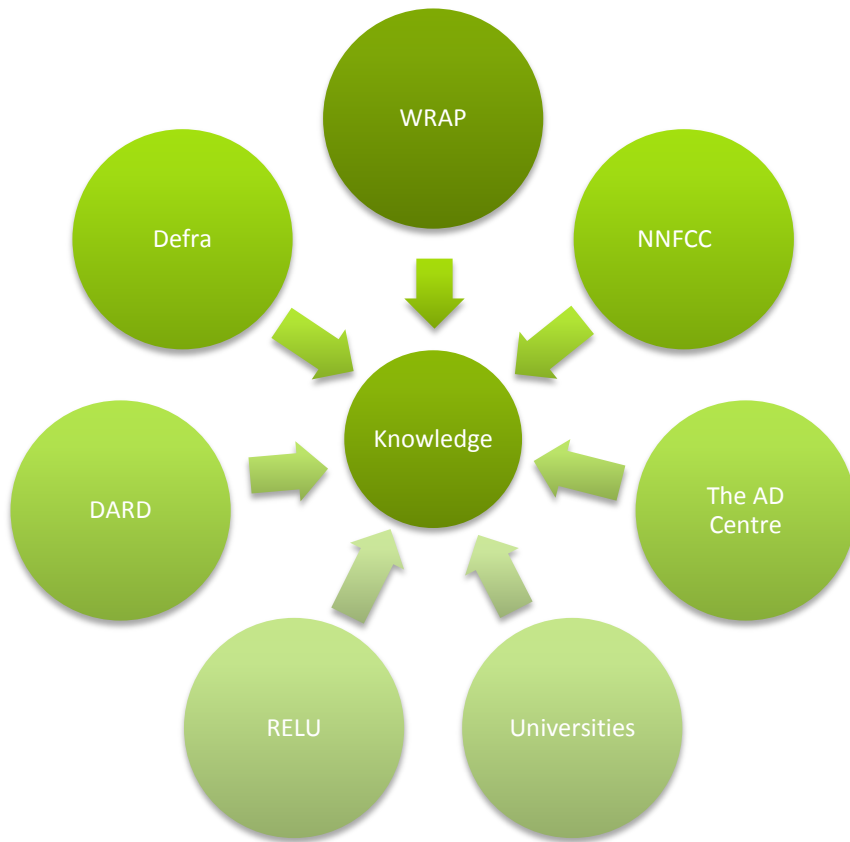
Increase food waste collections & recycling through AD

Improving efficiencies of existing infrastructure

Maximising digestate quality & hence beneficial use

- ZWS infrastructure programme
- ZWS's 4 year Food Waste collections Programme
- High infrastructure currently Circa 220ktpa capacity
- Regulations proposed will provide additional food waste feedstocks for AD
- ZWP focuses on improved resource use
- From March 2013 PAS110 will be required for operations to count as recycling.
- 1st Scottish site achieved PAS110 certification in August

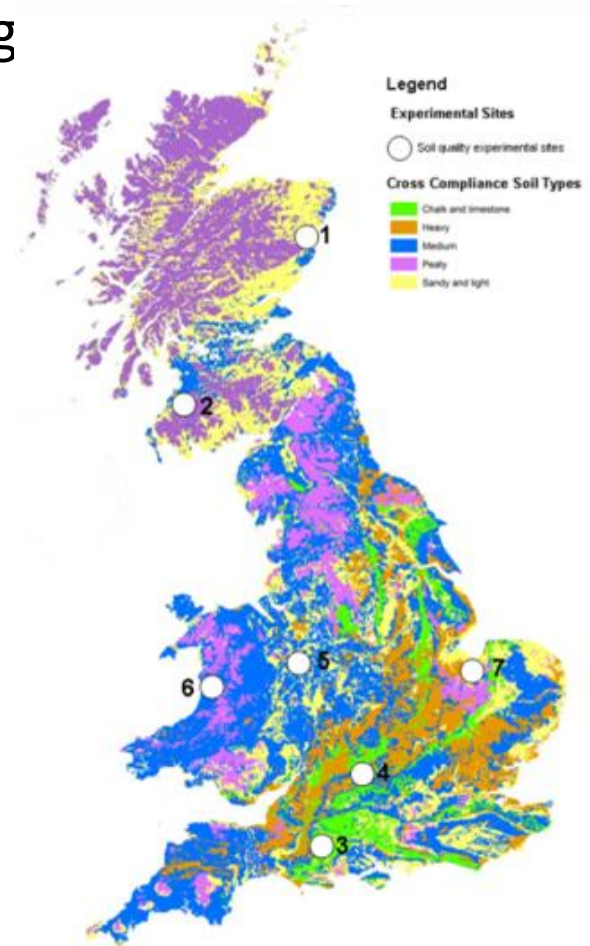
# UK AD Research



- Huge information base
- Demonstration projects
  - Cockle farm park – NE England
  - AFBI – Northern Ireland
  - Organic Power - SE England
- Bench scale projects
  - The AD Centre
  - Southampton University

# Field Experiments – Digestate in Agriculture

- ‘To quantify the effects of contrasting digestate and compost applications on soil and crop quality, crop available nitrogen supply and emissions to the air and water environments’
- 2010 – 2014 this joint WRAP / Defra initiative is investigating:
  - Soil quality
  - Agronomic benefits
  - Crop quality / yield
  - Crop safety
  - GHG impacts

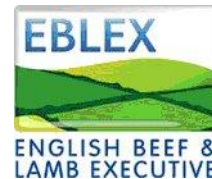


# Confidence in digestate?

- Responding to concerns of UK farm assurance and retailers
- Critical literature reviews
  - Allergens
  - Flavour / odour taints
  - *Clostridium*
  - Persistent herbicides
- Risk assessment
- Digestate data
- Digestate stability / odour

[David.Tompkins@wrap.org.uk](mailto:David.Tompkins@wrap.org.uk)

BRITISH RETAIL CONSORTIUM



# Knowledge Exchange

- Farmers
  - Working with key partners to deliver information directly to farmers about digestate and compost
- Agriculture Students
  - Working with Colleges & Universities
  - Developing modules to be part of wider education programmes
  - [www.wrap.org.uk/dc-agri](http://www.wrap.org.uk/dc-agri)
- ETF KTP's
  - Demonstrator projects and Universities working together to collect data on various plants & processes

# Digestate in Landscape and Regeneration

Evidence gathering through field trials to develop key markets:

- Brownfield restoration
  - Biomass – short rotation forestry
  - Habitat recreation
- Sports turf
  - Golf course fertiliser

Trials examine:

- Practical handling and storage
- Effect on soil characteristics
- Effect on plant growth and health

