



Biomass Heating – National Implementation in the UK

Presentation to IEA Bioenergy ExCo60, Munich.

Keiran Allen

29th October 2007



Agenda

- Introduction to the Carbon Trust and Innovations
- The Biomass Sector Review
- The UK's Biomass Heating Market
- The Biomass Heat Accelerator (BHA)
- Looking forward

The Carbon Trust is a private company set up by government in response to the threat of climate change



Working with business and the public sector, our mission is to accelerate the move to a low carbon economy by developing commercial low-carbon technologies, and helping organisations reduce their carbon emissions

We do this through 5 complementary business areas:

Insights

Explaining the low-carbon economy



Solutions

Delivering carbon savings for organisations



Innovations

Developing new low-carbon technologies



Enterprises

Creating new low-carbon businesses

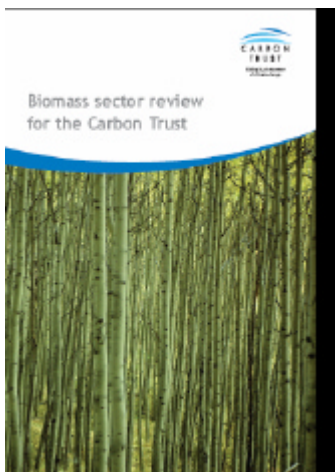


Investments

Financing low-carbon businesses



The Carbon Trust's Biomass Sector Review was published in 2005 following a long review of the entire Biomass space



The projects' main aims were to:

- Develop a robust fact base on the economics and impact of existing biomass technology
- Assess the realistic carbon saving potential of biomass in the UK
- Identify the main barriers (policy and market) to the further development of the biomass sector in the UK
- Identify where the Carbon Trust could help to deliver carbon savings by accelerating the development of the sector

The Carbon Trust seeks to maximise carbon saving over time per pound invested



- This approach was used in the early stages of the project to help select specific areas of biomass for further detailed analysis
- The study took a “*here and now*” approach to the technologies so as to maximise potential for implementation
- Key findings:
 - Biomass has the potential to deliver material carbon savings today (up to 5.6 MtC per year using UK resources alone)
 - Liquid biofuels are not the most resource-efficient use of biomass (both in terms of the “cost of carbon” and the total volume of carbon saved) using current technology
 - **Using biomass for heating via combustion and displacing fuel oil gives the most cost-effective carbon savings from bioenergy (without subsidy) at the present time**

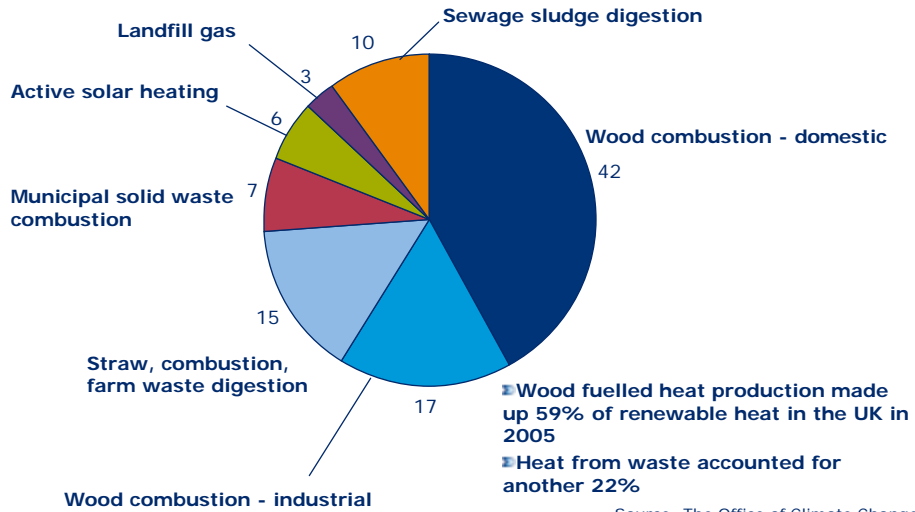
Biomass heating is not a new renewable energy technology and is already deployed in the UK but with very small market penetration



- Technologies used are generally mature with track records from other countries
- Current UK deployment estimated at ~0.6%¹ of total heating requirement
- Heating from biomass technologies can come from a range of technologies:
 - Wood/straw/co-product combustion
 - Anaerobic digestion of waste products
 - Landfill gas
 - Municipal solid waste combustion (biodegradable proportion)

¹Source: The Office of Climate Change

Wood fuelled heating makes up the majority of Renewable heating in the UK

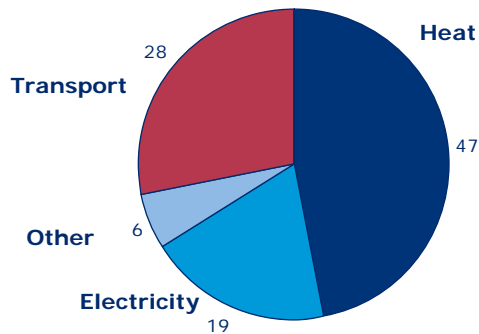


Source: The Office of Climate Change

In the last year, UK policy has come to recognise the part played by heating in the UK's CO₂ Emissions



CO₂ Emissions by Sector, 2005



Source: The Office of Climate Change

Following on from the findings of the Biomass Sector Review, the Carbon Trust launched the Biomass Heat Accelerator project



- Project budget £5M over 5 years
- 0.1-2MWth size range is key focus
 - Closest to full commercial technology in this range without public subsidy at present time
 - Securing volumes of fuel required by these scales of application relatively straightforward (minimise supply chain barriers)
 - Existing replacement market is ~2-3000 units per year in this range (market that is most underexploited and has biggest growth potential)
- Project under way for ~1 year

Carbon Trust Biomass Heat Accelerator (BHA) has been designed to address the key barriers faced by the technology in the UK



Barrier	Detail
Economics	<ul style="list-style-type: none"> ■ Longer paybacks and high up-front costs a significant obstacle for typical customers
Political	<ul style="list-style-type: none"> ■ "Stop-Start" nature of public support mechanisms discourage long-term investment/business planning/consolidation
Fuel Supply	<ul style="list-style-type: none"> ■ Market infrastructure ■ Perception of fuel availability and price risk ■ Large variations in quality control amongst suppliers
Poor end-user understanding	<ul style="list-style-type: none"> ■ Unaware of the technology generally ■ Can lead to over-specification and other implementation errors
Legislative issues	<ul style="list-style-type: none"> ■ Current legislation does not prevent biomass from being installed, but was not designed necessarily with the nuances of biomass heating in mind

Carbon Trust Biomass Heat Accelerator (BHA) has five main workstreams:



1. Establish cost and performance benchmarks for biomass heating systems in the UK (~0.1-2MWth scale range);
2. Consultancy partnerships with installation/manufacturing companies to reduce typical installed project costs;
3. Dissemination activities to improve technical understanding amongst key audiences;
4. Risk-mitigating activities in the fuel supply chain; and
5. Development support to new prospective installations to bring them forward to installation in the most cost-effective manner

➤ Workstream 1 – Main area of activity which has produced emerging results

Workstream 1 focuses on financial performance of past projects to identify opportunities for development and move towards a fully commercial technology

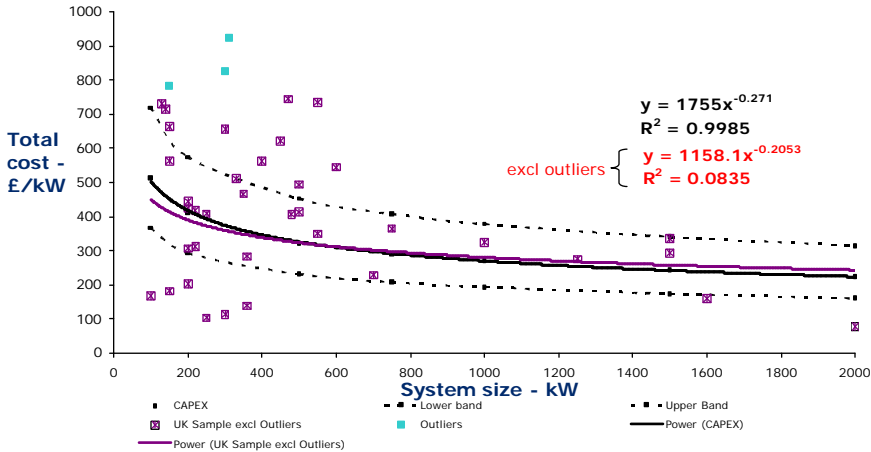


- Sample population of 49 sites representative of market spread
- Capex and Opex data gathered from both ends of project (installer and customer)
- Optimum financial performance is a function of two things:
- Good value in terms of "Capital Expenditure", itself a function of:
 - Good design/specification
 - Appropriate contracting structures in place
 - Market competition
- An optimised "Capacity Factor" (CF) or utilisation, itself a function of:
 - Appropriate application and location
 - Good design
 - Quality installation, commissioning and O&M regime
 - Fuel of a quality and consistency that is *correctly matched* to boiler requirements

Observed data exhibit a very high degree of variability in capital costs



Observed biomass heating system capex. vs. size

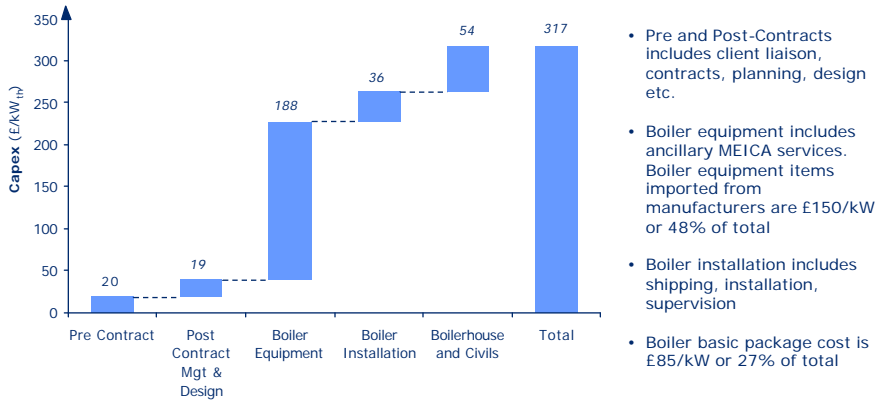


Source: Carbon Trust BHA data

Workstream 1 analysis identified "cost centres" where focused engineering work may be able to reduce installed capital costs



Current Capex breakdown for biomass heating (500kW)

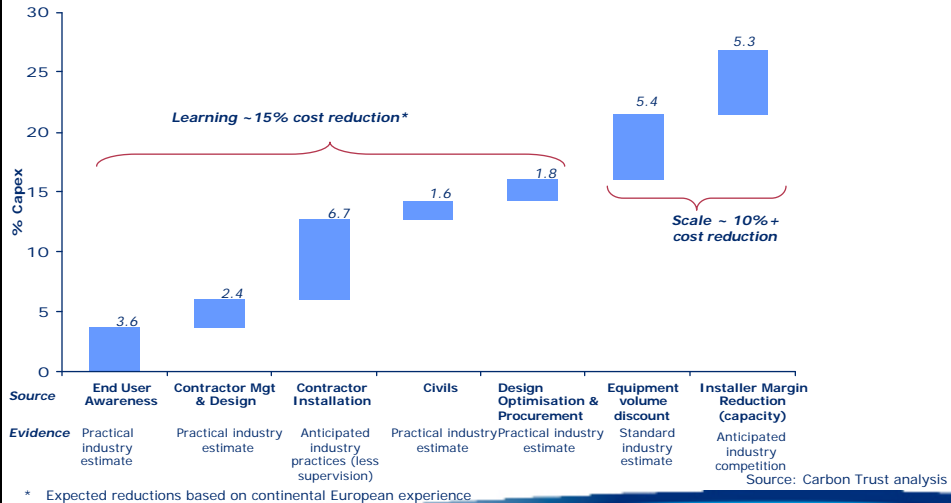


Sources: Data from an actual 500kW installation (2005). Matches average figure used in economics review.

Workstream 1 analysis identified that capex cost reductions of up to 25% from today's levels could be achieved



Modelled capex reductions by project cost centre (based on 500kW example)



Workstream 1 learnings have informed a selection of "cost engineering" projects on Workstream 2



The format of consultancy partnerships with installation/manufacturing companies to reduce typical installed project costs has been used effectively before by the Carbon Trust on Marine Energy

Area	Rationale	Projects underway/ kicking off
Civil Engineering	Boiler houses and fuel stores often responsible for high-cost installations	3
System sizing	Evidence indicates that many systems have not been size-optimised. Many opportunities exist to improve capacity factors of systems in future	1
Business processes	Biomass heating companies are SMEs. Efficient business processes could help reduce overhead cost per sale and free up capacity	3
Lean Manufacturing	Opportunities exist for UK-based manufacturers to manufacture lower-cost devices to compete with products imported from the continent	1
Alternative plant sourcing	Many components of a biomass project could be sourced locally or at lower cost	2
Remote monitoring	Design for minimal attendance/early fault diagnosis could reduce call-out costs	1

The project to data has revealed a number of key findings:



- There is a large variation in capital costs and relative cost effectiveness across sites
- Lower relative cost effectiveness is due to two key factors: high capital costs and low capacity factors
- High capital costs are often caused by over-engineering of installations (particularly fuel stores and boiler houses)
- Low capacity factors are thought to be due to incorrect design (especially over-sizing of systems), incorrect commissioning, and inadequate operational support/utilisation
- Very few sites use meters to monitor the level of heat delivered, thus making it very hard to verify actual performance
- In general the private sector sites are more cost effective in terms of use of capital and operational performance than the public sector sites
- ***The data suggests a link between grant levels and capital costs – either grants are allowing projects to go ahead that would otherwise have not been viable, or they are leading to higher than expected prices***

Biomass Heating – National Implementation in the UK



Presentation to IEA Bioenergy ExCo60, Munich.

Keiran Allen

Keiran.Allen@carbontrust.co.uk

+00 44 (0)20 7170 7041

Biomass Sector Review: www.carbontrust.co.uk/biomass