

Briefing to the Royal Society of Edinburgh in response to *Inquiry into Energy Issues for Scotland*

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The Contribution of Woodfuel to the Domestic Energy Agenda in Scotland

The Global Context

The use of wood as a source of energy for heating, cooking and to power industrial processes is arguably the oldest application of any form of fuel by mankind to serve our needs. However, with the discovery of ever-denser and more refined sources of energy throughout recent history, wood as a fuel, in developed countries at least, largely fell out of favour as coal, oil, natural gas and nuclear power were increasingly exploited.

In developing countries, wood fuel has always been present in the overall energy mix, as the more refined fossil fuels and nuclear technologies are more expensive than wood fuel and other traditional sources of energy, and are also often in the ownership of large multi-national corporations or governments who rely on them for valuable export revenue. Africa, for example, relies on wood fuel for almost a quarter of its total primary energy supply¹, while globally, wood fuel use amounts to nearly one billion tonnes of oil equivalent, a level comparable to the consumption of natural gas or coal. This makes it the largest renewable energy resource in use today.²

With the current concern over security of energy supply, and the threat of the effects of global warming looming ever closer, a number of developed countries have shown interest in increasing the use of wood as a fuel, with some making rapid progress to increasing market penetration of technology at a domestic and commercial level. In the EU in particular, predominantly the northern and Scandinavian member states, woodfuel now plays a significant role in heat markets. Of the total energy used across the EU, 8% of this is classed as renewable, and 60% of this is derived from woodfuel and biomass.

On a country-by-country basis, France, Austria and Sweden stand out as those which have made the most progress in raising the proportion of wood fuel used for domestic heating in recent years. Austria is the EU country which has embraced wood fuel heating most eagerly, moving from a few hundred automatic wood heating systems in the mid-1980's to over 100,000 systems in 2005. In addition to this figure, there are many hundreds of thousands of individual home heating systems which rely on straightforward log burners for room heating or as part of a wet central heating system. This is in marked contrast to Scotland, which although not as heavily forested at 17% of land area, still has a very significant forest resource yet has less than 50 automatic domestic wood heating schemes. The number of log burning stoves of all types cannot be realistically measured, but probably numbers in the low tens of thousands. Even with this modest contribution, the recent Forum for Renewable Energy Development in Scotland report into wood fuel, stated that it "*has virtually no market penetration whatsoever*"³.

Wood fuel and the Economy

Research has shown that wood fuel projects provide higher levels of employment, especially during the operations phase, than any other mature renewable technology, due for the most part that it is the only renewable energy source which requires a feedstock. The Directorate General for Energy of the European Commission predicts that across the EU, investment in bioenergy will create 838,780 new full-time jobs by 2020, 58 times more jobs than any other type of renewable energy⁴. These figures were bolstered in the 2004 Renewable Supply Chain Gap Analysis⁵ for the DTI, which estimates an average of 6 jobs per MW, and when combined with the latest projections for the development of the wood fuel sector in Scotland⁶, there is the potential for the creation of 860 new jobs in the supply chain and system maintenance by 2010, rising to 7,500 jobs by 2020. This is in addition to the creation of a significant number of skilled jobs in the design, manufacture and installation of the systems themselves.

There are currently just 90 jobs sustained by wood fuel in Scotland³, the majority of which are serving the chopped firewood market at a domestic level. Jobs created in this sector are made more important by the fact that they are often located in rural areas, where new employment opportunities can have an important role to play in ensuring the viability of increasingly fragile rural communities. In order for the EU estimates for job creation to be achieved, it is important that the woodfuel market be encouraged to develop with local, small-scale embedded heat and power generation as the dominant end-use of the available woodfuel resource.

Current developments are being influenced considerably by the market for Renewable Obligation Certificates, an internationally-tradable subsidy for electrical power generated from renewable sources. This is leading to the construction of large scale biomass-fuelled electricity generation plants across the UK, and to the development of co-firing technology, where biomass is burned alongside coal in existing power plants, although the ROC subsidy is not available for co-firing past 2016. Whilst electricity generation from biomass is preferable to the use of fossil fuels, it has the potential to retard the development of the more economically and environmentally beneficial small-scale market opportunities. The consequences of this may include: restricting the amount of wood fuel available for ensuring small-scale market development; artificially elevating the cost of wood fuel through access to ROC subsidies; steering investment in wood fuel supply infrastructure towards serving large markets; and restricting employment opportunities in the sector to a handful of sites and larger supply chain enterprises.

Wood fuel and the Environment

The environmental credentials of wood fuel are hard to equal – wood is a renewable fuel and its production and use are almost carbon neutral. As the Sustainable Development Commission Scotland report, *Woodfuel for Warmth*⁷, states, “*The largest net savings in total greenhouse gas emissions, ranging from 89 % to 96 %, can be achieved when wood fuel heating systems replace or displace electric radiant heating supplied by the national grid and coal-fired heating systems. In comparison with LPG and oil-fired heating, wood fuel heating systems can deliver savings between 80% and 94%. The smallest savings, of between 73% and 90%, are made relative to natural gas-fired heating systems. In all cases, these represent significant reductions in greenhouse gas emissions.*” The report goes on to state that between 0.6 and 1.4 x 10⁶ tonnes of CO₂ emissions could be avoided annually by utilising the wood fuel resource available in Scotland.

In addition to the benefits of offsetting CO₂ emissions, the development of the Scottish wood fuel sector will have additional local and global environmental benefits. For example: encouraging the management of neglected woodlands for fuel; encouraging the planting of more trees and woodlands – leading to landscape and biodiversity benefits; diverting tree surgery and wood waste from landfill and other unsustainable disposal routes as the market expands; and increasing the market penetration of other forms of renewable energy generation technology.

Scotland’s Wood Fuel Sector – Capacity and Infrastructure

Forestry Commission research⁸, states the available timber resource of Scotland in 2006 as 1.38m oven dried tonnes per annum. This reduces, however, to 381,000 oven dried tonnes per annum when existing non-woodfuel markets are taken into account. This is enough to serve the heating and hot-water needs of some 46,000 homes in 2006 (est. 7 o.d.t. house/per annum), and there is an increasing amount of timber available from Scotland’s forests (forecast 40% increase by 2017-2021 from 2002-2006 baseline⁹) and waste wood sources. As timber prices rise in line with increased demand, new planting will be stimulated in anticipation of expanded future markets.

In addition to raw material availability, a combination of other factors mean that Scotland’s forest industry is better placed than most other parts of the UK to exploit the rapid growth potential of wood fuel for domestic markets. These include: ongoing financial and strategic support for forest industry development and expansion through the Scottish Forest Industries Cluster; clear commitment from the public sector to incorporate wood fuel heating into new-build and retro-fit developments; and the activity of a number of trans-European knowledge transfer projects throughout the country.

The support and knowledge-transfer activities listed above are key to ensuring the effective development of supply chain infrastructure to support the uptake of wood fuel at a domestic level, but are not matched by programmes or support networks for the development of the systems required to turn wood fuel into useable heat and hot water. This is in marked contrast to other European countries which have well established wood fuel industries, and is reflected in the fact that there are very “*few indigenous manufacturers of woodfuel boiler plant and associated equipment*”⁹. There are a handful of boiler importer and installation companies present in the UK, but the majority of these are immature companies (< 5 years trading) with limited finances, skills and capacity. Reports from this component of the UK wood fuel sector indicate that demand for wood fuel systems significantly outstrips the ability of the current supplier/installer network to satisfy demand.

The situation described above has the potential to damage the development of the small and medium-scale wood fuel sector in both the short and long term, the most immediate issue being the damage to consumer confidence where there is a desire to install a wood fuel system yet the market is unable to respond. More damaging effects may include the emergence of inexperienced and/or unscrupulous companies who capitalise on the strong demand. There is anecdotal evidence to suggest that a number of new and existing wood fuel boiler companies are installing inappropriate or sub-standard systems and/or are overpricing their products and services and as a consequence are damaging both consumer confidence and the overall progress of the sector.

Timescales for Development

The Royal Commission on Environmental Pollution, in its 2004 report *Biomass as a Renewable Energy Source*¹⁰, set out a 4 stage approach to the introduction of biomass energy to the UK. This timeline focused on the land-take required for the development of the sector (a subject which is not addressed here), but included complementary predictions for the development of the markets. The domestic element of this timeline is summarised below:

First Stage 2004 - 2012

*Grants for production of biomass and demonstration conversion facilities rationalised.
Wood from forests, sawmills and... ..tree management... ..used as fuel... ..to prove the system.*

Second Stage 2012 - 2018

*Increasing numbers of small CHP plants installed in hospitals, educational establishments and commercial/industrial premises.
...start of a significant programme of construction of larger (30MW) biomass CHP plants near... ..conurbations.*

Third Stage 2018 - 2025

A rolling programme of energy conversion facilities and heat distribution systems will provide a gradually increasing market for wood.

Fourth Stage 2025 - 2050

By this stage the programme will have been established. ...district-heating schemes will be the norm in new build residential... ..developments

The current situation, spurred by recent large wholesale gas price rises, is that elements of the second stage are now emerging, particularly CHP installations in industrial premises, and that a number of wood fuel district heating schemes are being planned for new build and retro-fit residential applications. This rapid short-circuiting of the approach outlined by the Royal Commission highlights the volatility of existing energy markets and the need for the rapid development of a coherent, renewables-based energy strategy for the Scotland and the UK. This strategy should also have the accompanying support mechanisms to underpin the sustainable development of the sector, and where biomass is concerned, this should have regard for both the supply chain and the end user.

References

- ¹ **Food and Agriculture Organisation** 2005 *State of the World's Forests 2005*. Rome
- ² **Domac, J., Richards, K., & Segon, V.** 2005 *Old fuel for modern times* Renewable Energy World. London
- ³ **Forum for Renewable Energy Development in Scotland** 2005 *Promoting and Accelerating the Market Penetration of Biomass Technology in Scotland* Scottish Executive, Edinburgh
- ⁴ **Directorate General for Energy of the European Commission** 1999 *The impact of renewables on employment and economic growth* European Commission, Brussels
- ⁵ **Department of Trade and Industry** 2004 *Renewable Supply Chain Gap Analysis* DTI, London
- ⁶ **Luker, S.** 2005 *The Potential of Wood Fuel Energy Systems - Presentation to Conference: Energy from Forestry and Agriculture, November 2005, Elgin* Scottish Forest Industries Cluster, Edinburgh
- ⁷ **Sustainable Development Commission Scotland** 2005 *Renewable Supply Chain Gap Analysis* DTI, London
- ⁸ **Forest Research** 2004 *Woodfuel Resource Project – www.woodfuel.org.uk* Forestry Commission, Edinburgh
- ⁹ **Scottish Forest Industries Cluster** 2002 *Woodfuel Opportunities – renewable energy for Scotland* Scottish Forest Industries Cluster, Edinburgh
- ¹⁰ **Royal Commission on Environmental Pollution** 2004 *Biomass as a Renewable Energy Source* RCEP, London