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### Abbreviations and Terms

Bagasse	sugar cane or sorghum waste	MJ	megajoule (one million joules)
C	carbon	MTOE	millions tonnes oil equivalent
CHP	combined heat and power	PV	photovoltaic
DECC	Department of Energy and Climate Change	RED	Renewable Energy Directive
Defra	Department of Food and Rural Affairs	RHI	renewable heat incentive
EU ETS	Emission Trading System	SEPA	Scottish Environment Protection Agency
FC	Forestry Commission	SRC	short rotation coppice
FITs	feed-in tariffs	SRF	short rotation forestry
GWP	global warming potential	TWh	terawatt hours
KWh	kilowatt hours	TOE	tonnes oil equivalent
LCA	life cycle analysis	TPES	Total Primary Energy Supply
LPG	liquefied petroleum gas		

Proceedings written and designed by Gabriel Hemery MICFor, [Sylva Foundation](#)

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## PREFACE

SHIREEN CHAMBERS



The Institute of Chartered Foresters was founded in 1925 as the Society of Foresters of Great Britain and was incorporated by Royal Charter in 1982. Our members are employed in every branch of forestry and arboriculture and are experts in a wide range of specialist fields. We provide services to members in addition to information and guidance to the public and industry; and training and educational advice to students and professionals. We also regulate the standards of entry to the profession and offer examinations for professional qualifications.

Forestry has never been as high on our political agenda as at present. Ambitious climate change targets set by government mean more trees are needed to sequester carbon, to contain carbon in timber construction, and to use woody biomass as fuel.

Trees undoubtedly play an important role in green energy targets but are some of these roles conflicting? Can we provide enough fibre for biomass and for traditional panel and timber use? Can afforestation targets be met if windfarm development is causing the removal of woodlands? Over 160 delegates attended the Civic Centre in Newcastle Upon Tyne to hear both UK and international speakers try to answer these questions and set out their views on how our sector can contribute to the huge energy demand that the UK will face as our traditional energy sources diminish.

The Institute is committed to offering our members the opportunity to listen to and debate with, leading scientists and policy makers, helping foresters to adapt their own management decisions in response to the latest research and thinking. The 2010 conference 'Forests & Energy' did just this by providing us with new and thought provoking ideas and stimulating debate, as you will see in the proceedings that follow.



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## THE GLOBAL POTENTIAL FOR ENERGY PRODUCTION FROM FORESTS

ADRIAN WHITEMAN

A recent study<sup>1</sup> by the World Bank and Food and Agriculture Organization provides the information on which to present here an overview of bioenergy developments and possible implications for the forestry sector.

Bioenergy is a very broad subject that can be defined as one component of renewable energy, which is simply energy produced from biofuel, which is, in turn, produced from biomass. The main sources of biomass are trees, crops and animals (including waste products - e.g. sawmill residues, animal waste). Biofuels are usually divided into solids, liquids and gas. End products (energy) are heat, power and motion (transport). Any pathway to get from biomass to bioenergy is technically feasible though some are preferable to others. The most important parts of the picture for forestry are the solids and liquids produced from trees and crops. Solid biomass includes both trees and crops and can be further divided into traditional and modern uses (this is not exact, but is important because of the different trends in these two types of bioenergy use).

Bioenergy use has increased by almost 50 percent since 1970, to reach almost 1.2 billion tonnes oil equivalent (TOE) in 2005, which is just under 10 percent of total energy use (Total Primary Energy Supply or TPES). In these calculations all bioenergy was used in the form of solid biomass, and traditional uses (fuelwood, charcoal, crop and animal wastes) accounted for most of this. Fuelwood and charcoal accounted for about half of all traditional uses or about 450 MTOE. One TOE is about four cubic metres of wood, therefore about 1.8 billion cubic metres of wood was used directly as fuelwood and used to make charcoal.

Regional variations were also present with traditional uses predominant in developing regions. Modern uses include use within the forestry and food processing industries and commercial production of heat and power. Uses within industry were quite significant in many regions, due to the production of pulp and paper across the World and, to some extent, the use of sugar cane waste (bagasse) in some developing regions. Only North America, Europe and Latin

America had notable amounts of commercial energy production from solid biomass.

In terms of future outlook to 2030 (Figure 1), with current renewable energy and bioenergy policies, traditional uses are not expected to increase due to economic development in some major countries such as China, India and Indonesia. Modern uses of solid biomass are expected to increase the most, due to bioenergy policies. These bioenergy policies are also likely to increase production of liquid biofuels. Most targets for liquid biofuels aim for a share of total consumption by 2020 or 2025 but production is expected to

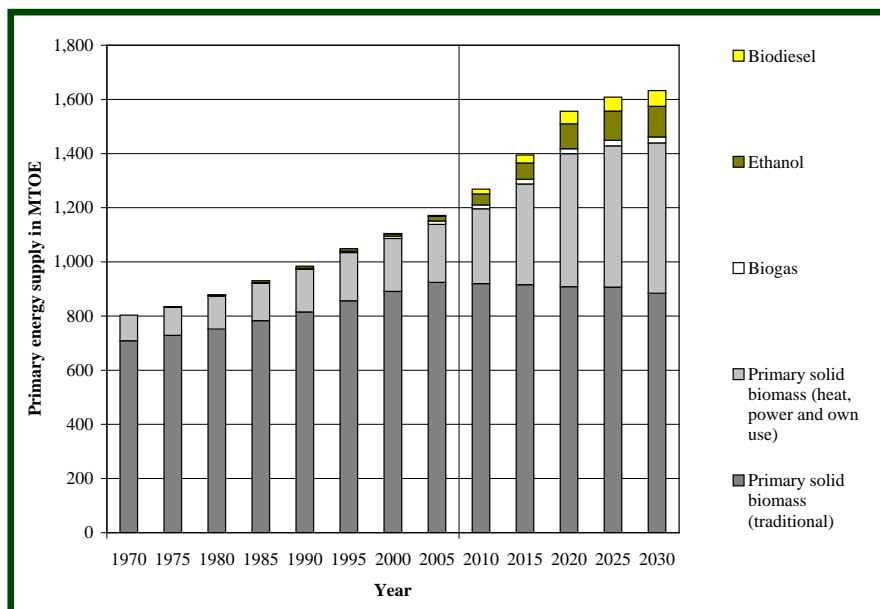


FIGURE 1 BIOENERGY SUPPLY, BY TYPE, FROM 1970-2030

<sup>1</sup> FAO and World Bank Bioenergy Infonote: <http://www.fao.org/docrep/008/j5135e/j5135e00.htm>. Accessed May 2010. The speaker may be contacted directly to request a full copy: [adrian.whiteman@fao.org](mailto:adrian.whiteman@fao.org)

increase beyond this point due to continued growth in demand for transport fuels afterwards, especially in developing countries given liquid biofuel policies and targets.

The three main driving forces will be economic, policy development, and targets and instruments:

1. **Economic:** Traditional bioenergy use, and use within the processing industries, will be largely driven by economics. For example, more black liquor will be available for bioenergy production as pulp and paper production increases. In the opposite direction, traditional uses will tend to decline as people become richer and switch to more attractive fuels.

The delivered cost of biofuel is probably the most important factor affecting the economic viability of bioenergy production. Waste is generally the cheapest source (and the cost can be negative if waste disposal is costly). The use of existing resources is the next cheapest option (this includes the use of roundwood, forest residues and food crops), although the value of existing (non-energy) uses is very important. Energy crops are generally more expensive at present, although their costs may come down as they are expanded. Such crops include wood from short-rotation tree crops, grasses and non-food crops (e.g. *Jatropha*).

Transport costs are also very important because biofuels tend to have a low energy density (amount of energy in one tonne of biofuel) compared with other types of fuel. The amount of available supply can also be important because modern bioenergy systems are often most economic at a large scale.

2. **Policies:** Growth in the use of liquid biofuels and commercial bioenergy production will be mostly driven by renewable energy policies. These policies will have a number of different objectives, such as energy security, climate change *etc.*
3. **Targets and instruments:** These policies will be implemented using a wide range of targets, measures and instruments, including subsidies for bioenergy production and use. Incentives for bioenergy production are many and varied and have a significant impact on the financial viability of bioenergy production. At present, many of the newer types of bioenergy require subsidy and this situation is likely to continue for some time.

TABLE 1 ADDITIONAL LAND REQUIREMENT FOR BIOFUELS BY 2030

Potential land-use change (and impact on forests)	Mostly within agriculture		Degraded land?	More likely to have a direct impact on forests			Total
	Sugar beet and cereals	Temperate oilseeds		Jatropha, cassava, sorghum	Biomass energy crops	Sugar cane	
<i>Net importers</i>							
North America	11.5	6.3		10.0			27.9
European Union (27) + 3	8.9	12.2		15.0			36.2
East Asia and Pacific	1.0	5.2	5.9		1.4	3.5	17.0
South Asia			6.8		0.4		7.3
<i>Net exporters</i>							
Europe and Central Asia		3.0					3.0
Latin America and Caribbean					4.3	8.0	12.3
Africa			1.4		1.3	2.8	5.5
<b>World</b>	<b>21.5</b>	<b>26.8</b>	<b>14.2</b>	<b>25.0</b>	<b>7.4</b>	<b>14.2</b>	<b>109.1</b>

Based on the outlook summarised here, the land required to produce biofuels has been estimated (Table 1). Most countries aim to produce as much of their own supply as possible (e.g. for energy security) but some international trade in biofuels or feedstocks is likely. In particular, development of biofuel crops in Africa is likely to occur to meet demand elsewhere. The various biofuel crops are also likely to result in different land-use changes. So, for example, in temperate regions, agricultural crops used as biofuels are likely to be grown on existing agricultural land or other non-forest land, but some forest areas may be managed more intensively in the future as energy crops. In tropical regions, expansion of biofuel crops is much more likely to have an impact on forests either through direct land conversion or the indirect expansion of agriculture into forest areas. However, some of this expansion may also occur on currently

degraded land. It should also be noted that biofuels are only one factor increasing demand for land. For example, in the case of oil palm expansion in Southeast Asia, much of this expansion is driven by increased demand for palm oil as a source of food.

In summary there are a number of opportunities for the forestry sector that can build on its strengths. Bioenergy policies have created a new and rapidly expanding market for wood that could amount to an additional annual demand of over 1 billion cubic metres by 2030. Furthermore, so long as this wood can be produced sustainably, bioenergy from wood is generally better than fossil fuels and other types of bioenergy in many respects. To build upon this strength, it is likely that the forestry sector will have to work in partnership with companies in the energy sector. This will benefit the sector in many ways, such as improving access to finance and in assisting with marketing bioenergy. Furthermore, bioenergy is just a first step into a high-volume, commodity market. It is likely that bioenergy production will be further developed to produce additional higher value-added materials and products (*i.e.* the biorefinery concept). The main strength that the forestry sector must bring to this partnership is the ability to manage fibre supply - in particular, to deliver sustainably produced fibre in large volumes and at an acceptable cost.

There are of course threats too and the forestry sector must be aware of certain weaknesses. The rapidly expanding market described above may also, be seen as a threat to wood and fibre supplies that are used by existing industries. However, in the longer-term the forestry sector has shown many times before that it can adapt to such changes through new and more efficient processing techniques and investments in forest management to increase wood production. Much more of a threat is the increased demand for forest land from non-wood biofuel crops, and the possible social and environmental implications of this for sustainable forest management in a broad sense. The economic viability of some aspects of biofuel production from wood is also still uncertain. The costs of producing liquid biofuels from wood are falling rapidly, but still need to fall substantially to make these economically competitive against other types of liquid biofuels. The need to produce large volumes of fibre, close to processing facilities and at acceptably low costs also remains a challenge.

Perhaps the greatest challenge will be how to produce these large volumes sustainably. The expected increase in demand will reinforce the current trend towards more intensively managed forests at the same time that rising incomes also place greater demands on forests for non-wood benefits.

Finally, it is important to recognise that bioenergy policies often have multiple objectives and these sometimes conflict and need to be carefully prioritised. For example, energy security strongly encourages domestic production of liquid biofuels, but in temperate countries this may not be very cost-effective and may not result in the best outcome in terms of GHG emissions. All of the options described above have some problems, none are perfect and the trade-offs between them are probably still quite poorly understood by many policy makers. We all must engage in the bioenergy debate to inform the public about the costs and benefits of all of the options, including those outside the sector. Presently, most bioenergy policies are implemented through demand-side measures and instruments. However, many of the social and environmental impacts of bioenergy development are related to the supply-side (*i.e.* the production of biomass), so this should be given more attention. In this respect, the scale of production is probably the most crucial variable that must be examined in terms of its economic, social and environmental impact.

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## **UK POLICY BACKGROUND: RENEWABLE ENERGY STRATEGY 2009 AND BEYOND**

**GAYNOR HARTNELL**

The Renewable Energy Association was established in 2001, and it currently has 600 corporate members. Its subsidiary company REAL has over 1000 members, and operates a consumer code and BioFertiliser Certification Scheme. It is active across a range of renewable energy technologies and applications, and it developed the heat incentive and feed in tariffs.

The Renewable Energy Directive (RED) includes binding targets for 20 percent of energy to be sourced from renewables by 2020 by all EU27 member states. The RED covers all forms of energy, including power, heating & cooling and transport. Each signatory country must achieve 10 percent share in petrol and diesel. Interim targets apply from 2011/12, and regular reports to the Commission will initiate from the end of 2011.

The Renewable Energy Strategy (RES) has been produced to help the UK in meeting its mandatory target in the RED: an ambitious 15 percent, which is a tall order. The RES concerns all forms of energy and the UK has the steepest hill to climb, being currently near to the very bottom of the EU league table for renewable use. The UK must move from 1.5 percent renewables use to 15 percent, the largest increase for any of the EU27.

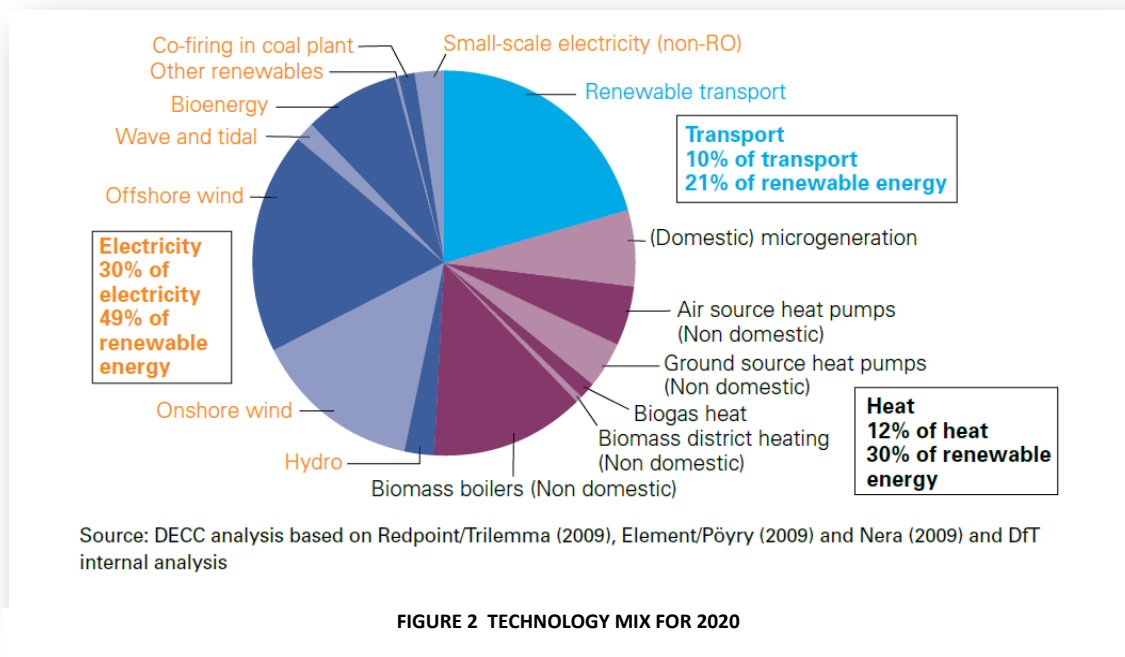
In December 2009 the Member States released their 'forecast documents' and the UK reported that it was on track for meeting the target and not needing to rely on imports. Each Member State is required to develop their National Renewable Energy Action Plans with the assistance of a template produced by the Commission, and submit them by end June 2010, to include:

1. Summary of national renewable energy policy;
2. Targets and trajectories (national and sectoral);
3. Measures for achieving the targets.

Member States must have transposed these plans into national legislation by the end of 2010. The UK has been active in thinking about and discussing the issues, so the task has been made easier by development of the UK Government's RES. The REA is co-ordinating the UK part of a project called REPAP 2020 that has developed a shadow national plan, lobbied UK Government, and developed a critique of the UK plan for the European Commission.

To meet the 2020 target the UK must produce 240 TWh from renewables. To achieve this, for heat we must move from less than 1 percent today to 12 percent, for transport fuels from 1.5 percent in 2008 to 10 percent, and for power from 6.5 percent today to 30 percent. The technology mix is diverse but biomass provides a significant proportion at about half the mix (Figure 2).

In terms of a big overview of the UK policy scene, in power generation the UK has had a policy in place since 1990 that has required competitive tendering, and now includes feed-in tariffs for small scale projects. Banding has helped to support some of the sector, including biomass, but the situation is extremely complex. For transport the Renewable Transport Fuels Obligation, requires suppliers of fossil fuels to ensure that a specified percentage of the road fuels they supply in the UK is made up of renewable fuel. In terms of heat, limited support from 2006 (Low Carbon Buildings Programme) has been in place but the Renewable Heat Incentive is expected from April 2011.



From April 2010 feed-in tariffs (FITs) have been introduced in the UK. Renewable obligations are not easy for individuals or non-specialists as the grants are bureaucratic and stop-start in nature. Feed-in tariffs will give a fixed return, guaranteed over the tariff lifetime, and should lead to up front capitalisation. The UK Government was initially reluctant, but eventually agreed that tariffs will be available up to 5 MW. Photovoltaic, wind, biogas and hydro are eligible for FITs but biomass is not.

The trajectory for renewable energy, rather than heat, is likely to see the largest growth potential in wind energy, on and offshore. Wave and tidal stream have yet to be proven, whilst solar has phenomenal potential but cost reductions must first be realised. Biomass is the only dispatchable form of renewable electricity but of course it can be used in other ways.

Renewable heat is where biomass has the greatest potential, and is the energy form where the most dramatic expansion is needed. Heat supply accounts for 50 percent of final energy demand and 47 percent of CO<sub>2</sub> emissions. Various models of biomass must be considered; from local heat-only or combined heat and power, power generation in large plants coupled with heat pumps, to the gasification of biomass and its piping to homes.

Very novel policy mechanisms have now been proposed, such as the Renewable Heat Incentive. On 1<sup>st</sup> February 2010, the UK Government published a consultation on the proposed design of the RHI scheme, which it aims to introduce in April 2011<sup>2</sup>. The consultation seeks views on a number of aspects of the proposed scheme, including tariff levels.

The RHI affects biomass, biofuels for domestic users, heat pumps, solar thermal, biogas, and biomethane. It covers the cost difference with fossil fuel alternatives on an upfront and running costs basis, where the payment has been designed to cover for the ‘hassle factor’. These include a rate of return of 12 percent (6 percent for solar thermal) on upfront investment plus inflation adjustment and barrier costs. The fixed tariffs are calculated for expected equipment lifetimes of 10-23 years.

Looking ahead, land-use planning is likely to become a huge issue. To enable biomass to reach its potential, and for the UK to meet its ambitious targets, it is imperative that policy continuity is maintained.

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<sup>2</sup> Department of Energy and Climate Change, [Renewable Heat Incentive \(RHI\) scheme](#). Accessed May 2010.

## A MACRO UNDERSTANDING OF THE ENERGY MARKET

JOE CLARKE

The biggest issue of all is perhaps public perception. Every person will have views based on a different perspective, ranging from concerns regarding human well-being, climate change mitigation, environment protection, fossil fuel replacement, to security of supply.

It is possible to divide the sustainable energy market into two areas: demand and supply. Reducing demand is a non-trivial task because of the difficulty of bringing about the required lifestyle change (do a little, save a little), and the complexity of selecting and deploying apt technologies (for example, heat recovery in industry, passive solar design in homes, or hybrid engines in vehicles). At the same time, new energy sources must be deployed and secured, including clean fossil fuels, new nuclear fission plant, and new and renewable energy systems.

At present fossil fuels dominate the economy and it is likely that they will continue to dominate the world economy for the next 30 years or more: current estimates of reserves indicate 230-1500 years for coal, 40-250 years for oil, and 60 years for gas. The challenges we must address are to refine exploration techniques, to reduce pollution (*e.g.* decarbonise), enhance extraction (*e.g.* sequester C), find new resources (*e.g.* coal bed methane, oil shale, tar sand), and develop new uses (*e.g.* methanol production).

Nuclear power is dominated by the fear factor. Can we, in the future, consider rationally and calmly nuclear power? Currently nuclear fission accounts for about 6 percent of global energy production. It is more expensive than fossil-based power generation but less expensive than most renewables. Of course radioactive waste is a problem (addressed by transmutation initiatives) and it is estimated that we have sufficient supply for 100 years of  $U_{235}$  and 14,000 years of  $U_{238}$  (security issues). Nuclear fusion may be commercially viable by the 22<sup>nd</sup> Century and, if so, there is abundant fuel supply (sea water): 1g equivalent to 45 barrels of oil, with little radioactive waste production. However, astronomical temperatures are required.

To develop strategic renewable energy resources we must avoid problems with fault clearance, network balancing and power quality. Distributed renewable energy systems with limited control possibility should be restricted to about 25 percent of network capacity. High capture levels will require increased transmission network capacity, active distribution network management, energy storage and/or standby capacity. Of course, we must also recognise that the practical resource is not vast relative to total energy demand.

Mackay has estimated the current energy consumption in the UK at 196 kWh/day per person against a maximum conceivable UK renewable energy production of 174 kWh/day per person if society is prepared to accept the environmental consequences (Figure 3, page 9). It is likely that the infrastructure required to attain such a production level will take as long to build as the fossil infrastructure it seeks to replace.

The figures presented in Figure 3 illustrate that the maximum conceivable renewables actually matches the demand, at least in quantity if not temporally. However, if we are to achieve high capture levels based on a stochastic renewable resource, there are significant implications: the land required for biofuels alone equates to around 75 percent of the UK's land area. UK citizens must understand that such high levels is equivalent to the industrialisation of our landscape at an unprecedented scale.

Looking in more detail at the biomass potential within the renewable mix: although the UK is currently behind in EU league tables, it has the biggest potential, particularly with wood pellets that have a high energy density by volume (10,800-12,600 MJ/m<sup>3</sup>) of any biomass fuel. It even stands up moderately well against fossil fuels, such as house coal (25,500 MJ/m<sup>3</sup>) or LPG (23,600 MJ/m<sup>3</sup>). However, biomass heating systems have high capital costs and many practical operational difficulties exist, *e.g.* controllability and the removal of ash. In summary, there is little doubt about

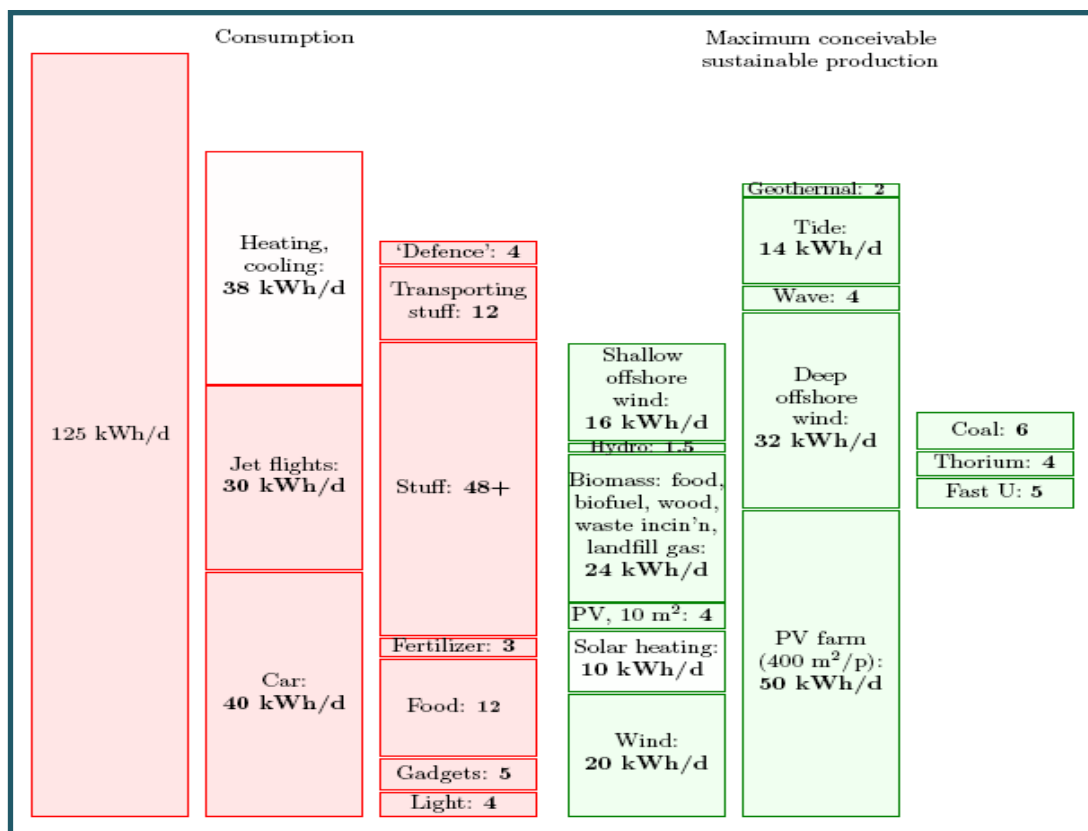


FIGURE 3 ACTUAL AND CONCEIVABLE SUSTAINABLE ENERGY PRODUCTION.  
 SOURCE: Mackay [www.withouthotair.com](http://www.withouthotair.com)

biomass’ green credentials, but concern still exists about functionality and capital cost. Increasingly innovative strategic approaches are being developed to increase the potential for biomass. In Austria energy policy has been developed to connect industry with landowners. There are even courses run by universities to support the industry.

Another option is to move from distributed renewable energy systems to embedded systems where micro-generators are placed alongside loads so that demand/supply profiles may be better matched. This is a radical concept that represents a new way forward. To achieve this in the biomass sector system operational control and efficiency must be improved. It is likely that utility companies will in future position seek to link both demand and supply, at the micro-installation scale, under a single business model.

We need proper information resources in biomass supply and demand so that we can accurately model what we consume and how we can meet the demand. The new myForest service<sup>3</sup> provides one example of a new approach to resource modelling. Further, we need to match policy constraints with technological opportunities. In forestry it must be possible to integrate views of enhanced performance while being able to illustrate how forest production could provide wide-ranging public benefits. The Internet will be important in delivering smart services to customers, perhaps enabling environmental monitoring, smart metering, local and aggregate control, demand-side management, and other user information.

Major issues that we must address in the future will be very real problems with environmental quality. We must prolong fossil fuels and take a ‘renewables encapsulated’ approach. Finally, let’s just deploy and get started, even at a small level and worry less about targets!

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<sup>3</sup> [www.myforest.org.uk](http://www.myforest.org.uk)

## CAP REFORM POST 2013: OPPORTUNITY OR THREAT?

ANDREW CLARK

Reform of the Common Agriculture Policy (CAP) is a fact of life. Across Europe one can be sure that there are 27 member states with an equal number of different views about the CAP’s future and the necessity and direction of reform. Despite member state reservations there have been very significant shifts in the way support is distributed and in the conditions; from a price and market support policy, to direct payments designed to support farm income accompanied by the growth of rural development policies. More recently, decoupling of direct support has been implemented, which particularly in the UK context is significant. Food security is now on the agenda for every member state.

Yet the Treaty of Rome objectives, which established the Common Market and the CAP in 1957, remain the same and are still valid. Firstly they are to increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour. Secondly, they aim to ensure a fair standard of living for the agricultural community in particular by increasing the individual earnings of persons engaged in agriculture. Other objectives include the stabilisation of markets, ensuring availability of supplies, and ensuring that supplies reach consumers at reasonable prices.

We must make no bones about it, the biggest driver for change in the CAP has always been budgetary, despite years of intellectual criticism. The CAP is vital to Europe’s budget yet accounts for a relatively small proportion of EU Gross Domestic Product (GDP) at about 0.5 percent of total GDP. Mounting concern about Euro zone budget deficits can only increase this budget pressure. However this is not the only challenge to the CAP. Future challenges include the ever growing number of countries and diplomats, inevitably leading to slower and more protracted decision making. Perhaps because of this the new Agriculture Commissioner Dacian Ciolos seems to be keen to maintain support for Pillar I and to allow flexibility by member states.

The distribution of support between countries will also be significant, even though it is supposed to be a *Common* Agricultural Policy. New accession countries receive direct payment of less than €100 ha, whilst for old member states payments can exceed €500 ha. Politically this will be a major negotiation area for the next reform of the CAP in 2013. There is anticipated to be a 20 percent reduction in budget post 2013, and that the budget will be more evenly distributed with movement from Pillar I and Pillar II, and within Pillar II.

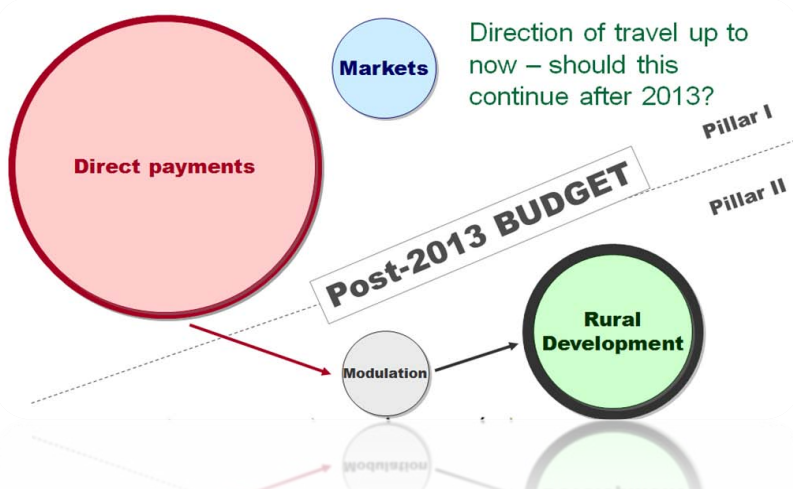


FIGURE 4 DIRECTION OF TRAVEL FOR CAP REFORM

In terms of timescales, the period up until September 2010 will be critically important. A public consultation is currently in place (April 2010), with Commission Communication scheduled in late 2010. Legislative proposals will be finalised in 2011, with decisions anticipated possibly by the end of 2012. Parallel negotiations on ‘Financial Perspectives’ will be taking place and certainly, budgetary issues will be of central importance. CAP reform will be difficult with over 1000 people seeking to influence decisions.

Other factors for post 2013 include the need to reform Pillar II but this will require co-funding and is therefore more expensive to run for countries that are required to use internal funds. Markets have never been considered but should be in the future (Figure 4, page 10).

Staring at the tea leaves continuing slow evolution of the CAP is inevitable. The main pressures for reform are clearly the total budget and the distribution of CAP across member states. We may end up with a more diverse CAP to reflect country differences under Dacian Ciolos' leadership, although the NFU is not supportive of this outcome. At the same time new challenges will be integrated into the CAP, not least a focus on climate change. Throughout the NFU we will advocate a strong Pillar I to buffer farmers from the volatilities of the market place and to address market failure.

At the same time Pillar II needs more focus and an improved budget, and should focus on the agricultural sector rather than remain a policy 'dumping ground' for policy ambitions without funding. It seems likely that modulation will be phased out with a move to permanent funding for rural development. As part of this reform, the UK needs a fairer allocation from core funding (currently 1.3 percent), while priorities must be refocused away from Axis 3 and 4 towards:

- structural adjustment to market + farm competitiveness;
- modernisation + innovation;
- rewarding provision of environmental goods beyond regulatory baseline;
- adapting to and mitigating climate change.

Post 2013 the NFU is campaigning for a CAP that will sustain productive capacity, buffer against volatility, create better functioning market, support competitiveness and productivity, and provide incentives to improve performance.

So, is CAP reform a threat or an opportunity for the forestry sector? Opportunities certainly include the narrative of 'production' for all land managers including foresters, and woodland offers a strong public value argument, especially in connection with renewable energy. Within the rural development programme there are under-used forestry measures, especially renewable energy. However, foresters must also recognise the threats, which include the EU's allocation for the second pillar scheme and the UK's poor record of rural development scheme delivery.

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## ON-SHORE WIND DEVELOPMENT AND THE IMPACT OF FORESTRY POLICY

MANDY GLOYER

There are a number of tensions that are emerging as we strive to meet climate change targets; one of the major areas has been in connection with on-shore wind power generation and forestry policy.

Key targets exist that affect both on-shore wind and forestry. Environmental targets include reducing green house gas emissions by 80 percent by 2050, and the sourcing of 15 percent of all energy from renewables by 2020. Forestry targets vary between the UK countries, focussing on achieving 25 percent forest cover in Scotland, increases in Wales and Northern Ireland, whilst English policy is closely linked to climate change objectives.

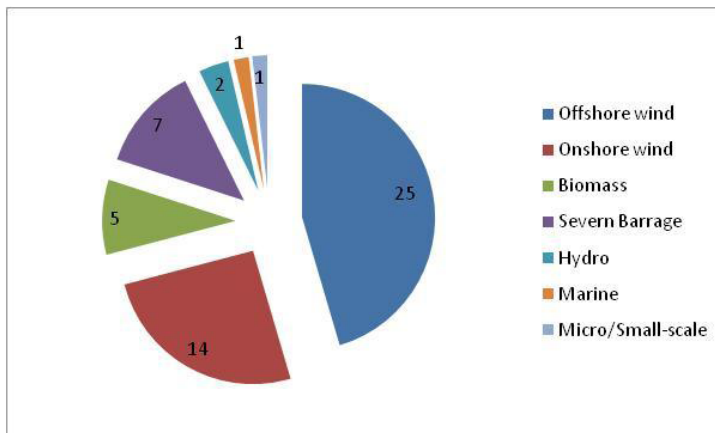


FIGURE 5 UK RENEWABLE ENERGY SOURCES IN 2020 (SOURCE: UK BUSINESS COUNCIL FOR SUSTAINABLE ENERGY, 2008)

By 2020, it is expected that off-shore wind may retain the lion’s share (25 percent) of renewable energy for the UK (Figure 5). On-shore wind, at 14 percent, has major targets to meet, increasing generation up to 33 GW, including a three fold increase in capacity in Scotland alone. The Severn Barrage would be a major project were it to come to fruition but it is still in question due to environmental concerns. There is an increasing need for land for both wind farms and forestry, which could lead to conflicting pressures on the UK’s land resource.



FIGURE 6 A WIND TURBINE AND IN AN UPLAND FOREST

Can forestry and on-shore wind power generation co-exist comfortably? Wind engineers have concerns that nearness to trees can severely curtail the 20 year lifespan of a turbine by accelerating degradation, due to wind shear and turbulence effects. Wind yield can be reduced by 10-25 percent. Accelerated fatigue of turbines can lead in extreme circumstances to blade failure. ‘Keyholing’ of trees around turbines has been tested with some success (Figure 6).

However, problems still exist and some wind engineers would prefer to see a minimum of 500 metres between a turbine and the nearest trees. They argue that ideally hub height should be kept a minimum of 10 m above tree height. Clearly however, clear felling of forests is recognised as unsustainable if national forestry targets are to be met.

An obvious solution may be to build taller turbines. There are problems in this approach however, especially in engineering taller structures in the UK with turbulent and high wind speeds. Design of turbines for forested landscapes is not necessarily a priority for the European mainland-based manufacturers.

Greater consideration to forest design and structure could lead to a wide range of options at ground level, including short-rotation forestry and lower height trees and shrubs. Best practice guidelines need to be agreed for forest planners and managers, focussing for example on improving keyholing techniques.

Where tree removal is required for construction or development, there is a need to agree appropriate responses. If woodland removal is controlled poorly at local level this could be a problem, but there are many ways to achieve afforestation targets, including re-planting either on or off-site. To properly encourage appropriate re-planting, there is a need to rectify the low level of support through rural development funding available in the UK, and the next round of CAP reform could be significant in this respect. Forestry interests should be attempting to influence this now.

Strategically, political guidance and leadership are required to maximise public benefits, especially carbon benefits. The requirement for a Sustainable Land Use Strategy within the Scottish Climate Change Act is positive and welcome in hopefully enabling the addressing of strategic issues. Of course, we need more than strategic plans, for example much better integration of environmental strategies with planning regulations.

We welcome further discussion between the forestry and renewable sectors.

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## BIOMASS IN NORTH EAST ENGLAND

MARTIN GLYNN

There are over 100,000 ha of forests in North East England, representing 12.5 percent cover; making it England's second most wooded region. Kielder Forest is a major component and, at 250 square miles, is Britain's second largest forest. Rural Development Initiatives (RDI) is active in the region, supporting the regional forestry initiative Northwoods, and delivering of Ignite, NEWHeat, Yorkshire Woodfuels Ltd., and other projects. Partnership working is very important for RDI.

RDI undertook a research study in 2008 on behalf of the Forestry Commission and ONE North East that estimated annual contribution of biomass to the North East region. This is such a fast moving area that already aspects of the report are becoming dated but it nevertheless provides useful baseline figures, even though these may be quite conservative. Annual contribution of biomass was estimated to be £40M, with the potential to rise to £76M by 2015<sup>4</sup>. This could lead to the creation of 2000 jobs in the region. Installed capacity already exceeded 125 MW, with three large installations at Alcan, Egger and Sembcorp, each exceeding 30 MW. Over 440,000 tonnes of green biomass was estimated to be utilised. These figures related to the whole biomass supply chain, with the majority of value from harvesting and processing, and in biomass installation.

Since 2008 there has been an increase in medium and large scale operations, with more than 25 non-domestic heat-only installations in place, exceeding 8 MW of installed capacity in the region. At the same time there has been very significant growth in the supply chain.



**FIGURE 7 ARTIST'S IMPRESSION OF A LARGE SCALE ELECTRICITY BIOMASS INSTALLATION**

Also in the region since 2008 there have been three significantly large scale proposals for electricity biomass installations; two 300 MW and one 100 MW. All three are located at deep water port locations, such as on the River Tyne, and near to rail heads (Figure 7). Therefore they will be capable of bringing in material from long distances. The business models are clearly looking at international markets for supply, although all three have stated that the biomass supply will be sustainably sourced.

The maximum benefit seems to be derived in larger heat-only installations, over 500 KW, where potential exists to advance significant benefits for both supplier and generator. At small scale however, planning and operations are hampered by lack of information about critically important factors such as capacity and fuel requirements, and ultimately limited by economies of scale. Two

distinct supply chains are emerging: (1) biomass supply for small to medium heat-only schemes, and (2) very large installations. Across the scale however the industry is conscious of fibre security, and concern exists regarding displacement within the existing forestry and wood sectors.

In terms of realising the benefits, beyond those identified in the study described above, we must recognise that the UK biomass supply chain is in its infancy. A significant amount of support and assistance is required by the sector. Only when all elements of the supply chain are working to their full potential will the benefits, especially financial, be realised. To date there has been a lot of attention focussed on supply and less on demand.

<sup>4</sup> Clubb, D. (2008). An economic evaluation of current and prospective value to the north east of England from biomass-related activities. [http://www.northwoods.org.uk/files/northwoods/publications/BiomassValue\\_northeast.pdf](http://www.northwoods.org.uk/files/northwoods/publications/BiomassValue_northeast.pdf)

Partnerships are crucial (Figure 8). In North East England the regional development agency, One North East, has been very pragmatic and effective in supporting the emerging biomass sector, as have the Forestry Commission. A number of very effective schemes are currently active:

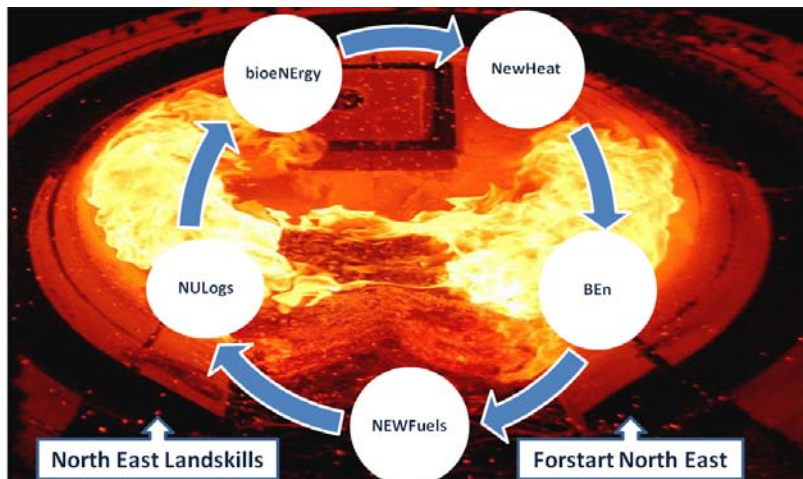


FIGURE 8 PARTNERSHIPS OPERATING IN NORTH EAST ENGLAND

1. Through bioENERgy, the first significant investments in machinery, storage and road building are beginning to emerge. Grant aid to the tune of £1M has been available through the Rural Development Programme for England (RDPE) for two years, with more than £700,000 already claimed. The typical grant rate is 40 percent, and private sector match funding investment has topped £1.3M. Thirty five projects across 28 business have been supported to date, while in the first quarter of 2010 a further 17 expressions of interest have been received.
2. Support for the domestic wood heat end of the market has also been effective. The nulogs initiative provides one-to-one support and training for firewood businesses, provides woodland management advice, and supports a firewood supplier’s network.
3. The NEWFuels initiative, funded by the Bio-energy Infrastructure Scheme supported by Defra, has 22 producer members and operates 11 supply contracts. Currently 2,500 tonnes are processed through the group.
4. NEWHeat has supported 305 biomass feasibility studies, and produced 25 detailed scheme designs. Fourteen boilers have been installed with a total installed capacity of approximately 2 MW. It is estimated to saving about 900 tonnes of CO<sub>2</sub> per annum. Investors are now interested in biomass because it makes financial sense, and no longer solely for its green credentials.
5. The three year BEn project<sup>5</sup> is a Biomass Energy Register for sustainable site development across seven partners from five countries in Europe. It aims to strengthen the biomass sector through networking between private and public stakeholders, and developing a map of stakeholders, an inventory of biomass sources and sinks, and an energy register.

The lessons learnt so far are that the integration of support and facilitation is critical. Joint action by regional and national organisations leads to very positive benefits. Clearly our focus, at least in the North East, should be on medium to large heat-only installations. The Renewable Heat Incentive has the potential to have a very dramatic effect on the forestry sector, especially in England. We may see a rapid imbalance appear between supply and demand. There is great potential for the forestry sector but there are likely to be challenging times ahead.

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<sup>5</sup> <http://www.ben-project.eu/>

## ENERGY STRATEGIES FOR FOREST OWNERS

JASON BEEDELL

From a woodland owner's perspective, how is it possible to develop an energy strategy? Smiths Gore is one of the UK's largest firms of rural property advisers; managing woods, advising owners, managing estates and large houses, and also managing farms. These firm's contacts with many forest and woodland owners therefore provide a useful perspective on this question.

There are many business opportunities for landowners, especially woodland owners. Chief amongst these are the sale of raw materials for energy generation (logs, chip, pellets), production of biofuels, and the provision of land for renewable energy equipment. To a lesser extent opportunities also exist for energy sales to the national grid (feed-in tariffs), to local communities, carbon offsetting, and carbon sequestration. Some markets are much more developed than others, and for many woodland and property owners these have only come onto their radar in the last two to three years. An important point is that opportunities exist that are much wider than woodfuel production.

It seems that the majority of woodland owners are considering more how they can use their woods to cut their energy costs, rather than developing new income streams. They can achieve this in a number of ways, especially through energy efficiency savings, reviewing arrangements with suppliers, developing on-site generation, and by contributing to slowing climate change and associated adaptation costs.

From experience gained from working with foresters, estate managers, and planners throughout the UK, it seems that the main interest is in firewood. Wood burners in particular offer a number of clear benefits, including (i) proven technology, (ii) perceived lower maintenance, (iii) less processing of fuel, (iv) lower capital cost, and (v) less space required / alterations to buildings. Clearly the owners' motivation is a desire to have beneficial use of and add value to their woodland.

There is growing interest in chips and pellets but relatively few boilers have been installed and still only for early adopters. For private owners wanting to use woodfuel themselves, this is mainly due to recent increase in firewood prices. However a number of barriers, either real or perceived remain, including the complication of processing, capital costs for boiler and equipment, a feeling that systems are still unproven, the increased time, labour and maintenance requirement compared with oil or gas, and of course the difficulties of planning, especially in installing flues in listed buildings for example.

It seems that a key requirement is for improved information on these barriers and perceptions, especially concentrating on estate owners, with a view to understanding why uptake has been so low. Perhaps social scientists, including those from Forest Research, might wish to use social psychology models to understand the barriers. Work could concentrate on attitudes, social norms and perceived behavioural controls. Two schemes that provide advice to woodland owners to boost woodfuel production, Woodfuel East and Heartwoods in West Midlands, are perhaps tacit acceptance that left alone the market would not develop organically. Hopefully this view is not over-pessimistic but it is certainly the experience of Smiths Gore within our own client base, and also for many of our competitors.

A study of three 'pathfinder' areas in the East Midlands in early 2008<sup>6</sup> highlighted three key points:

1. Woodfuel suppliers are supplying significant amounts (compared with other parts of the supply chain) – most is chip (180 kt) and pellets (130 kt) (Table 2);

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<sup>6</sup> Building supply chains and support networks for the woodfuel sector:  
[http://www.rics.org/site/scripts/download\\_info.aspx?fileID=3477&categoryID=548](http://www.rics.org/site/scripts/download_info.aspx?fileID=3477&categoryID=548)

2. Considerable amounts handled by contractors, tree surgeons and as waste wood - much of which they claim is used as woodfuel, mostly as logs, and;
3. A small amount is produced by woodland owners – equivalent to 0.30 t / ha of woodland in the three areas.

**TABLE 2 BUILDING SUPPLY CHAINS AND SUPPORT NETWORKS FOR THE WOODFUEL SECTOR**

Supply chain	Annual volume (t pa)
Woodland owners (in 3 smallish areas only)	10,000
Waste wood	53,000
Contractors and tree surgeons	64,000
Woodfuel suppliers	320,000

So there is considerable scope to increase the amount produced.

The same study identified that for large woodland owners (>50 ha), less than half produced woodfuel including logs, and only around a third produced it as a business / income generation. Each active producer was generating 500 tonnes per annum. Well developed log markets existed but woodchip and pellet production was under-developed due to fears about end- user demand. Some owners were actively considering

woodfuel production for their own use and to market, while many viewed woodfuel as method of generating use and income and carbon reduction from own land

ENERGY STRATEGIES FOR RURAL BUSINESSES	
<b>Stage 1</b>	Baseline assessment
<b>Stage 2</b>	Forecasting "Business as Usual"
<b>Stage 3</b>	Establishing the vision
<b>Stage 4</b>	Reviewing the options
<b>Stage 5</b>	Building partnerships
<b>Stage 6</b>	Financial and carbon appraisal
<b>Stage 7</b>	Setting objectives and targets
<b>Stage 8</b>	Risk assessment
<b>Stage 9</b>	Setting the implementation plan
<b>Stage 10</b>	Reporting and communicating the strategy and implementation plan

There are clearly huge benefits for owners of large estates. They could be market leaders or early adopters and there is evidence to support this from around the country. A recent study<sup>7</sup> of historic houses revealed that the average energy bill just was under £15,000; equivalent to 55 tonnes of CO<sub>2</sub> per house a year, or 9 average households. One large house had 2000 light bulbs but had never considered how much electricity these were using. Remember that the raw material is often right on the doorstep of these houses!

A guidance note produced by RICS<sup>8</sup> provides a template for an energy strategy for rural businesses. It sets out how to produce an objective and structured energy strategy, through 10 stages from understanding what you are doing at the moment, to doing it, and letting people know what you have done.

So looking forward is it business as usual or can we meet a greater vision? Many businesses have not considered whether their energy usage is efficient or investigated how they could reduce or 'green' it. To do this, they will need to consider first what they want to achieve, for example to reduce emissions by a stated amount, become carbon neutral by a certain date. In reality our experience is that the main motivation is still about cost saving or income generation rather than emissions reductions. However, this is the stage that woodland owners and rural businesses find difficult at the moment. Many say that finding expert, independent advice is difficult.

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<sup>7</sup> Energy Conservation in historic houses: A guide for historic house owners. Smiths Gore and Historic Houses Association, 2009. <http://www.smithsgore.co.uk/assets/x/145854>

<sup>8</sup> Available to RICS members only: [http://www.rics.org/site/scripts/download\\_info.aspx?downloadID=3692](http://www.rics.org/site/scripts/download_info.aspx?downloadID=3692)

## MEDIUM SCALE HEAT AND CHP IN FINLAND

JYRKI RAITILA



FIGURE 9 SEASONING OR AIR-DRYING AT ROADSIDE

Woodfuel systems operate at different scales in Finland. At the small scale, harvested trees are first taken to the forest roadside (by forwarder) and seasoned there for about one year (minimum over one summer). After that they are chipped and taken to heating plants (Figure 9). Note, however, that ‘small scale’ in Finland is much larger in scale that it may be defined in Britain. Harvesting improves the silvicultural condition of poorly managed stands. Typical removal is in the order of 80 – 120 MWh/ha (40 – 60 m<sup>3</sup>/ha). Higher quality of chips can be used in heating plants and boilers from farm scale up to >100 kW. Harvesting of whole trees for woodfuel is usually a separate operation, not connected with harvesting of commercial timber although felling and bunching are expensive operations.

At the larger scale processing is completed at the installation plant (Figure 10), and this is efficient for distances under 30 km. For example, logging residues (e.g. lop and top) are extracted by forwarder and transported by road in loads up to 25 tonnes. One third of residues are left as a nutrient reserve and actual yield per hectare are usually 100 MWh/ha. The material is used mainly in CHP plants, occasionally in bigger heating plants >15 MW. Harvesting is easy and cheap; the cheapest forest fuel.



FIGURE 10 PROCESSING RESIDUES AT THE PLANT



FIGURE 11 A LARGE SCALE HARVESTING AND BUNDLING OPERATION

A different system more usually adopted for forest residues is to season and chip material on site with mobile chippers. The chips are then transported to the plant and this is usually the most efficient method for residues. Bundling (Figure 11) is also used for forest residues in order to increase the energy density of the load in long-distance transportation.

In spruce-dominated sites stump pulling is sometimes implemented. Stump pulling and soil preparation for regeneration are carried out simultaneously. Impurities such as stones and mineral soil are a big challenge for processing machinery. The stumps are seasoned for over a year, first on site and then at landing. Yields usually reach 150-200 MWh/ha are mainly used in CHP plants.

In terms of the business models that operate in the forest energy sector in Finland, again they operate at different scales, and concentrate on specific functions in the value chain (Figure 12). The whole chain model usually refers to heating entrepreneurship which is NOT large scale business. It is adding value (*i.e.* selling heat) to chip production that makes this small scale business profitable. The trend is: the bigger the company the more it uses subcontractors. Businesses specialising in chipping and crushing/grinding and transport use terminal-sized machines or effective chippers and tend to be based on contract work where transport is often provided by a third party. Businesses also focus on chipping and transport, whose customers are usually heating plants and organisations supplying fuel for plants. Others specialise in buying material and undertake harvesting, chipping and transport. Businesses add production and even the supply of heat to their model, effectively managing the whole of the value chain.

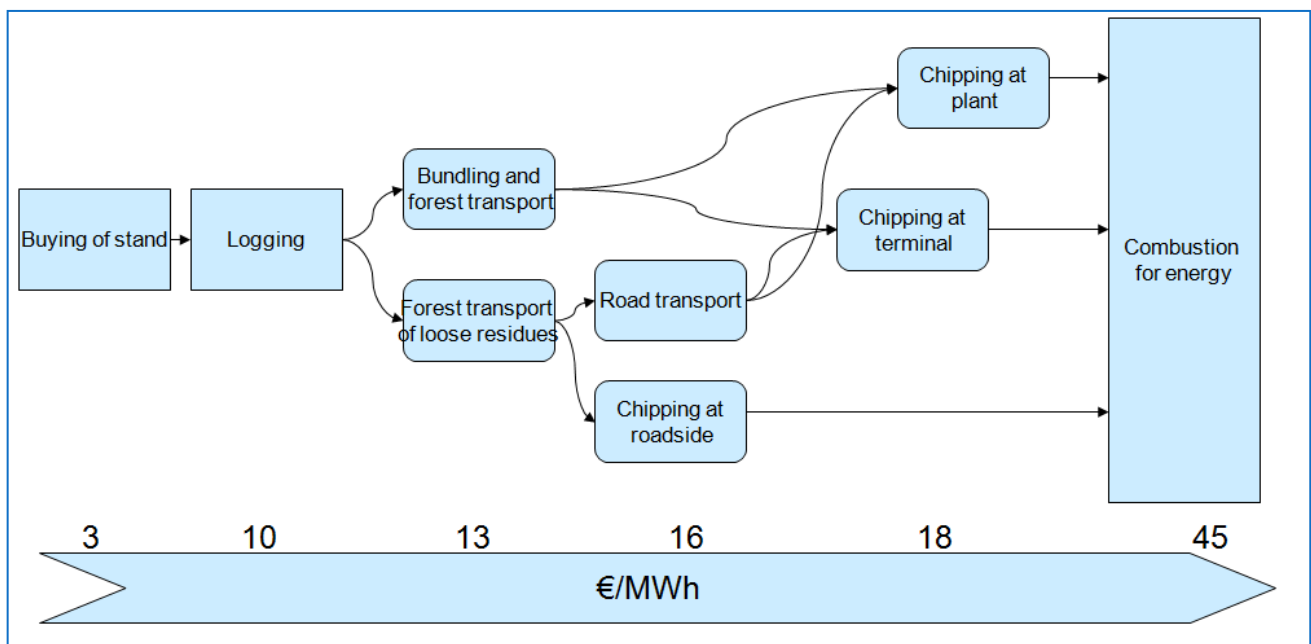


FIGURE 12 THE VALUE CHAIN IN THE FOREST ENERGY BUSINESS

Such a large scale operation is typical for large forest companies such as Vapo, L&T Biowatti, UPM-Kymmene, and Stora Enso. These companies use subcontractors at all stages of procurement, to avoid investing in their own machinery if possible. They can exploit the diverse expertise of a large company, for example in organisation and contracting. The woodfuel flows are directed effectively to financially sound companies (energy producers), depending on the market situation.

Recent market development has proven that both models, small and large, can be profitable if they are operated professionally. Clearly the subcontracting model offers the advantages of low investments; minimising invested capital, but must operate with narrow margins that require high volumes of material. These large scale business models require effective organisation and contracting. Adding in heat supply to the business model, heating entrepreneurship or the 'Whole chain' model, requires large investments and long term commitment: there are certainly no instant 'jack pots'. At the small scale there is more flexibility and freedom to organise roles among the owners. Value is added by putting the companies own expertise and efforts (labour) into the business.

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## CREATING A WOOD HEAT MARKET IN THE MIDLANDS

RICHARD HARVEY

The heat-only option is the most attractive for landowners. In the long term it will be recognised strategically that biomass it is more appropriate for heat than power generation.

The Rural Energy Trust (2002-08) was established as a not for profit organisation to provide funding from regional and national sources, to raise awareness, provide training and demonstrations, support research and knowledge transfer, and undertake capital grant applications. A knowledge transfer project, the Rural Energy Trust Anglo-Finnish Project (REAF), which ran between 2004 and 2006, supported the exchange of ideas and technologies ranging from harvesting demonstrations to short rotation coppice (SRC) management.



FIGURE 13 THE FINNISH FELLING FRAME IN OPERATION

From REAF emerged some novel ideas for managing SRC, such as the Finish 'felling frame' enabled chainsaw operators to operate saws at close to ground level without the inherent health problems for operators in stooping to coppice stools (Figure 13). The project also supported techniques for improved boiler performance and to monitor fuel quality.

A more recent initiative in the Midlands has been the LiGHT project with Lincolnshire County Council<sup>9</sup>. Two hundred organisations have been involved since its launch in 2005 and it has played a significant role in establishing biomass in Lincolnshire. Twenty five installations have been installed creating in excess of 25 MW output. Importantly, information and data about performance have been collected to demonstrate viability.

Rural Energy Ltd was formed as a new company operating in the Midlands in 2002. It is a heating system installation company with 12 farmer/local shareholders. Initially it was East Midlands-based but now has a national perspective. The company imports Austrian and German heating systems, providing a complete service from feasibility, design, installation, monitoring, to after-sales. To date over 200 commercial installations have been created providing up to 2MW. The company employs 30 full time staff with turnover growth at 50 percent per annum. The company has always promoted woodchip over wood pellets given their improved density and lower cost.

A recent success for the company has been the provision of containerised wood chip heating systems for seven regional offices of Defra (Preston, Lincoln, Crewe, Stratford, Thirsk, Lincoln and Bury St. Edmunds). The boilers are 90-250kW supplied by wood chip delivered by pneumatic blower lorry (Figure 14). Looking to the future it seems that the delivery of chip via blower will be unviable so new systems are being explored.

Another good story, both for the company and for woodfuel in the Midlands region, has been the installation of a complete system for a large glasshouse company (Figure 15, page 21). The purpose built Energy Centre has a hydraulic walking floor fuel discharge system



FIGURE 14 A CONTAINERISED WOOD CHIP HEATING SYSTEM AT A DEFRA OFFICE

<sup>9</sup> <http://www.lincolnshire.gov.uk/section.asp?docId=43306>

and the 2 MW biomass boiler provides the base heat load. The boiler can burn green (wet) material, and being cheap, this is helpful both in terms of cost and availability. Installation cost was in the region of £100,000 but the investment has paid back to the company in just three years.



FIGURE 15 WOODFUEL SUPPORTING SIX ACRES OF POT PLANTS AT BELLS BROS NURSERIES, BOSTON, LINCOLNSHIRE

East Midlands Wood Fuels Ltd, was established as a not for profit organisation in 2005. It received capital and revenue grant funding from the Bioenergy Infrastructure Scheme. It has 24 woodland owner members and provides capital grants for wood chippers, transport trailers and lorries, and wood processing equipment. It has

successfully delivered several thousand tonnes of woodfuel in the region but has also experienced many problems and there are limitations with the model.

English Wood Fuels Ltd was established in 2007 as a woodfuel supplier. It has one full time employee and 17 wood chip and 32 wood pellet clients. Wood chip is sourced as chip or as round wood, and chipper and delivery vehicles are hired. Wood pellets are sourced from one supplier. The viability of this model is the low costs from sourcing round wood, the low cost of processing and transport, and the short delivery distances.

In summary, the biomass energy industry is demand led. Essentially, install the boilers and demand for fuel will follow. Encouraging management of woodlands is an issue of economics, rather than demonstrations and training. Demand for biomass fuels will increase the cost of timber significantly over the next few years, perhaps as much as 100 percent at roadside. When the Renewable Heat Incentive comes into play this could lead to payments of 6.5p/kWh =£120/tonne. Two main markets exist: a premium market for dry (35 percent moisture content), chip in small quantity deliveries (<10 tonnes), and a standard market for wet chip (>40 percent in large deliveries of 20 tonnes).

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## **WIND FARMS IN FORESTRY: EXPERIENCES OF WIND FARM DESIGN AND EIA FROM WALES**

### **JOHN WOODRUFF**

Natural Power is a specialist renewable energy consultancy company, dealing in wind, wave and tidal power. They provide development, construction, operation and maintenance, and technical services. With offices in Scotland, Wales, England, France, Canada, USA and Chile, the company has a 99 percent success record in consenting MW, with 2,300 MW consented to date. Exploring a case study of wind farms in Welsh forests provides interesting insights into the issues and outputs.

In 2005 the Welsh Assembly Government published Technical Advice Note (TAN 8), which included a policy on wind farm development<sup>10</sup>. Seven Strategic Search Areas (SSAs) suitable for large scale wind farm development were identified. Each SSA was given a target MW output ranging from 70 MW to 290 MW, targeting a total 800 MW additional capacity by 2010.

The key site requirements are of course a good wind resource, and large open exposed sites are a prerequisite. Wind farms should also be sited away from dwellings and have good road access. In fact, these requirements closely match large scale forestry planting sites of the 1960s and 70s. Accordingly, some 50 percent of SSAs are located on land owned and managed by Forestry Commission Wales (FCW). The Welsh National Forest Estate Wind Farm programme ensures that development rights on FCW land in each SSA are awarded by tender. It stipulates 'turbines within woodland not wind farms that replace woodland'. Key design criteria are to minimise impact on forestry, for example that turbines are 'keyholed' into forestry.

One example is provided by Pen y Cymoedd (TAN 8 SSA F) where 84 turbines are planned (Figure 16). All turbines are on FCW land, with 58 percent of roads using existing forest roads. The forest consists of upland conifer plantations planted in the 1950s, 60s and 70s. The area has a large urban population with 30,000 homes in close proximity.



**FIGURE 16 COMPUTER GENERATED DRAWING SHOWING PROPOSED TURBINES AT PEN Y CYMOEDD**

<sup>10</sup> Technical Advice Note (TAN) 8: Renewable Energy (2005). <http://wales.gov.uk/topics/planning/policy/tans/tan8/?lang=en>

The area is also in close proximity to the Brecon Beacons National Park therefore landscape impact is extremely important. The planning application for Pen y Cymoedd is currently under consideration by DECC. The felling of 650 ha will be required to facilitate the 84 turbines.

Various technical issues must also be overcome, particularly in relation to the trees. Turbulence caused by the trees creates 'roughness', leading to additional stress on the turbine machinery. Shear is another issue where trees reduce wind speeds near to the tree top height, so wind speeds are variable between the top and bottom of a rotation for the turbine's blades. Generally, trees reduce energy produced. Some engineers are developing towers 20 m taller (100 m hub height / 145 m top blade height) to try and overcome these issues but these are unlikely to be viable on small sites.

A large number of practical difficulties had to be overcome just to complete the Environmental Impact Assessments (EIAs). Closures of the forest due to forestry activities prevented access for planners and timetabling became crucial. Forest cover reduces visibility and accessibility, slowing the survey process, while some areas were difficult to access areas for peat probing/hydrology and peat remains a significant constraint. Other surveys were potentially affected including archaeology and mines. Breeding populations of birds, such as the Nightjar, also curtailed some surveying operations. In this instance radio tagging was employed to improve understanding of the population distribution and its activities. A practical solution to these survey constraints was arrived at thanks to 'micrositing allowance' in planning consent, allowing more time for the whole EIA to be completed.

In considering the impact of the project it was also important to consider the 'sharing' of the forest with a wide array of other interests, including walkers, horse riders, cyclists (particularly specialist mountain bike trails), and car rally events. A Rights of Way constraint was also present, leading to the designation of alternative permissive routes.

In relation to the forest, the plans aim to minimise impact on forestry, maximise use of existing/planned felling and use of existing road network. Careful consideration was paid to coup/windfirm boundaries, and to future forest management that could affect visibility. Additional specific species issues included a nationally rare population of honey buzzards.

Opportunities for wind farms on forestry land are manifold, from green energy production, improved income, improved infrastructure, environmental gain – habitat management, employment and community benefit.

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## MANAGEMENT OF SMALL WOODLANDS IN GERMANY: WOODFUEL ONE PART OF THE STORY JÖRG SCHWEINLE

Germany has 31 percent woodland cover, 44 percent of which is privately owned. Most of the woodlands are also very small and are owned by an estimated two million owners. Many of the woodlands are smaller than one hectare (ha), and the average is 2.5 ha. These small woodlands are often long and narrow which makes management difficult, both practically and in terms of economic scale.

The owners of small woodlands have difficulty accessing markets, especially as these tend to be geared towards large suppliers. They are also hampered by lack of knowledge and limited skills, which limits their ability to manage the woods in their care. Sometimes woodland owners are unwilling to manage as it is not seen as important.

The woodland resource and owner issues summarised above are important because the greatest proportion of growing stock is in small woodlands (Figure 17). The state forest service is currently harvesting 100 percent of mean annual increment from state forests, sometimes more, to meet demand. To meet increasing demand from the forest industry and the growing biomass sector (Figure 18, page 25), more forest material needs to be sourced. Annually 80 million m<sup>3</sup> of wood is consumed in Germany, and this estimate excludes wood used in domestic heating which could account for another 25 million m<sup>3</sup>.

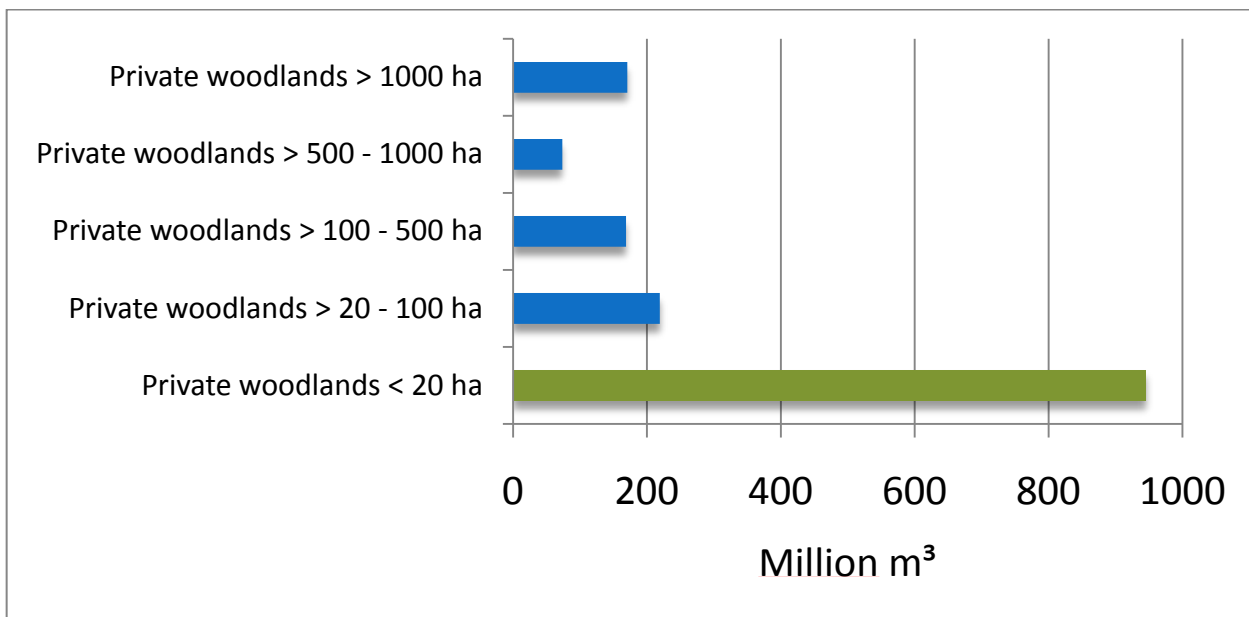


FIGURE 17 STANDING STOCK IN GERMAN PRIVATE WOODLANDS

A critically important step in bringing more material to the market place is getting people to talk. The model adopted in Germany is the employment of Forest District Managers by the State Forestry Enterprise or Chambers of Agriculture, whose roles are to advise woodland owners. Each Forest District Manager manages up to 30,000 ha of woodland, therefore liaising with several hundred woodland owners. The Forest District Manager takes a central role amongst the various actors (*e.g.* private woodland owners, public authorities, entrepreneurs, forest industry, bioenergy industry), and must certainly be a good communicator as well as a forester.

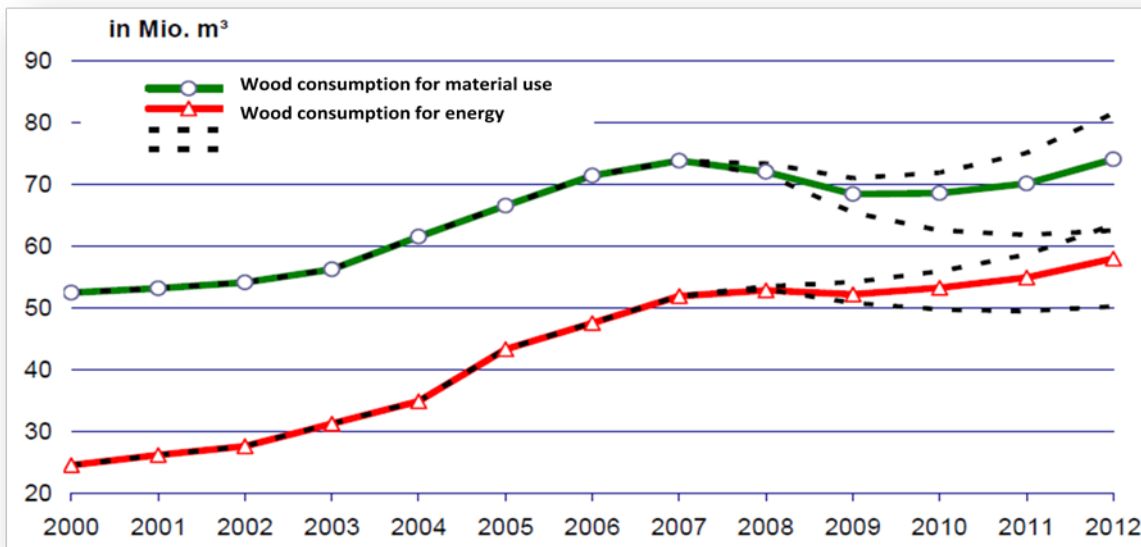


FIGURE 18 INCREASING DEMAND FOR WOOD IN GERMANY. SOURCE: MANTAU, 2008.

Inventory of small woodlands is the foundation of sustainable management but can sometimes be difficult to complete as owners can be reluctant to permit access and it can be time consuming. After twenty years of support work, good data now exists for most of the woodlands resource.

Woodland owners are supported by Forest District Managers (FDM) to bring woodlands into management and to market forest products. Government assistance from a FDM is available for woodland owners for a fee in return for technical management (paid per ha), assistance (graduated payment per ha and size of holding), individual services (fee per m<sup>3</sup> or ha), and for training. Grants are also available from the European Agricultural Fund for Rural Development (EAFDR). For example, in Germany €16 million was paid per annum to small woodland owners to support forest management and infrastructure development.

Fluctuations in the price of oil have had a dramatic effect in wood markets. In 2005 and 2007 during high oil price peaks, even small woodland owners reacted to mobilise timber. This perhaps emphasises that the current difficulties in mobilising wood from these woodlands is linked to the economy. The heat sector is more important as a market for wood fuel than power generation in Germany. To develop the heat sector a Market Incentive Programme for small biomass boilers is in place. An initiative to develop regional bioenergy markets has been launched recently by the Federal Ministry for Agriculture, Food and Consumer Protection. The initiative aims to develop bioenergy value chains, to promote transfer of knowledge and qualification, to motivate stakeholders and to resolve conflicts; all with the ultimate aim of improving living standards in the region. Among 210 applicants 25 regions are funded with €400,000 available over three years.

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[www.vti.bund.de/en](http://www.vti.bund.de/en)

Clearly, management of small woodlands is about people and not so much about trees.

## BIOMASS ENERGY AND TRADITIONAL FOREST INDUSTRIES: CAN THEY CO-EXIST?

ALISTAIR KERR

The short answer is “yes”! Biomass energy and traditional forest industries already co-exist at all scales. But it is important to bear in mind that the biomass sector is very immature and is developing rapidly. Wood fibre will be the dominant fuel for biomass. There will be winners and losers long term but perhaps in the short to medium terms the wood supply part of the sector should flourish.

The Wood Panel Industries Federation (WPIF) is on the front line in terms of competing with the biomass industry for the wood resource. There are seven manufacturing sites across Britain generating 8600 full time equivalent jobs, and a turnover of £600 million. The output in 2009 was 3 Mm<sup>3</sup>, consuming 3.2 Mt of wood. The panel industry is also Britain’s largest recycler of wood. A typical panel plant is large and characterised by having high volume continuous throughput. Typically 55 percent of the manufacturing process heat demand is satisfied by use of own process derived fuels.

There are at least 20 current proposals for new biomass plants across the UK, effectively on our doorstep. These are likely to have a significant impact. In a private letter to some developers of these installations it has been stated that Baltic, Nordic and North American sources are anticipated to be the major biomass sources, suggesting effectively that their development will have little impact on existing wood markets in the UK.

The main drivers for change will be global climate change and rising oil prices but looking beyond these perhaps the greatest concern is in relation to energy security. Wood energy is becoming a viable alternative as a means of fulfilling an anticipated shortage of supply. The Government adopts a carrot and stick approach, using blunt instruments of subsidies to support technical development, such as the Renewables Obligation, Renewable Heat Incentive (2011), Climate Change Levy, Carbon Reduction Commitment, and EU ETS.

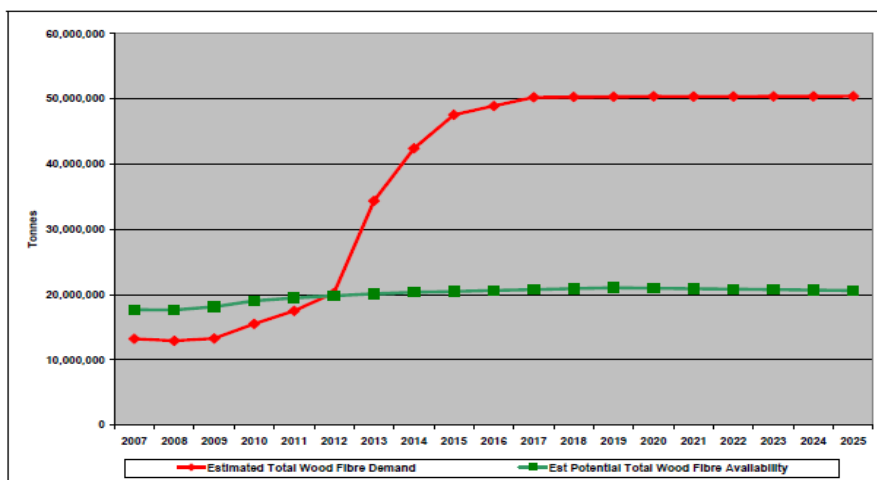


FIGURE 19 FORECAST TOTAL AVAILABILITY AND FORECAST TOTAL DEMAND FOR WOOD FIBRE IN BRITAIN.

Source: Wood fibre availability & demand in Britain 2007-2025: John Clegg Consulting - 2010

A recent report commissioned by WPIF, ConFor and others, forecast that total wood fibre availability could reach 20 Mt (Figure 19)<sup>11</sup>. However demand may reach 50 Mt. The greatest pressure is likely to be on small round wood production and supply.

The same report revealed that sawmill product demand and supply is fairly evenly balanced in the medium term. However for recovered wood the forecast reveals that supply is likely to stay constant at approximately 4.5 Mt

while recovered wood demand will soar to 7.0 Mt by 2017.

When totalled the imbalance between supply and demand for wood fibre can clearly be met in one way, namely through import (Figure 20, page 27). So why not just import? Home-grown material will certainly be cheaper and,

<sup>11</sup> [http://www.confor.org.uk/Upload/Documents/37\\_WoodFibreAvailabilityDemandReportfinal.pdf](http://www.confor.org.uk/Upload/Documents/37_WoodFibreAvailabilityDemandReportfinal.pdf)

perhaps more importantly in the long term, security of supply can be assured. Up to 10 percent may be secured domestically but economics will dominate decision making, and ability to pay will drive markets. One important omission from the report is that the impact of the Renewable Heat Incentive.

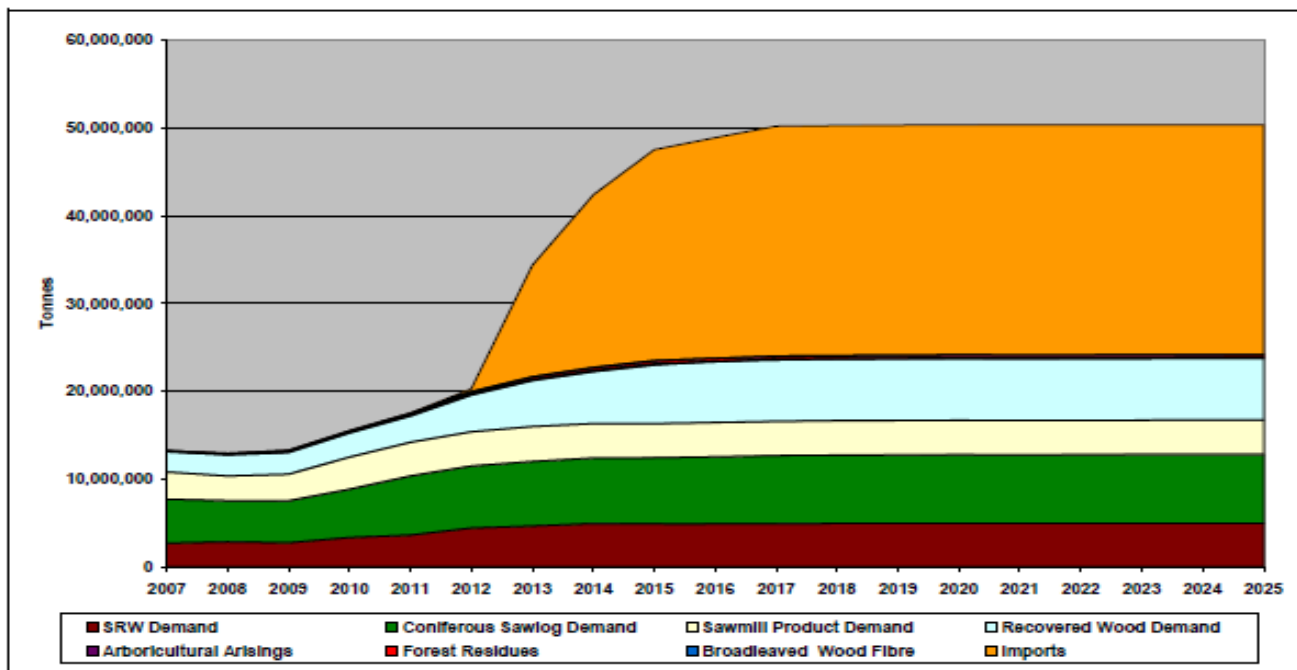


FIGURE 20 FORECAST TOTAL DEMAND FOR WOOD FIBRE IN BRITAIN BY TYPE 2007 – 2025.  
Source: Wood fibre availability & demand in Britain 2007-2025: John Clegg consulting - 2010

If this forecast is realised the impacts will be wide-ranging and considerable. We are likely to experience increased volatility of wood markets, increasing prices, and reduced competitiveness. Seasonal variation may become more critical and more common, for example as experienced in recent shortages during the winter of 2009 - 10. Supply chains to the energy sector are likely to shorten whilst whole supply chain ownership may dominate, with vertically-integrated companies seeking to exert as much control as possible. There may certainly be displacement or ‘Tesco-isation’ of wood supply! If this were to happen we would expect prices to start to fall which would be good for consumers but bad for growers.

In terms of opportunities and mitigation we can expect further refinement of banding. Combined Heat and Power is the way forward for biomass but to stimulate local supply we must mobilise the private sector. Industry has the largest and most consistent heat demand while further incentives to develop low grade waste streams are required. Solutions lie in the subsidies machine and by all means incentivise the technology but not the supply. Let us hope for a level playing field.

*Alistair Kerr is Director General  
of the Wood Panel Industries  
Federation*

[www.wpif.org.uk](http://www.wpif.org.uk)

## THE BIOMASS HEAT ACCELERATOR

KIERAN ALLEN

The Biomass Heat Accelerator aims to catalyse growth of the medium-scale commercial and industrial biomass heating market by reducing costs, demonstrating best practice and addressing supply chain risks<sup>12</sup>.

A key question is whether the Renewable Heat Incentive (RHI) will provide value flow to the forestry sector. The RHI could have a transformative on biomass in the UK. It will operate as a feed-in-tariff for owners of renewable heat generation (but may be available to Energy Service Companies). The RHI is designed to put the UK on a path to achieving Renewable Energy targets. It is expected to cause a marked increase in demand for wood for heating-fuels. It comes in to effect in April 2011 and is perhaps the world’s first Feed-in-Tariff just for renewable heat.

Looking at this in more detail the RHI levels proposed vary from up to 18p/kWh down as low as 1.6p/kWh, depending on scale (Figure 21).

The RHI could potentially half the time to achieve financial pay back on investments. Without the RHI, even a ten year payback is not really viable (Figure 22). These estimates are based on detailed feasibility reports undertaken on two ‘live’ projects from the Biomass Heat Accelerator (BHA). Internal rate of return assumes a 20 year lifespan with no major refit costs through life, with RHI revenues for 15 years. **Low RHI:** 350 kW: 1/3<sup>rd</sup> heat output at 6.5p/kWh; 2/3<sup>rd</sup> heat output at 2p/kWh 2000 kW: all output at 1.6p/kWh. **High RHI:** 350 kW: all output at 6.5p/kWh 2000 kW: all output at 2.5p/kWh

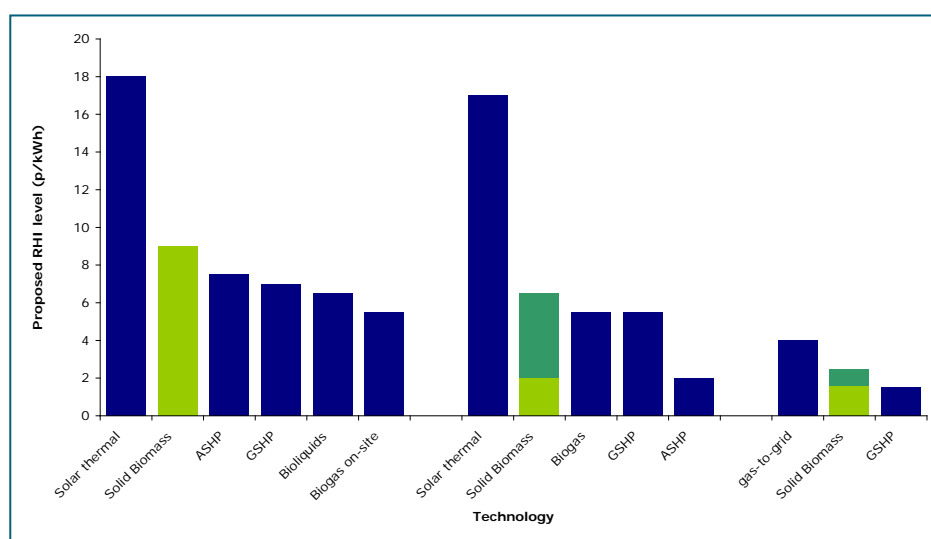


FIGURE 21 PROPOSED RHI LEVELS BY TECHNOLOGY TYPE AND SCALE

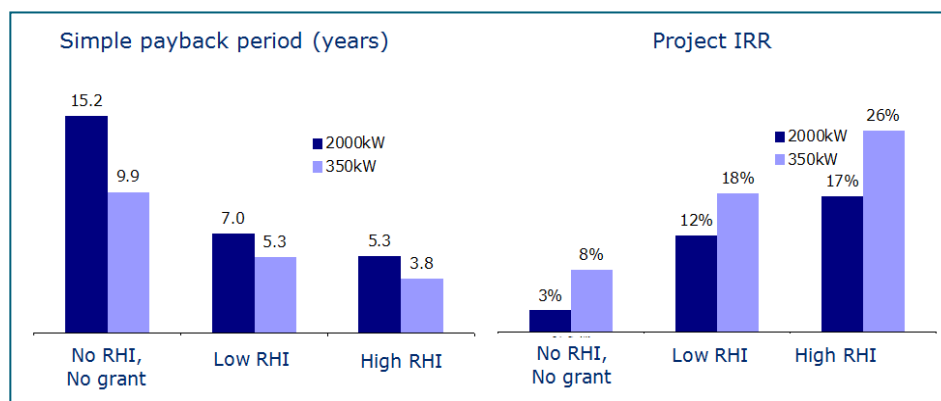


FIGURE 22 IF IMPLEMENTED AS IN CONSULTATION, RHI WILL HAVE A SIGNIFICANT IMPACT ON FINANCIAL PERFORMANCE OF BIOMASS HEATING SYSTEMS

<sup>12</sup> <http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/biomass/Pages/biomass-heat-accelerator.aspx>

The Carbon Trust considers that the biomass heat-only is the best option but a number of barriers remain including high capital outlay, concerns regarding material supply and security, and a lack of understanding. The Biomass Sector Review<sup>13</sup>, published in 2005, analysed economics and barriers for biomass energy. The review identified savings of up to 20m tonnes of CO<sub>2</sub> per annum possible using UK biomass resources. Using biomass for heating offered the lowest cost-of-carbon savings while the best economics were in small-to-medium scale applications (~100kW<sub>th</sub> to ~3MW<sub>th</sub>). Although the review was produced in 2005 much of the analysis still valid, and the Biomass Heat Accelerator was underpinned by analysis in the Biomass Sector Review.

Another report designed to act as practical guidance to help bridge knowledge gap in biomass heating was produced in 2009<sup>14</sup>. Lack of market knowledge and understanding was identified as a key barrier to the technology. The report consolidates and re-freshes existing industry “best practice” and knowledge. A combination of technical reference manual, policy ‘light’ document and implementation guide is aimed at a broad audience: architects, planners, engineers, consultants and end-users.

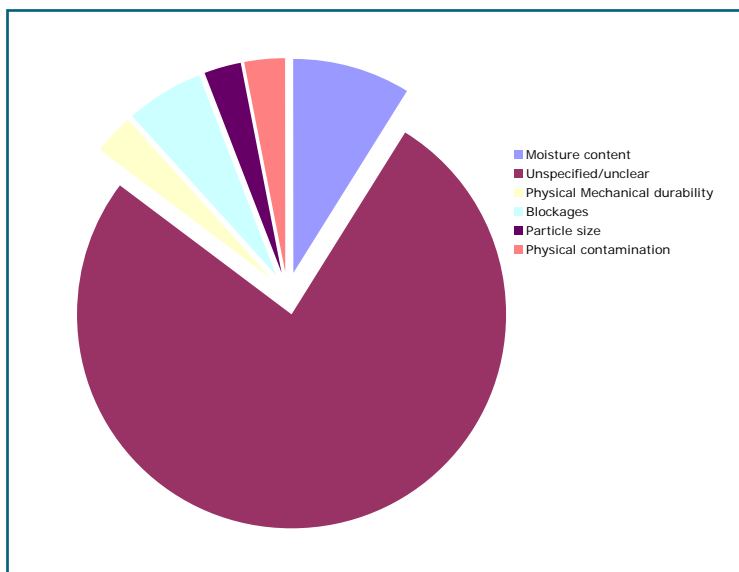


FIGURE 23 BREAKDOWN OF FUEL QUALITY CONCERNS

Consumer confidence is extremely important. Issues remain in connection to supply and also quality: essentially fuel reliability issues (Figure 23), with 41 percent of sites reporting some concerns. Lack of consumer confidence is effectively inhibiting demand growth

In contrast, most practitioners are bullish regarding material availability in the short-medium term. For example: *“It is often said that one of the barriers preventing the greater use of modern biomass systems is security of fuel supply. Within the northwest of England this is simply not the case”* – Envirolink NW. To quote another: *“So we’re all happy then? Well yes ... probably. For the market sector we operate within (small to medium scale industrial/commercial sector) I believe these*

*figures (Defra/BERR/FC) allow for a significant amount of confidence. To the customer looking to buy up to 2000 tonnes year I can hand on heart say “yes there is enough and there will be enough” from the sources we currently know about and are available to us and due to the higher value nature of these supply contracts.”* – Julian Morgan-Jones, South East Wood Fuels Ltd.

There is clearly great potential, especially given the quote immediately above was said before the development of the RHI. Is it an exciting opportunity for the future or a big threat? Only time will tell.

Kieran Allen is Technology Acceleration Manager for The Carbon Trust

[www.carbontrust.co.uk](http://www.carbontrust.co.uk)

<sup>13</sup> Biomass sector review for the Carbon Trust, Carbon Trust, (CTC512,). <http://www.carbontrust.co.uk/Publications/pages/PublicationDetail.aspx?id=CTC512>

<sup>14</sup> Biomass heating: a practical guide for potential users (CTG012): <http://www.carbontrust.co.uk/Publications/pages/PublicationDetail.aspx?id=CTG012>

## SHORT ROTATION FORESTRY AND ITS RELEVANCE TO THE UK

JOHN PURSE

The response of other countries to a sudden burgeoning demand for wood fibre provides several interesting lessons for the UK forestry sector.



FIGURE 24 EUCALYPTUS NITENS SRF AT 8 YEARS, CHILE

Short Rotation Forestry (SRF) is undertaken for economic reasons, to produce wood for particular industrial end-uses (Figure 24). Mostly it is grown to produce pulp, but not exclusively. It is often undertaken on good-quality land, in order to help to obtain highest yields, but a combination of good establishment practices and good rainfall can provide excellent yields on less fertile sites.

Technically, weed control until canopy closure is usually the

most critical element of SRF. Optimising fertiliser application at planting and for one or two years afterwards is also very important, as is initial site preparation. Many larger companies support their investment with their own genetic improvement programmes to increase yield and reduce delivered cost. Yield and wood quality are both important. The customer specifies quality and it is not unusual for yield to be sacrificed to obtain the required quality. The system has to be sustainable, both environmentally and economically; in practice yields generally increase over successive rotations. SRF typically involves yields (MAI) between 25-45 m<sup>3</sup>/ha/y, and/or rotations of 7-10 years. Some tree species respond to being treated as crops better than others; SRF involves species other than eucalypts, though certain eucalyptus species and hybrids are dominant worldwide.

The evolution of SRF with Eucalyptus was initiated in Brazil and South Africa in the 1970s, driven by private sector pulp producers because certain eucalyptus species proved very good for Kraft pulp and its products. Subsequently these systems have been widely copied and developed, leading to 9.5 million ha of industrial eucalyptus plantations globally in 1999. Annual planting in Brazil was in the order of 60-100K ha/year in 1990s. Growth of uptake has been phenomenal in Chile where *Eucalyptus nitens* was unknown commercially in 1987 but covered 80K ha in 2001 (mostly SRF).

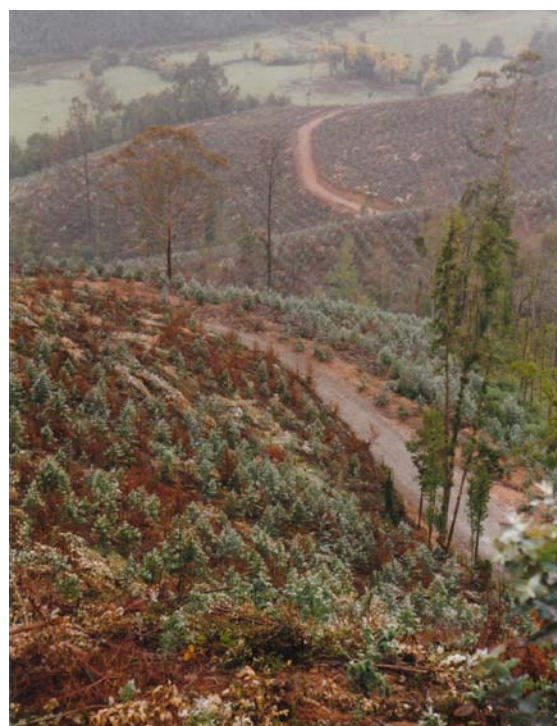


FIGURE 25 EUCALYPTUS ESTABLISHMENT ON STEEP HILLSIDES IN CHILE FOLLOWING CLEARFELLING

The technologies and plant material have been introduced to Europe. For example the techniques illustrated in Figure 25 fitted well with demands for fibre production in Galicia and Cantabria in Northern Spain (Figure 26). A non-SRF planting by Coillte in Ireland (Waterford) has demonstrated that *Eucalyptus nitens* easily outperforms Sitka Spruce at age 14.

An early trial in the UK shows promising results (Table 3).



FIGURE 26 EUCALYPTUS IN THE CANTABRIAN LANDSCAPE, NORTHERN SPAIN

TABLE 3 DEMONSTRATION OF EUCALYPTUS SRF IN UK

Latest assessment (8.33y):	<u>Unthinned</u>	<u>Thinned @4y</u>
Stocking at assessment (stems/ha)	1975	878
No. trees assessed	117	62
<u>dbh range (cm)</u>	6.5-27.9	14.2 - 33.1
Dominant height (m)	20	22
<u>Vol (m<sup>3</sup>/ha)*</u>	334	311
<u>Biomass yield (odt/ha, assuming BD=0.45)</u>	150.3	140
<u>MAI (m<sup>3</sup>/ha/y)</u>	40.1	37.4
<u>MAI (odt/ha/y)</u>	18	16.8
Thinning yield @ 4y (m <sup>3</sup> /ha)		42
Biomass yield @ 4y (odt/ha, assuming BD=0.42)		17.6
Cumulative yield @ 8.33y (m <sup>3</sup> /ha)		353
<u>Cumulative biomass yield @ 8.33y (odt/ha)</u>		157.6

Parts of the British Isles are well-suited to SRF using eucalyptus. In certain regions, world-class yields and rotations should be possible. Yields are likely to be influenced more by climate than by soils. Areas with cold winters are not suitable for very high-yielding species such as *Eucalyptus nitens*. Therefore it is important to match species to locations. Rainfall is also an important determinant of yield. Cost-effective techniques for weed control need development. Growth in interest will only happen with demand and support from end-users but experience shows that this could happen remarkably quickly given such support. Large-scale biomass customers ought to be really interested in SRF, especially as energy crop status would add further value for power generators. There is also potential to grow SRF as feedstock for 2<sup>nd</sup> generation liquid biofuels.

Dr John Purse is Director,  
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## STUMP HARVESTING AND RESIDUE BALING: ITS ROLE IN INCREASING BIOMASS PRODUCTION

### PETER WHITFIELD

UPM has interests much wider than just biomass with a versatile low-carbon energy portfolio. This includes nine hydro power plants in Finland, and 12 modern biomass mill site-based combined heat and power plants that have been built since 1990. Total electricity generating capacity is approximately 1.6 GW. Recently UPM has rebranded as the 'Biofore Company' to emphasise its intentions to become a major player in the emission free energy market and to expand this business, leveraging cost competitive energy sources<sup>15</sup>.

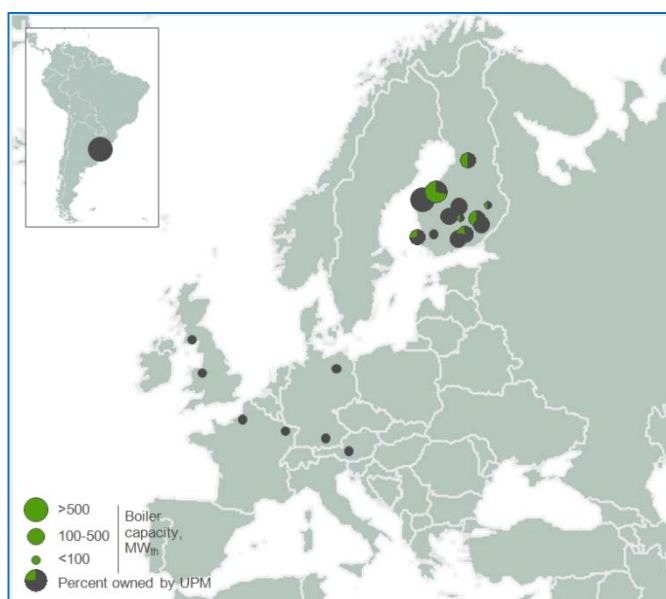


FIGURE 27 UPM INVOLVEMENT IN BIOMASS PLANTS

UPM has experience with large-scale biomass energy plants in six countries. Its predominant location is in Finland (771 MW capacity) but it has four other plants in Europe (108 MW) and one in Uruguay (161 MW). Many of these are under combined ownerships with the local town or other users in a district (Figure 27). UPM is the second largest biomass generator in Europe, and currently larger than any utility.

In the UK alone UPM has invested £120 M in renewable CHP plants, has appointed dedicated Supply Managers to secure supplies. In developing the business they worked with UPM Finland colleagues to establish current practice. Virgin biomass options were reviewed as there were clearly some opportunities. The focus for supply however has been towards brash and stump harvesting.

Brash and stump harvesting protocols were developed to ensure a thorough and professional process. A literature review and lifecycle analysis were commissioned by UPM Tilhill to be carried out by Renuables<sup>16</sup>; a spin out company from Bangor University. Work was undertaken jointly with other private sector companies, SEPA and Forestry Commission to develop and share results. Work on a literature review on environmental impact of stump harvesting and LCA was undertaken with Bangor University, and the information fed into the FC's own Guidance Note on site selection and best practice<sup>17</sup>. UPM also supported investments by contractors in equipment for harvesting and haulage. Environmental impact is clearly important, along with economics. In reality, opportunities in the UK for stump harvesting are fairly limited. Economically, with brash balers requiring an investment of at least £300,000, significant supplies are required. The assessment of sites for stump or brash harvesting however, revealed that there were relatively few sites that were suitable in the UK.

Life cycle analysis (LCA) in the study area in South West Scotland was carried on brash and stump harvesting and biomass energy systems (Figure 28). Systems considered included were roundwood harvesting only, roundwood and brash harvesting, roundwood and stump harvesting, and a coal fired system as a reference. The LCA investigated energy wood for fuel and compared it to the coal system in collaboration with UPM Caledonian. A particular area of

<sup>15</sup> [www.upmbiofore.com](http://www.upmbiofore.com)

<sup>16</sup> [www.renuables.co.uk](http://www.renuables.co.uk)

<sup>17</sup> Stump Harvesting: Interim Guidance on Site Selection and Good Practice. Forest Research, April 2009. [www.forestry.gov.uk/pdf/FC\\_stump\\_harvesting\\_guidance\\_April09.pdf/\\$FILE/FC\\_stump\\_harvesting\\_guidance\\_April09.pdf](http://www.forestry.gov.uk/pdf/FC_stump_harvesting_guidance_April09.pdf/$FILE/FC_stump_harvesting_guidance_April09.pdf) Accessed May 2010.



FIGURE 28 STUMP HARVESTING IN SOUTH-WEST SCOTLAND

interest related to soil carbon changes over a single rotation. Podzols and peaty gleys were selected as representative of the most frequent forest soil types, and in providing contrasting low and high soil carbon content. Data revealed that, relative to a typical 40 year rotation site with 100 percent removal of residues, clearfell resulted in a 18 percent positive change, whilst removal of residues on a clearfell site led to losses of 6 percent and 20 percent for above ground residues and stump harvesting respectively.

The UPM Tilhill operational controls and FC guidance highlight that best practise for brush and stumps harvesting should

operate on mineral soils only, avoiding organic rich soils. No more than 60 percent brush OR stump should be removed. The worst case scenario illustrated in Figure 29 (red dotted line) shows the result if all soil carbon was lost, which in reality would only be achievable if it was incinerated.

In summary all woodfuel systems offered at least a 60 percent improvement over coal in terms of carbon balance. All forest biomass systems complied with the minimum greenhouse gas savings stipulated in the Renewable Energy Directive (2009/28/EC) of 60 percent by 2018.

Soil carbon changes had a far greater effect on carbon emissions than the combination of all other inputs. Roundwood fuel systems made a positive contribution to lowering GHG emissions with no negative impacts on soil carbon. Energy generated from stumps had higher carbon emissions than energy derived from roundwood or brush. Transport of stumps was highlighted as inefficient (50 percent of energy inputs, 58 percent GWP).

Looking to the future uncertainties remain regarding the impact that stump harvesting could have on short and long term soil greenhouse gas emissions and further research is required. UPM Tilhill is considering further study options in cooperation with other UPM biomass supplying regions and other agencies.

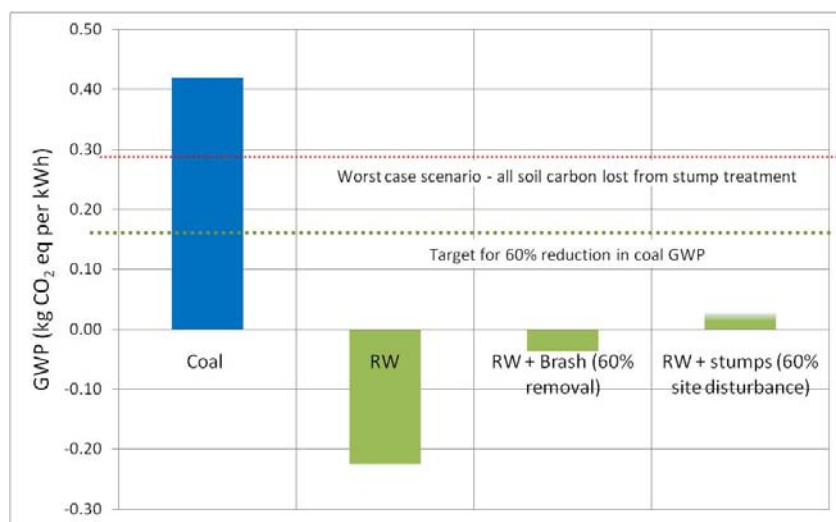


FIGURE 29 IMPACT OF UPM OPERATIONAL CONTROL AND FC GUIDANCE. RW = CLEARFELL

*Peter Whitfield FICFor is Timber Operations Director for UPM Tilhill*

[www.upm-tilhill.com](http://www.upm-tilhill.com)

## CONFERENCE SUMMARY

ANDREW SHERIDAN

It is my difficult task to provide a brief summary of such a full conference but I would like to share some of the key points that have stuck with me from the fifteen excellent presentations.

We started this conference with a session on the 'Big Picture' in terms of global energy supply and demand. Demand for energy is growing and against this background we need to somehow reduce carbon emissions. It is clear that we will have to employ all the weapons in our arsenal to achieve this, some of which, *e.g.* frugal living and journey curbing, are not going to be popular. The deployment of renewables will only play a part in the answer, albeit an important part.

The conference has focussed on the key renewable energy sources that are available from forest land and we have had a gallop through those technologies, namely biomass for heat and/or power and wind power. We heard that 900 million cubic metres of wood is already used for heat and power generation globally and that this can be grown through developing partnerships with the energy sector. The UK has some very challenging renewable energy targets for 2020 and to meet them we heard that an area the size of Wales would need to be covered in wind turbines.

It appears that policies are at long last in place to encourage renewables, especially renewable heat. The forthcoming Renewable Heat Incentive, which was mentioned by several of our speakers, will increase demand for woodfuel from commercial and domestic heat users and will provide new income streams for forest owners. There has been a general consensus that mechanisms to stimulate demand for wood heat are the most effective means of developing the industry – improve the economics of the technologies to increase demand and the forestry sector will gear-up to supply that demand.

Benefit to forest owners from new markets for biomass will not automatically follow and we heard how in Finland woodland owners add value to their product by selling heat to the customer rather than selling the trees standing in the forest. The alternative 'contracting' model that we are more familiar with in the UK maximises efficiency and lowers price for the end user but tends to drive down the price of wood received by the owner.

In contrast, returns to forest owners from wind farms can be very attractive, often much more attractive than those from timber production. There has been much discussion during the conference on whether we as foresters should be encouraging the felling of trees to make way for wind turbines. Turbines work best away from trees but it appears that much work is now being done to minimise the tree felling that is necessary to establish wind farms, and that habitat restoration is taking place where trees do need to be felled.

It is clear that maximising the potential for forests to produce renewable energy will have environmental impacts and we have heard how policies and practices are being developed to ensure that more energy is produced in a sustainable way in conjunction with real carbon savings.

As ever, communication to the general public about what we are doing as an industry is sometimes lacking and it is important to highlight the real progress that we have made on renewable energy since the last ICF conference on 'Wood for Energy' in 1990. If I can paraphrase John Woodruff's comment relating to a discussion on PR during the conference: Spin is good... it's what generates electricity!

*Andrew Sheridan MICFor was  
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2010 ICF National Conference.*

*Andrew is Senior Forestry  
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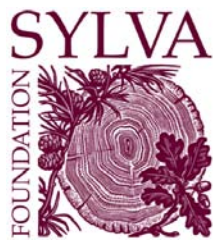
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