

The Potential for Wood Fuel Supply on the Isle of Wight



A report by South East Wood Fuels Ltd for the Isle of Wight Council

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Authors: Andrew Tolfts, Rebecca MacMillan



Aim and objectives

The overall aim of the study is to identify actions that can be taken to develop the production and use of wood and similar biomass fuels on the Isle of Wight. By realising their sustainable potential contributing to the aspiration to become an eco-island.

The expected outcomes of the study were

1. A better understanding of the Island's woodland and tree resource and its potential for use for renewable energy resource.
2. Reliable information for developers and planners to build their confidence in wood fuel as a viable energy source.
3. A contribution to the planning for a sustainable wood fuel industry with recommendations on measure to support its development.
4. Guidance to planners and developers embarking on wood fuel developments.
5. To evaluate the potential for wood fuel use to contribute to Eco-Island priorities.

The study is designed for use by policymakers on the Isle of Wight, developers, planners, the woodland industry and those considering installing renewable heating and CHP plants.

Cover picture: Woodland in the north west of the Island. Dense undergrowth shows the benefits of being deer free.

Executive Summary

The Isle of Wight has the resources for a viable wood fuel industry with both virgin timber and waste timber available and a small group of skilled and experienced personnel. If all the theoretically available wood were used 29,000 homes could be supplied with hot water and heating. In practice there are competing uses for some wood and some is inaccessible so it is thought that sufficient to heat only 17,000 homes will become available.

The wood fuel supply chain is poorly developed at present due to lack of demand but has the capacity to respond quickly to increased demand.

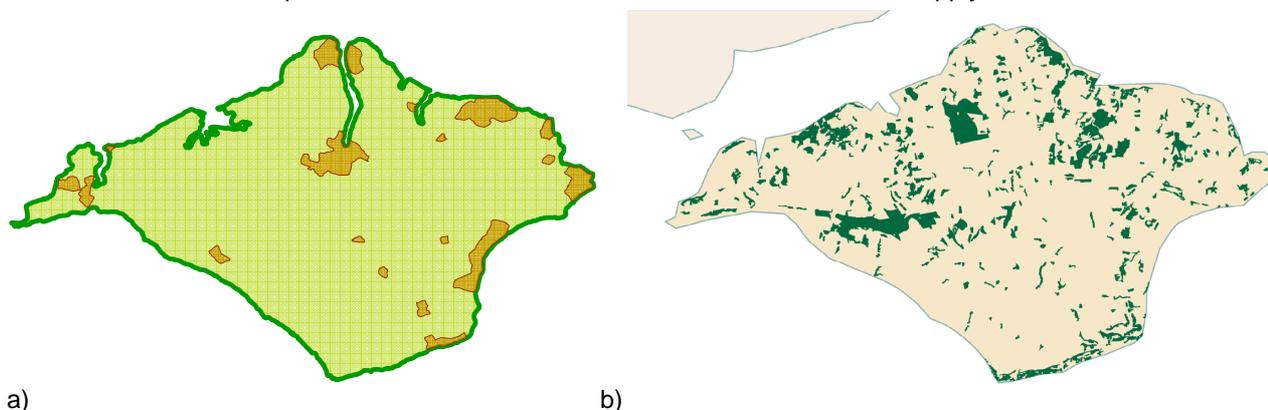
Context for wood fuel use

A commitment to reduce CO₂ emissions and to increase the use of renewable energy is part of the Isle of Wight Eco-Island concept. Using wood fuel can help deliver these objectives. There are several reasons for increasing interest in wood fuel, most of which are shared with other parts of the UK. They include:

- lifetime cost savings from adoption of wood fuels
- meeting public and private sector targets for carbon emissions reduction
- making progress towards zero carbon housing by 2016
- strengthening the rural economy and increasing the number of year round jobs
- maintaining the appearance of the countryside to support tourism
- improving biodiversity in particular managing woodlands for high profile species such as the red squirrel and dormice.

Central government instruments to achieve carbon reduction targets are becoming more important. These include the Climate Change Levy, the forthcoming Carbon Reduction Commitment and the incentives offered through Renewable Obligations certificate, the proposed Feed In Tariff for renewable power and the similar Renewable Heat Incentive which is expected to be introduced in 2010 or 2011

The distribution of built up areas is well matched to that of woodlands which will supply most wood fuel.



a) b)
Figure 1 Distribution of a) built up areas and b) woodlands over 2 hectares on the Isle of Wight. (source for woodland *National Inventory of Woodland and Trees*, Forestry Commission)

The available wood resource

Both virgin and previously used timber are available on the island. The main sources are:

Woodlands

There are 4,549 ha of woodland on the Island. The largest owner is the Forestry Commission with 1,123 ha. The remaining woodland is divided between many other owners. Much of the woodland has been undermanaged for a considerable time because markets for timber on the Island are very limited, particularly for softwoods. There is one permanent sawmill and several mobile sawmills though none cut large amounts of timber. It is uneconomic to transport logs by ferry for sawmilling on the mainland. This results in low prices for woodland owners.

The Forestry Commission reported that there is approximately 1,000 ha of overstood coppice which would benefit from renewed management. The limited management of private woods in recent years has been focussed on enhancing biodiversity values. FC woodlands have been more intensively managed.

By offering owners a higher price for their timber than existing markets wood fuel may help revitalise woodland management. However, potential yield from woodland is limited by poor accessibility, the availability of skilled contractors to manage the woods and competing management objectives. Given these constraints the potential annual production from woodlands is estimated at 15,300 tonnes of wood fuel at 30% moisture content.

Arboricultural arisings

Tree surgeons on the Island have developed markets for most of the logs and chip that are produced as a by-product of their tree maintenance work. The domestic log market is supplied from the hardwood logs. Branches and tops are chipped for mulch and surfacing. Softwood logs remain as a waste product but are beginning to be used as logs for wood burning stoves. The total amount available is estimated at 6,700 tonnes a year.

Tree surgeons have expressed interest in supplying wood chip as fuel and are well placed to enter the market as they could use much of their existing equipment. Many are also active as woodland managers.

Waste wood

There is a well established infrastructure for the collection of commercial waste, including waste wood. Four larger and eight smaller companies were contacted to assess their facilities, current wood management practices and interest in wood fuel supply.

Wood is a significant part of the waste stream and currently has a disposal cost of £66/t at the landfill site. There are limited alternatives to this at present. One company chips wood and exports it for particle board manufacture or to the Slough Heat and Power Station. Others were anticipating supplying the Forest Road CHP plant where the gate fee is expected to be £30/t.

Clean waste wood can be used in standard boilers but contaminated wood, including any that comes from construction or demolition, has to be burnt in equipment that meets the requirements of the Waste Incineration Directive to ensure there are no harmful emissions. An estimated 2,700 tonnes of clean waste wood and 2,800 tonnes of contaminated wood are produced each year.

Energy crops

There is the opportunity to plant both short rotation coppice (SRC) and annually harvested grasses such as Miscanthus for energy production. A proposed 100kWe CHP plant at Elm Farm, Calbourne plans to use energy grasses as its part of its fuel mix.

The costs associated with establishing both SRC and grasses mean they are unlikely to be planted without an established market for their output. SRC wood chip is slightly more expensive than chip from easily accessible woodlands so is not expected to be planted in the short term despite offering an additional diversification for farmers. Energy crops affect the appearance of the landscape and may not be appropriate in the AONB. In the long term up to 7,200 tonnes a year of biomass fuel may be available from energy crops grown outside the AONB.

Agricultural residues

Some farmers are experimenting with production of briquettes from straw, oil seed rape stalks and pea haulm. The briquettes are suitable for use in wood burning stoves and similar appliances. They may also be suitable for use in gasifying CHP units. The impact of removing biomass from farmland on soil structure and fertility has not been assessed in detail. As a new product uptake is expected to develop slowly to a total of perhaps 10,000 tonnes annually.

Estimated growth in woodfuel use

Growth is starting from limited use of logs today with no modern large wood chip boilers on the Island. The chart below represents one pattern of growth which might occur if support is given to both the supply and use of wood fuel. The savings in CO₂ emissions is indicated in Table 1.

Year	current	2011	2018	2028
Estimated quantity of wood fuel used (t/yr)	1,900	9,900	23,871	44,936
Carbon emissions avoided (tCO ₂ /yr)	1,400	8,000	18,800	35,200
Homes heated and provided with hot water	700	3,700	8,900	17,000

Table 1 Potential wood fuel and emissions avoided

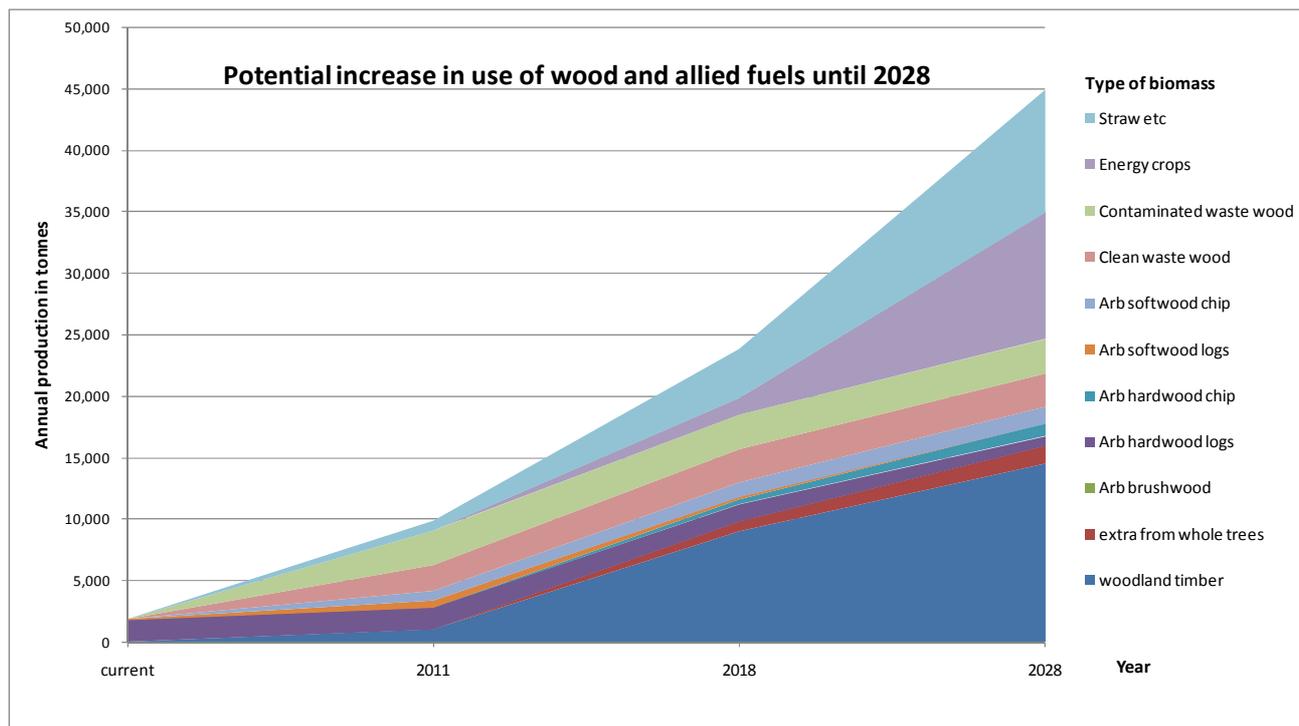


Figure 2 Likely growth in demand for wood and similar fuels on the Isle of Wight by wood source

A strategy for developing wood fuel use

The potential resource is limited but could make a valuable contribution to reducing the Island's carbon footprint. The following hierarchy is suggested as a guide to making best use of the resource and maximising carbon savings:

1. Reduce energy consumption through design of new buildings, draught proofing, improving insulation of existing buildings.
2. Use wood for heating since 80-85% of the embodied energy can be delivered as useful heat.
3. Use in combined heat and power systems. These have slightly lower theoretical efficiency (around 75-80%) but do not normally achieve this in practice unless run as base load heat providers.
4. Avoid stand alone electrical generation from wood as this has an efficiency of just 20-30%

Importing wood pellets will also help reduce the Island's CO₂ emissions beyond what could be achieved by using on-island resources.

Market development

Interest in wood fuel use is increasing though no new wood chip boilers have been installed so far. The Council is considering installation in existing schools and one of the prisons has plans for a new boiler to be installed in 2009. The large PAN housing project has yet to announce a firm commitment to biomass boilers. In the long term the use of wood fuel and similar biomass is constrained by the sustainable supply. Approximately 23,500 homes could have heating and hot water from biomass if all available biomass were used. The more likely total in the long term is 17,000 homes.

New buildings, existing premises and district heating schemes are all potential applications for biomass heating. Prospects for wood fuelled CHP are limited by the amount of fuel available and difficulty in finding a use for all the heat. A range of innovative measures to accelerate the adoption of wood fuel have been tried elsewhere and should be considered for the Isle of Wight. Grants and low interest loans are also available which, like many of the measures, aim at reducing the barrier posed by the higher capital cost of wood fuel boiler installations compared to fossil fuel alternatives.

The wood fuel supply chain

All kinds of woodfuel, logs, chip, briquettes and pellet can be made on the Isle of Wight but the supply chain is rudimentary as yet since there are no boilers to supply. Those working in forestry, tree surgery and waste industries are well placed to develop supplies. The likely pattern of development in the medium term is:

- firewood producers, many of them tree surgeons, will diversify into production of quality controlled, fuel grade wood chip;
- specialist equipment, such as larger drum chippers will be made available for contract chipping;
- woodfuel production and distribution hubs will be set up increasing the robustness of the supply chain and creating the facilities for further processing into wood briquettes and, perhaps pellets;
- import of pellets with distribution from either wood fuel hubs or stand alone facilities;
- waste wood processors are expected to start production of wood fuel with separation of clean and contaminated timber, principally to reduce disposal costs;
- a new processor of waste timber may be established to divert more wood from the waste stream; and
- several farmers will start to briquette straw and similar residues.

The processes involved in making wood chip from virgin timber from woodlands and tree surgery are drying, chipping, storage and delivery. Consistently high quality meeting the specification for the boiler is essential. Timber from forestry may be stacked, dried, chipped and delivered from the wood where it grows minimising investment in infrastructure. However production at a central yard or hub has a number of advantages:

- better utilisation of chippers and other equipment
- easier quality control and monitoring
- the capacity to hold stocks of chip and respond quickly and reliably to requests for supply
- easy access for delivery vehicles
- a higher public profile

Two or three hubs in the centre, east or north east of the Island, each processing up to 4,000 tonnes of chip annually would be able to supply all the virgin chip required in the medium term. The hubs would be best established near to end users rather than woodlands since smaller vehicles are normally used to deliver wood chip than transport timber. Reducing delivery time significantly reduces its cost.

Existing buildings, such as barns, silage clamps and concrete hardstanding can be adopted for wood fuel production, reducing the initial investment required to set up a wood fuel hub. Setting up a hub, even where some facilities are available is likely to cost at least £70,000.

Short rotation coppice also provides virgin wood chip suitable for use in all boilers. It is harvested with specialist equipment and normally stored and dried at the side of the field where it is grown. SRC provides an additional source of wood fuel without the need to invest in processing and storage facilities.

Waste wood can be sorted into clean (mostly pallets) and contaminated timber before wood fuel production. Chip made from pallets can be used in any wood chip boiler but that made from mixed or contaminated timber must be used in Waste Incineration Directive compliant appliances. The regulatory regime for waste wood is very different from and stricter than that for virgin wood. One advantage of waste timber is that drying is not normally needed. The processes involved in producing fuel chip from waste timber are similar to virgin timber except for a shredder substituting for a chipper and magnets extracting nails from the chipped wood.

Woodchip can be used as a fuel or can be further processed to make briquettes or pellets. Additional drying may be necessary as the wood needs to have less than 15% moisture content before processing. The chip is then further reduced in a hammer or ball mill and the resulting sawdust compressed to make either briquettes or pellets. Briquettes are made in a variety of shapes and sizes depending on the machinery used to make them. They substitute for logs in wood burning stoves and on open fires and some are suitable for use in gasifying CHPs. Straw and similar residues are a low cost raw material for briquettes which might allow them to compete with firewood logs.

Pellets are made at higher pressure to create a denser, more stable product. Diameters are standardised at 6mm or 8mm and well developed European standards are in place for describing and evaluating pellets. The cost of manufacture make briquettes and pellets more expensive than wood chip but they are particularly suited to use in individual houses as no expensive store is needed and they are clean and easy to handle.

Wood fuel delivery

Fuel reception and storage arrangements are critical for successful boiler operation, yet are often neglected in planning of new boilers. The best option for the fuel supplier is to tip into an underground store. This is quick, quiet and cheap but requires often expensive construction of the store. It maximises flexibility in delivery vehicles with everything from a tractor and trailer to a 90 m³ articulated lorry able to deliver, provided the store has a large enough capacity. Other options for delivery to above ground stores include scissor lift trailers, blowing chip into difficult to reach or above ground stores and having a hook lift bin 'cartridge' fitted with a walking floor. This is

connected to the boiler control mechanism and doubles as a fuel store as well as a means of delivery. The choice of delivery vehicle depends on the size of the fuel store and access constraints, but in general delivery in larger amounts is more economical.

Cost of production

Information on the production cost of the different fuels on the Island is incomplete, although they are not expected to differ greatly from elsewhere in SE England. Greater detail about the cost base for each fuel is given in the main report. The estimated prices for wood fuels for sale to the final user are:

Fuel source	Price range (£/tonne)	p/kWh range
Virgin wood	75.00 – 90.00	2.14 – 2.57
Clean waste wood	45.00 – 65.00	1.29 – 1.86
Contaminated waste wood	no information	
Short rotation coppice	85.00 – 95.00	2.43 – 2.71
Pellets	200.00 – 250.00	4.23 – 5.29
Briquettes, including straw	280.00 - 500.00	5.92 – 10.57

Table 2 Estimated wood fuel prices on the Isle of Wight

Expected price trends

The price of wood fuel on the Island is influenced by similar factors as elsewhere in the UK. The Solent partially isolates the island market, increasing costs of importing equipment and making it difficult for wood fuel from the mainland to compete with locally made products. In the past this isolation has depressed island timber prices and now means that a higher proportion of the Island's timber will be available for wood fuel production than in other areas where there is ready access to alternative markets.

The main factors affecting the price of wood fuel are the cost of timber, the cost of processing and delivery, and the balance between supply and demand. As demand increases rising wood chip prices will make management of additional woodland areas economic. Fossil fuel prices also influence wood fuel prices. When fossil fuels are cheap the rate of wood fuel boiler installation tend to fall and fossil fuelled backup systems may be brought into use. Conversely, higher gas and oil prices increase interest in wood fuel. The Renewable Heat Incentive will tend to increase wood fuel prices after its introduction in 2010 or 2011.

Taking into account these factors the price of woodfuel is expected to rise in the medium term. This may be delayed by the current recession but in 3-5 years wood chip prices may rise to £95 - £120 per tonne or 2.64 – 3.44 pence per kWh, mirroring the trend in fossil fuel prices. This will bring additional woodland into management promote higher diversion rates from the waste stream and expand the supply of wood fuel.

Actions to promote wood fuel use

A range of measures is available to both develop the capacity to supply timber and increase the number of boilers installed. The following actions will help improve the supply of wood fuel, particularly from woodlands:

- make woodland owners and managers better aware of existing grants and support, particularly for improving access
- providing additional support for improving access to woodlands
- investigate and demonstrate best practice for harvesting in small, difficult to access woodlands typical of many on the Island
- make best use of support available through the Rural Development Programme England (RDPE) for:
 - upgrading equipment for forestry contractors
 - setting up woodfuel production hubs
 - providing training such as the 'Ignite' course for wood fuel producers

To stimulate market development

- introduce a planning requirement for on-site renewable energy requirement (the 'Merton Rule') set at 20% or more of total energy use
- have a "consider biomass first" rule when installing boilers in Council premises
- use new, best practice biomass heating installations on the Island as case studies and demonstration units at all scales from individual households to large commercial boilers
- continue a campaign of information and education covering technical aspects of woodfuel use, economic benefits, grants and loans available for boiler installation
- make grants or loans for capital costs in addition to existing schemes
- consider setting up an ESCo to overcome the issue of high initial capital cost, either funded by external sources or in partnership with an existing ESCo provider

The Potential for wood fuel supply on the Isle of Wight

Aim and objectives	i
Executive Summary	ii
1. Context	1
1.1 Market drivers.....	1
1.2 The local policy context.....	2
1.3 Distribution of supply and demand	3
1.4 Air quality impacts	4
2. Potential Wood fuel Resources	5
2.1 Woodlands	5
2.2 Waste Wood.....	8
2.3 Compost oversize.....	10
2.4 Energy crops	10
2.5 Competition for wood	11
2.6 Ensuring the availability of biomass fuel	11
2.7 Carbon saving	13
3. A strategic approach to developing wood fuel use and reducing carbon emissions	15
4. Market Development.....	17
4.1 The current market.....	17
4.2 Biomass Fuelled Combined Heat and Power.....	18
4.3 Incentives & Grants	19
4.4 Measures to accelerate growth	20
5. Developing the supply chain.....	22
5.1 Wood fuels	22
5.2 Log production.....	24
5.3 Wood chip production from virgin timber.....	24
5.4 Wood chip from waste timber	27
5.5 Briquettes	28
5.6 Wood pellets.....	28
5.7 Development of the wood fuel and solid biomass supply chain	28
6. Distribution and delivery	31
6.1 Wood fuel hubs	31
6.2 Wood chip delivery	32
6.3 Wood pellet delivery	34
6.4 Importing wood fuel	35
7. Production costs for wood fuels.....	36
7.1 Wood chip from virgin timber at a central production site	36
7.2 Wood chip from waste timber	36
7.3 Short rotation coppice	36
7.4 Imported pellets.....	37
7.5 Small scale pellet production.....	37
7.6 Briquettes	37
7.7 Expected price trends.....	37
8. Training needs.....	39
9. Actions to promote wood fuel use.....	40

The Potential for wood fuel supply on the Isle of Wight

1. Context

1.1 Market drivers

Cost savings from use of wood fuel

The expected price of wood fuel and prices of alternative fossil fuels on the Isle of Wight were compared using prices from local suppliers. Figure 1.1 illustrates the cost effectiveness of wood fuel

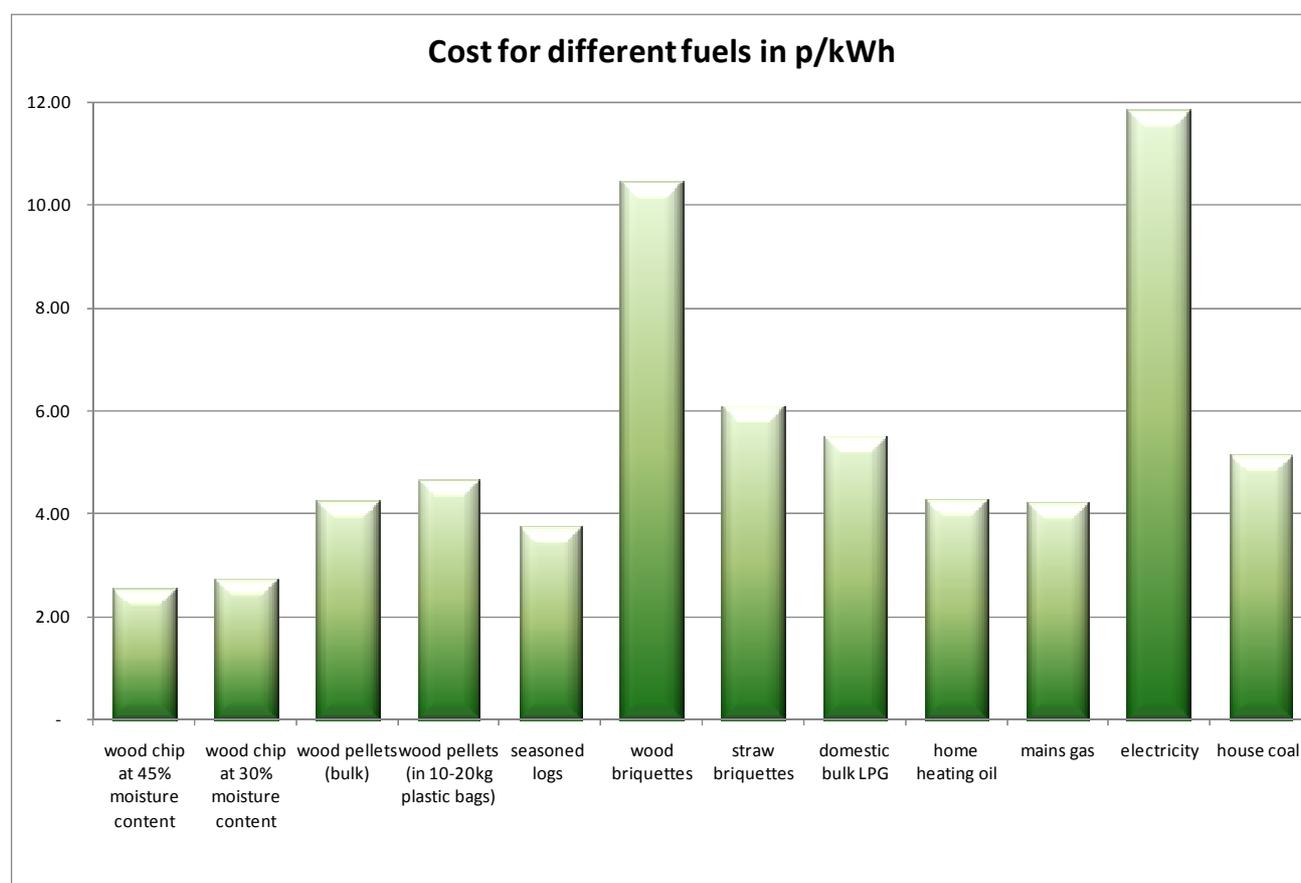


Figure 1.1 Price comparison for wood and fossil fuels on Isle of Wight, November 2008

The lower price for wood fuels reflect the generally higher initial capital cost for the boilers and their associated fuel reception and storage facilities. With wood fuel prices below fossil alternatives this extra cost is often recovered in as little as 5 years where the expected life of the boiler is 20 years. It is expected that lifetime costs for wood fuelled installations will be lower than for fossil fuel boilers.

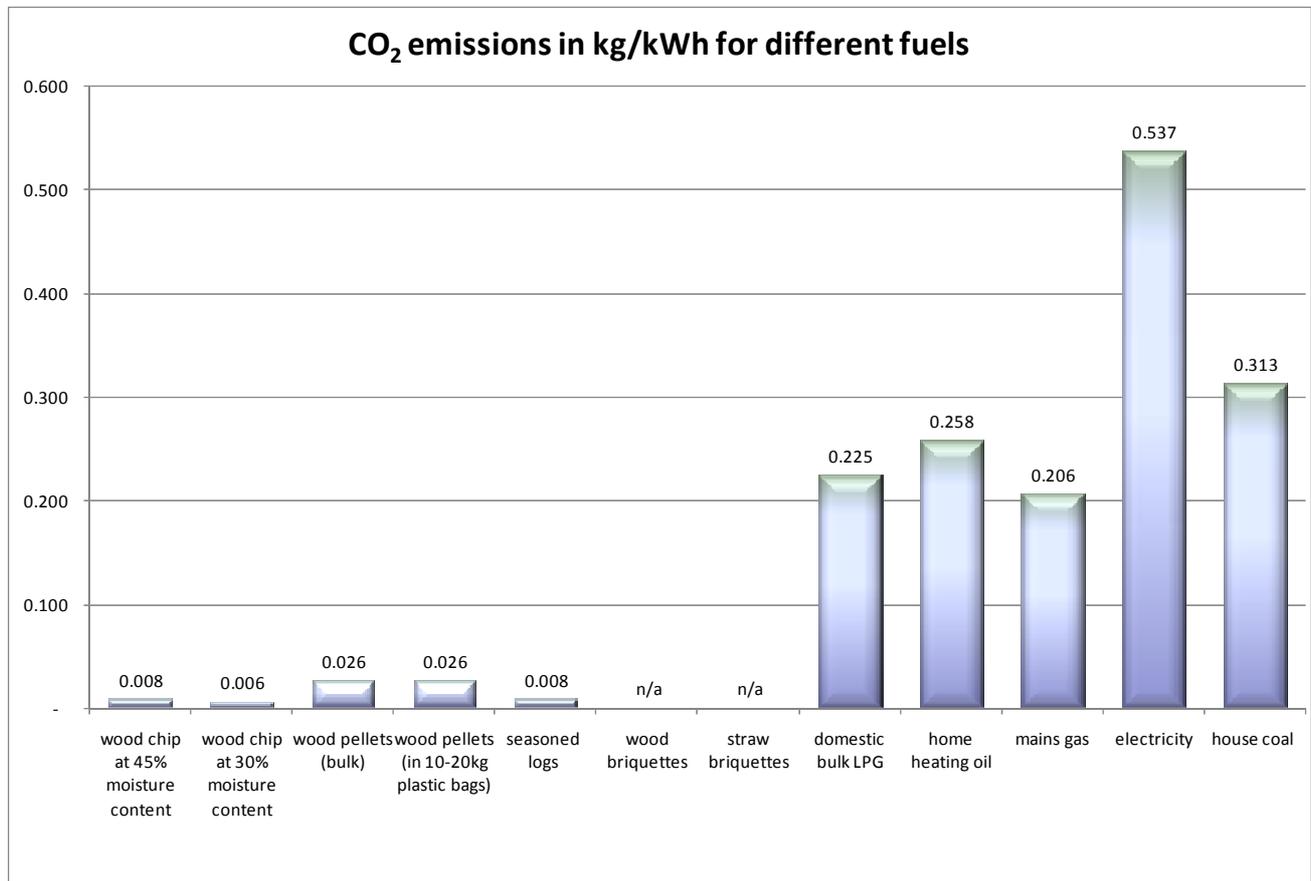
Carbon emissions savings

Many organisations and individuals are concerned about their carbon footprint and wish to reduce their emissions to a 'One Planet' level. Using wood and similar biomass fuels is an effective step towards this goal offering significant savings compared to fossil fuels (see Figure 1.2).

Motivations for carbon reduction include:

- reducing the cost of taxes such as the Climate Change Levy and emissions trading schemes;
- realising benefits from voluntary or mandatory carbon trading schemes including the Carbon Reduction Commitment;
- demonstrating corporate social responsibility;

- implementation of locally or nationally set carbon reduction policies in the public sector;
- demonstrating low carbon technologies in schools and colleges to support teaching;
- compliance with planning regulations for new domestic and other buildings which require energy saving and carbon reduction as actions towards sustainability;
- meeting national policies such as the increasing Code for Sustainable Homes levels and zero carbon homes by 2016



NB: Energy and carbon data for briquette production not available.

Figure 1.2 Carbon dioxide emissions for different fuels

1.2 The local policy context

The Eco-Island strategy¹ is the overarching framework for the planned transformation of the Island to a low carbon economy. The current Eco-Island vision is to 2020. Among the 15 priority actions are “to create wealth and reduce our carbon footprint at the same time” and to “produce as much of our energy as possible from renewable resources”. Actions relevant to wood fuel for 2008-09 include:

- equipping 3 new community buildings with renewable energy systems;
- implementing the Council’s own Carbon Management Strategy to reduce emissions from council activities by 4% per year; and
- designing an eco-school for Cowes with very low energy requirements, to be built by 2011.

The Eco-Island Strategy is managed by the Island Strategic Partnership (ISP) among whose aims are:

- “the ISP wants the Island to have the lowest carbon footprint of any region in England by 2020;
- We will invest in renewable energy technologies and use energy and water more efficiently.”

There are no specific targets for renewable heat or wood fuel use in the Eco-Island documentation.

The Eco-Island strategy is a key reference for developing the revised planning framework for the Island, the Island Plan (the name given to the Local Development Framework). A consultation on Core Policies (CPs) to be included

¹ www.eco-island.org.uk

in the Island Plan has been held. This highlighted the potential for renewable energy, and in particular biomass in CP13:3.

CP1 outlines proposals to adopt standards for the sustainability new development which require all major developments² to meet the standards in Table 1.1. This is more rapid than envisaged in the national plan. Code for Sustainable Homes level 4 requires 44% and level 5 requires 100% reduction in CO₂ emissions resulting from energy use in the house. Biomass fuels will certainly play a part in achieving this as a proven, modern, cost effective means of heating.

	Residential Code for Sustainable Homes³ level	Non-residential over 500m sq BREEAM standards
Now	4	Very good
From 2012	5	Excellent
From 2016	6	Excellent

Table 1.1 Proposed standards for new development

The progress towards sustainability and improved quality of life are monitored (from April 2009) through the Local Area Agreement with national government. A subset of 35 out of 198 indicators in the National Indicator Set are used to judge progress towards targets across the whole range of council activities. Included in the 'designated' indicators are two that are directly relevant to wood fuel:

- 186 Per capita reduction in CO₂ emissions in the LA area; and
- 188 Planning to adapt to climate change

Targets are included to reduce waste sent to landfill which will favour the use of waste wood as fuel.

The Council's Carbon Management Programme⁴ for its own activities aims for a 60% reduction⁴ in carbon emissions in 15 years. As part of the strategy to achieve this it includes commitments to renewable energy use, including biomass where appropriate, and achieving zero carbon in new flagship buildings.

Using wood as fuel, particularly if it comes directly from woodlands, supports a number of other policies.

- The natural environment and biodiversity conservation are enhanced through higher levels of woodland management benefiting iconic species such as red squirrels .
- Rural employment and skills benefit since wood fuel creates local jobs and contributes to rural diversification.
- Diversion of wood from the waste stream will reduce the quantity of material going to landfill.

1.3 Distribution of supply and demand

The Isle of Wight is sufficiently compact that the distribution of urban and rural areas does not affect the suitability for biomass use. Similarly the distribution of woodland and other wood resources across the Island offers a local source of wood fuel in all areas. See Figure 1.3Figure 1.

Automated wood fuel boilers running on wood pellet or wood chip are well suited to communal or district heating schemes which combine housing and commercial office and other uses. Use of wood chip for heating individual houses is not normally cost effective. The need for deliveries of a bulky solid fuel and economies of scale as boiler size increases favour shared facilities. Where an area is already served by district heating this can often be changed to wood fuel. However, installing district heating in existing low density housing is not always economic.

The best opportunities and lowest costs for wood heating are often in new developments where the needs for access and siting of the fuel store can be considered early in the planning process.

² Major means 10 or more dwellings or a site over 0.5ha for housing, 1000m² or more or a site over 1ha for commercial developments

³ Available from www.communities.gov.uk

⁴ available at: <http://www.iwight.com/council/committees/cabinet/11-12-07/Paper%20D%20-%20Appendix%201.pdf>

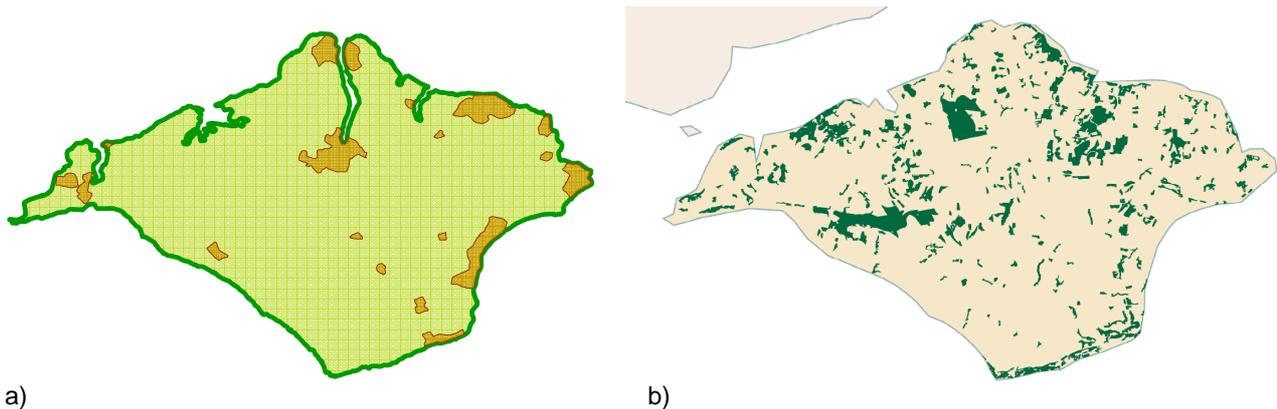


Figure 1.3 Distribution of a) built up areas and b) woodlands over 2 hectares on the Isle of Wight. (source for woodland *National Inventory of Woodland and Trees*, Forestry Commission)

1.4 Air quality impacts

Wood fuel produces particulates and NO_x emissions at levels higher than natural gas systems of similar output. This can cause concern in heavily urbanised areas. In London a report commissioned by a group of London Councils⁵ suggested that widespread adoption of wood fuel could jeopardise achievement of European air quality standards for particulates (PM₁₀ and PM_{2.5}) and NO_x. The methodology of this report and its emissions assumptions were criticised and a second study is now being made using more appropriate methodology.

A similar study carried out for the Scottish government⁶ showed more limited impacts for particulates. It includes a modelling tool for local authorities to assess local impacts more precisely. The study demonstrated that for the two cities assessed, Edinburgh and Dundee biomass would not be a major source of PM₁₀ or PM_{2.5} in urban areas but may lead to limits being exceeded where background levels are already high. If necessary, additional abatement measures can be taken with new boilers. Clean up technology is improving, for example ceramic filters have been shown to significantly reduce particulate emissions⁷.

With relatively small urban areas on the Isle of Wight, and limited wood resources it is unlikely that the impacts on air quality from use of wood fuel will be significant.

⁵ December 2007, *Review of the Potential Impact on Air Quality from Increased Wood Fuelled Biomass Use in London*, produced by AEA Energy & Environment for the London Councils and available at <http://www.londoncouncils.gov.uk/Transport/briefings/ReviewofthePotentialImpactonAirQualityfromIncreasedWoodfuelledBiomassUseinLondon.htm>

⁶ <http://www.scotland.gov.uk/Publications/2008/11/05160512/0>

⁷ Stewart Boyle, Wood Energy Ltd., personal communication.

2. Potential Wood fuel Resources

2.1 Woodlands

Woodland types and ownership

The 1996 inventory of woodland and trees estimated woodland cover at 12.0%, up from 9.7% in the 1980 census and continuing a long term trend of gradual increase in woodland cover. This is slightly less than the average for SE England (14%) but the pattern of smaller woodlands with a high proportion of broadleaved species is typical of the region. The total woodland area is 4549ha with the mix of woodland types shown in the table below. The increase in the woodland area results in part from new planting, particularly the 'Jigsaw Challenge' of the last 10 years which aimed to consolidate and connect ancient woodlands. Development of naturally regenerated scrub areas into woodland also contributed to the increase in woodland area.

Forest type	Woodland size (ha)	Percentage of total area
Conifer	495	10.9
Broadleaved	2,990	65.7
Mixed	639	14.0
Coppice	0	0.0
Coppice with standards	8	0.2
Open space	418	9.2
Total	4,549	100

Table 2.1 Isle of Wight Woodland types (1996). Source: *National Inventory of Woodlands and Trees*, Forestry Commission (2002)

In the 1996 inventory an area of overstood coppice with standards approaching 1000ha was reclassified as high forest creating the impression that there is almost no coppice on the Island (Hugh Milner pers. comm.). However, it is possible to restore the majority of this overstood coppice to productivity with benefits for target conservation species including dormice and red squirrels.

The woods are distributed across the Island with a marked concentration in the less exposed northern half of the Island on heavier soils. A notable exception to this is the Brighstone forest complex. Wood fuel from anywhere on the Island is within the commonly accepted 20-25 miles maximum economic transport distance of any other part of the Island.

There is a significant area of ancient semi-natural woodland on the Island and of plantations on ancient woodland sites (PAWS) as shown in Table 2.2 below

Woodland classification	Approx area (Ha)
Ancient semi-natural woodland (ASNW)	900
Plantations on ancient woodland sites (PAWS)	714
Plantations not on ancient woodland sites	1632
Naturally regenerated woodland (not ASNW)	228
Scrub areas classed as young woodland	595
Total	4069

Table 2.2 IoW woodlands classed by broad ecological type. Based on information supplied by Forestry Commission.

The Forestry Commission is the largest woodland owner on the Island controlling 27.5% of the total resource. These are the most intensively managed woods and have the best access. This gives the Commission considerable influence over the availability and price of timber locally. There are few large private woodland owners and the majority of private woodland blocks are smaller than the Commission's. Many privately owned woodlands have poor

access or are on steep slopes. All these factors tend to make production of wood fuel more difficult and expensive than from the Commission's woods. The breakdown of species and ownership is given in Table 2.3 below.

Species	Forestry Commission		Other		All ownerships	
	area (ha)	spp %	area (ha)	spp %	area (ha)	spp %
Scots pine	11	1	56	2	67	2
Corsican pine	183	16	270	9	452	11
Norway spruce	0	0	34	1	34	1
European larch	0	0	20	1	20	0
Other conifers	0	0	269	9	269	7
<i>Total conifers</i>	<i>195</i>	<i>17</i>	<i>648</i>	<i>22</i>	<i>843</i>	<i>21</i>
Oak	57	5	826	28	883	22
Beech	390	35	247	8	637	16
Sycamore	0	0	189	6	189	5
Ash	252	22	408	14	660	16
Birch	172	15	88	3	260	6
Poplar	0	0	12	0	12	0
Sweet chestnut	0	0	83	3	83	2
Elm	0	0	5	0	5	0
Other broadleaves	57	5	398	14	455	11
Mixed broadleaves	0	0	42	1	42	1
<i>Total broadleaves</i>	<i>928</i>	<i>83</i>	<i>2298</i>	<i>78</i>	<i>3226</i>	<i>79</i>
Total – all species	1123	100	2946	100	4069	100

Discrepancy in totals with other tables due to open space and rounding errors

Table 2.3 Area of high forest by principal species and ownership in 1996. Source: *National Inventory of Woodlands and Trees*, Forestry Commission (2002)

Current condition and management

The size of the forest resource, its species mix and cost of transport across the Solent is a serious impediment to commercial management of woodlands. There is a lack of sawmilling capacity for higher value logs on the Island, due to the limited resource, small market for timber products and competition from imported timber products made in low cost, high throughput facilities elsewhere. This results in low prices for woodland owners. For example, the Forestry Commission recently sold standing timber containing sawlogs at £3/m³, approximately 15% of the price they would have expected for similar quality trees on the mainland. The market for hardwood timber is just as difficult with little incentive for owners to thin or fell areas for the timber value. Most thinnings are sold as firewood for domestic use although difficulty in selling lower density species such as sycamore as firewood was reported. The lack of viable markets for timber on the Island has led to cutting below the sustainable level for both softwoods and broadleaves. Many woodlands are now overdue for thinning.

The main drivers for management biodiversity and management for key species, notably red squirrels and dormice. Grants offered by the FC have influenced owners' management choices towards the reintroduction of coppicing and restoration of plantations on ancient woodland sites (PAWS) to native broadleaved species. Although most woodland SSSIs are in favourable or recovering condition many would benefit from a increased management. Hazel coppice cutting cycles of around 15 years rather than the traditional 8 – 10 years benefit dormice and red squirrels and produce more suitable material for wood fuel production.

High value sawlogs are the only timber that it is worthwhile exporting to the mainland. The price for lower value products such as fencing bars and pulpwood is insufficient to cover the cost of transport across the Solent. This increases the quantity of wood available for wood chip fuel. An increase in the demand for wood fuel, in particular as wood chip, could revitalise the woodland sector, provided the price provides a realistic return to woodland owners, managers, contractors and production staff. The lowest price quoted for timber delivered to the user was £30 per green tonne for timber from larger plantations with good access. Timber from smaller, less accessible, poorer quality woodlands will cost more to bring to market.

Potential yield

The potential long term yield from woodlands is influenced by species, their accessibility, size and the price that can be obtained for wood fuel. The estimate given below in Table 2.4 has been compiled from information from the National Inventory of Woodlands and Trees, advice from Forestry Commission officers and consultation with woodland owners and contractors on the Island. It does not take account of existing uses for timber and should be seen only as a broad estimate of availability.

	FC		other ownerships		all woods
	ha	yield	ha	yield	
Conifers (yield 12m ³ /ha/yr)	195	2,340	648	7,776	10,116
Broadleaves (yield 5m ³ /ha/yr)	928	4,640	2,298	11,490	16,130
Total sustainable annual yield	1,123	6,980	2,946	19,266	26,246
Percentage accessible	95%	6,631	50%	9,633	16,264
tonnes/yr @ 30% moisture content		5,210		7,569	12,779
20% extra from whole tree harvesting		1,042		1,514	2,556
Total potential wood fuel from woodlands @ 30% moisture content		6,252		9,083	15,335

Note: 1m³ is equivalent to 1 green tonne of timber (45% moisture content)
30% moisture content used as this can be used in all modern wood chip boilers

Table 2.4 Potential wood fuel yield from Isle of Wight woodlands

Comparison with data from the wood fuel assessment carried out for the Forestry Commission show broad agreement. This shows potential wood fuel availability at 30% moisture content rising from 9,400 tonnes annually to 15,740 tonnes a year by 2021.

Over the next 10 years higher yields may be available as woodlands are brought back into management, coppice management is restored and the accumulated annual increment is harvested. After this period the annual quantity available will revert to the figure shown above.

2.1.1 Sawmill co-products

There is only one well established fixed sawmill on the Island, Clifford J Matthews Ltd, and four or five smaller mobile sawmills some of which are used in a single location. Slabwood and offcuts from the mobile mills are normally disposed of as firewood logs or left on site. The quantities produced are small and would not make a significant contribution to wood chip supplies.

Clifford J Matthews produces an estimated 4 tonnes a week (200 t/yr) of offcuts. Some is bagged and sold as firewood, some is given away free to people collecting it and the remainder is treated as waste. All the offcuts could potentially be stored and then chipped when a sufficient quantity accumulated to justify hire of a chipper, probably 2 or 3 times a year.

2.1.2 Arboricultural arisings

There are 15 tree surgeons and landscapes specialists identified as operating on the Island of which there are a number of smaller operators and a few larger companies dealing with the majority of the arisings.

Brushwood chip

Approximate levels of arisings: 3500 tonnes per annum

Disposal/Use: A small proportion is taken to landfill or for green waste composting where there is no other convenient disposal route and no access to a chipper. Chipped brushwood is disposed of as

- mulch, largely used in new developments
- surfacing for pathways and in particular horse ménages

- delivered free or at a nominal price to third parties, or
- left on site, spread out to decay.

Some tree surgeons look on brushwood chip as a disposal problem and are glad to get rid of it so long as it does not cost them anything. Others see it as a resource and have developed markets for it. Prices vary according to end use and quality of the chip. The price achieved is commonly £10 - £14 per cubic metre delivered. The highest rate reported, £35 per cubic meter, was for high quality chip sold into specific niche markets.

The market for chipped brushwood seems robust with little surplus at present. A decrease in new house building may reduce demand and produce an excess that could be available for other uses including wood chip fuel. The returns from supplying undried wood chip fuel, screened to a G50 specification are similar to the price for mulch, £10 - £12 per cubic ex yard meter after processing⁸. At this price it is difficult for individual tree surgeons to justify investment in screening equipment and alternative low cost disposal routes, such as leaving chip on site or spreading on arable land, are likely to be used.

Hardwood logs

Approximate levels of arisings: 1800 tonnes per annum

Disposal/Use: There is a secure market for hardwood as firewood on the Island with increasing numbers of log stoves being sold. In the medium term there may be potential for supply of briquettes made from straw and other agricultural residues as well as sawdust. These may substitute for firewood logs as the relatively low cost of straw and other residues may result in a lower cost product for consumers.

Until recently only the best firewood species, such as oak, ash and beech were used. Lower density species such as sycamore and poplar were rejected. However, shortage of the premium species is leading log merchants and users to accept a wider range of species including less dense hardwoods such as birch and sycamore.

Softwood logs

Approximate levels of arisings: 1400 tonnes per annum

Disposal/ Use: In contrast to hardwoods softwood logs are not readily accepted as firewood and pose a disposal problem for tree surgeons. Rather than being a source of income they may incur disposal charges for tree surgeons, although this is only the case for a minority of tree surgeons. As with brushwood there is a great range of disposal strategies. It may be:

- left with the tree surgeons' clients
- sold or given away for domestic wood-burning stoves
- individual large logs of particular species (e.g. *Cupressus macrocarpa*) sold as timber
- 'interesting' logs used for sculpture or furniture, and
- sent to landfill at cost to the tree surgeon.

Sale as firewood is only just developing for softwood logs. Their tendency to spit was a serious drawback when used on open fires. The increase in use of enclosed log stoves has created a market for softwood logs although it is not yet well-established. Until recently there was a clear surplus of softwood, although this has decreased in the last couple of years.

2.2 Waste Wood

The Waste Wood Industry

Post consumer waste wood arises from households, commercial and industrial users and the construction and demolition industry. Each source tends to use a particular disposal route:

- Large items of household waste that contain wood are commonly disposed of through Civic Amenity sites run by Island Waste on behalf of the Council. Due to space constraints timber is only segregated at one CA site. At present this material is landfilled but there are plans to use it as fuel for the Energos CHP plant at Forest Road.
- Commercial waste is collected by waste companies and skip firms. Industrial producers of woody waste use similar disposal routes. Some larger retailers return packaging waste to distribution centres on the mainland.
- Most building contractors use one of the approximately 11 skip companies serving the Island. This is then processed via the waste transfer stations. On the largest projects a site waste management plan will segregate waste wood at source.

⁸ Assume delivered as undried G50 grade chip at £32/t ex yard

Skip waste is sorted at one of four waste transfer stations operated by skip companies and Island Waste. Much of the wood is sent to landfill as there is no outlet for it on Island. A proportion is sent to the mainland for use as fuel in power stations or for particle board manufacture.

Amount of waste wood

Estimates of the amount of timber processed were given by the 3 largest companies, all of whom operate waste transfer stations and recycle varying proportions of the material received. The estimates are summarised below.

Company	t/yr wood received	t/yr clean wood	t/yr contaminated wood	Processing facilities	Disposal route
1.	50	17	33	Wood separated out as part of recycling process. Clean wood (pallets) stacked separately.	Contaminated wood to landfill. Clean to green waste compost.
2.	5,000	2,500	2,500	20t/hr shredding and screening line at transfer station. Ability to sort clean and contaminated wood. Bulkiers and smaller vehicle for transport	Avoids landfill if at all possible. Sends mixed chipped wood to power stations and board mills.
3.	250	Not stated	not stated	Transfer station to receive and sort waste wood, separating clean and contaminated wood.	Previously burned on site but relocating and cannot move incinerator. Sends clean wood to green waste composting. May send to another waste processor.
4.	not stated but substantial			Sorting facilities, works with Island Waste for disposal	Contaminated wood to landfill. Untreated shredded and composted.
8 other smaller companies	420 **				Some straight to landfill, some to transfer stations for sorting.
Total	5,800*	2,700*	2,800*		

* estimated total

** estimate based on phone interviews with the smaller companies

Table 2.5 Waste timber availability

Cost of disposal is the key factor for waste companies and all are anticipating supplying the Forest Road CHP plant. This would avoid landfill tax, saving £36/tonne. Tipping at the landfill site costs £66/t including landfill tax of £32/t. Landfill tax will rise to £42 in April 2009 increasing the incentive to recycle wood. Segregation of pallets for processing into wood chip or pellet fuel would be an attractive option for waste companies even if the material was accepted at no charge.

In addition there is a relatively small amount of wood arising from joineries, timber merchants and other wood-using businesses. This may already be accounted for in the figures above as it is commonly collected in skips.

Potential for use as wood fuel

Disposal of any of the wood currently collected incurs a cost of between £30 and £66 depending on whether or not it is sent to landfill. Even when the Forest Road CHP is in routine operation a gate fee may still be charged for wood disposal, even if it has been sorted and shredded. If a gate fee is not charged the cost of labour and transport must still be met. An alternative use in dedicated wood chip boilers (for clean wood) or WID compliant CHP plant (for contaminated timber) which could pay for the wood would be an attractive option for companies dealing with this waste.

Approximately 2,700 tonnes a year of clean waste wood could be shredded and used directly as wood chip fuel or as feedstock for wood pellet production. The 2,800 tonnes of contaminated wood is sufficient to support a CHP plant of 300kWe capacity. This would also produce approximately 600kW of heat.

2.3 Compost oversize

The oversized material screened out of open row green waste compost systems at the end of production process contains a high proportion of woody material. On the mainland this often poses a costly disposal problem for compost producers. Trials by Brighton University, TJ Composting and BioRegional have shown it is possible to clean and reprocess this material to produce a wood chip fuel suitable for use in larger boilers.

The major green waste composting site on the Island is operated by Island Waste. The oversized materials screened from their compost is reprocessed by Wight Salads and mixed with tomato plants once they have finished in an on-site composting system. This uses all the screenings from Island Waste's composting site leaving no surplus that might be used as fuel.

2.4 Energy crops

Three types of energy crops are recognised, Short Rotation Coppice (SRC), Short Rotation Forestry (SRF) and annually harvested, fast growing grasses, principally miscanthus although switch grass and reed canary grass are attracting increasing interest.

SRC, normally willow, is planted at high density (10,000 cuttings/ha) with an initial harvest 4 years after planting followed by cutting on a 3 year cycle either as billets or wood chip. Yields are often around 8 odt (oven dry tonnes) per hectare per year in the initial harvest rising to 12-14 odt/ha/yr in subsequent harvests. Defra's national mapping⁹ indicates that the Isle of Wight has low potential for SRC but the resolution of the mapping is low (5km squares) and suitable sites for SRC may be found locally. Expected long term yields from SRC are 8-12 odt/ha/yr.

SRF is closer to traditional forestry in that it is planted at similar or slightly higher densities than conventional forestry and grown for 8-15 years before harvesting with standard forestry techniques and equipment. Very fast growing species are used, mostly exotic broadleaves such as *Nothofagus* or *Eucalyptus* although more familiar species such as poplar, alder and sycamore are also being evaluated. Some fit well into the landscape but others such as the *Eucalyptus* may have undesirable impacts on the landscape. This is a developing forestry approach and predicted yields vary from 6 – 15 odt/ha /yr with the highest yields being predicted for selected eucalypts provided they prove sufficiently frost tolerant. In the longer term SRF areas planted with species that coppice may develop into areas run in a similar way to traditional hardwood coppice.

Miscanthus (elephant grass) is managed and harvested with standard agricultural machinery. The Defra map of potential for miscanthus shows the Isle of Wight as a high potential area with expected yields of 12 odt/ha/yr or more. Miscanthus and other energy grasses are proposed as part of the fuel supply for the 100kWe CHP plant at Elm Farm, Calbourne that has recently applied for planning permission. This will require approximately 750 tonnes of biomass fuel annually.

It is expected that energy crops will only start to be widely used after easily accessible existing resources from woodlands and the waste stream are committed. The investment required for crop establishment and time before the first harvest (4 years for SRC) discourage planting before a clear market exists. The type of energy crop planted will be influenced by the requirements of boilers and CHP equipment installed, for example miscanthus may not be suitable for use in boilers designed for wood chip.

Energy crops are a potential new enterprise for farmers, allowing diversification. Once established they require relatively little attention and can provide a regular source of income. However, small field sizes are not well suited for energy crops, particularly SRC where 20m headlands are required for harvesting equipment to turn. This may restrict their use in some areas.

A key issue for energy crops on the Isle of Wight is the visual impact they might have in the AONB, although gradual adoption over a number of years and planting SRC and SRF energy crops next to existing woodlands will help to integrate them into the landscape. It is possible, though unlikely that planting within the AONB may be restricted to preserve the current appearance of the area.

⁹ see <http://www.defra.gov.uk/farm/crops/industrial/energy/opportunities/se.htm>

For this strategy a conservative estimate of the rate of adoption and potential area that might be planted has been used. Areas planted with arable crops, temporary grassland or set aside were considered as potential energy crop sites. In line with other studies¹⁰ it is estimated that 10% of the suitable area will be planted with energy crops in the long term. The AONB covers half the Island and planting may be restricted within it, so the estimate has been reduced by 40%. It is expected that 600 ha will be planted to energy crops in the long term with the mix of SRC and miscanthus determined by available planting sites and markets. 600 ha would yield at least 7200 odt of biomass fuel annually.

The estimated costs of production for SRC and miscanthus are summarised in Section 7. These indicate that at current costs and grant rates a price of £50/t for SRC at 30% moisture content and £45/t for miscanthus at 20% moisture content is required to provide an acceptable return to the grower. For SRC this is similar to the expected price for wood chip from woodland excluding delivery to the end user. For many applications miscanthus will require briquetting or pelleting. Depending on the cost of processing the cost to the end user will be similar to or slightly greater than wood chip.

2.5 Competition for wood

Wood produced on the Island is not necessarily used for fuel, nor is it always used on Island. Historically sawlogs and lower value pulpwood have been sent to the mainland despite the impact of ferry costs. However, returns to growers, principally the Forestry Commission, have been very low or negative. The private sector has tended to leave trees standing rather than cut them at a loss. Wood fuel used locally offers potentially more attractive returns.

Increased use of wood fuel will enable more intensive woodland management. More timely thinning will result in an improvement to the quality, growth rate and value of the final crop trees. In the long term, better management will create a greater resource of hardwood and softwood sawlogs on the Island and may lead to an expansion of sawmilling. With a higher proportion of timber used as sawlogs less will be available as fuel. This reduction can be compensated for by increasing the proportion of woodlands being managed.

Waste wood has also been sold off-island with chipped mixed wood sent as fuel to Slough Heat and Power and to board mills. This provides a cheaper disposal route than landfill. The price received covers little more than the cost of transport so development of a wood fuel market on Island would improve returns to recyclers. The commissioning of the Forest Road CHP offers such an opportunity for the disposal of waste wood.

The CHP has a fuel requirement of 30,000 tpa of which up to 20,000t will be produced from domestic refuse. The expected sources of the remaining fuel are commercial waste and waste wood collected at civic amenity sites operated on behalf of the Council¹¹. Operators of waste transfer stations also expect to supply suitably sorted waste, including wood to the Forest Road CHP rather than sending it to landfill. Use of waste in the CHP will avoid payment of landfill tax, currently £32 per tonne and due to rise by £8/t in April of 2009 and 2010. The cost of disposal at the CHP is expected to be around £30/t for mixed waste wood and other suitable materials.

The CHP may need more fuel than is available as contaminated timber which may bring it into competition with heat only boilers of CHP plants for clean wood from, for example, reclaimed pallets as the number of installations increase. Where wood chip is scarce boiler operators are likely to have first call on supplies as they are competing directly against fossil fuels. A wood chip price of £90.00 per tonne is the equivalent of 2.5p/kWh.

2.6 Ensuring the availability of biomass fuel

Figure 2.1 shows a potential growth pattern for the production of solid biomass over the next 20 years. This makes use of existing resources and assumes a moderate level of energy crop planting. In all cases the easiest and cheapest resources (e.g. woodlands with easy access or source segregated pallets) will be brought into the fuel supply first. Resources that require extra processing or cost more to obtain are exploited in later years when wood fuel prices are expected to rise.

A more detailed breakdown of expected demand growth is given in Table 2.7. The total quantity of 45,000 tonnes a year by 2028 is sufficient to heat almost 17,000 homes or support a 6MWe CHP installation.

After 2028 most of the easily accessible biomass wood and straw resource will be in use and scope for further growth in supply without impacting on agricultural production will be limited.

¹⁰ For example, Yorkshire and Humber Vision for Biomass, AEA Technology for Yorkshire and Humber Assembly, October 2007

¹¹ Lynn Clarke, personal communication

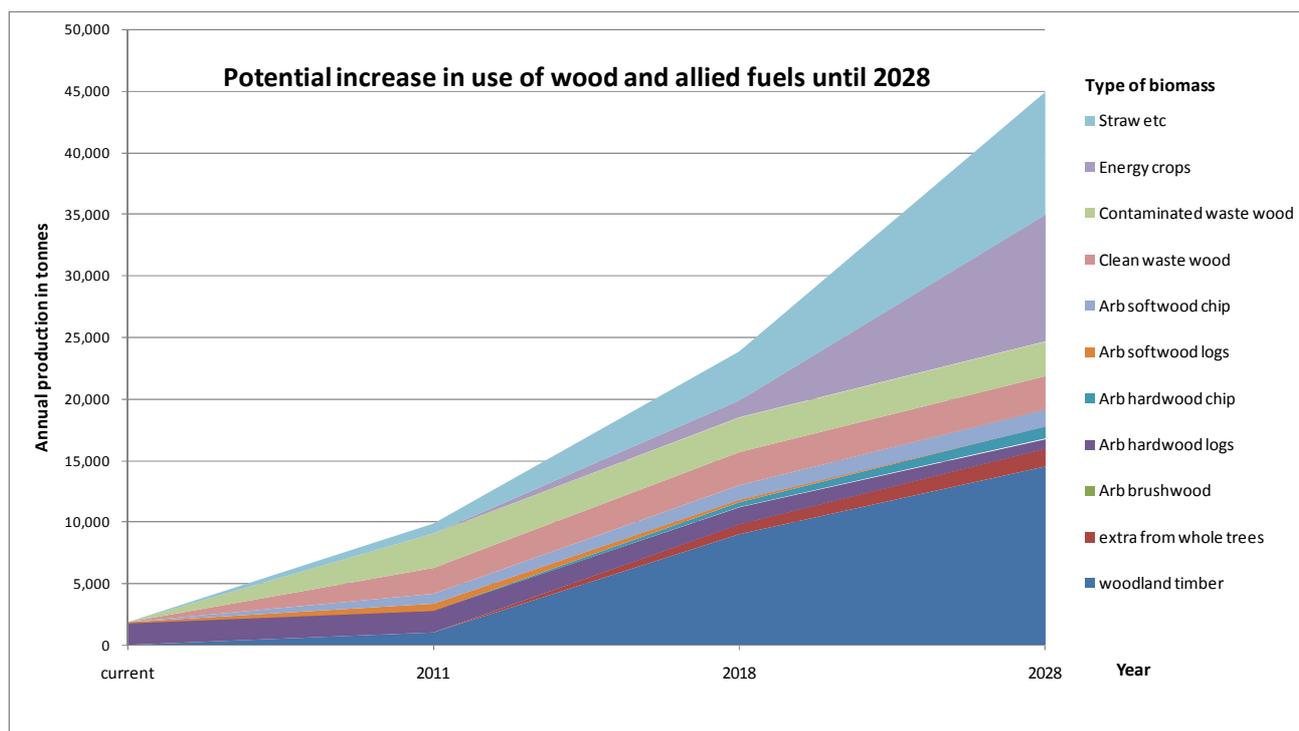


Figure 2.1 Likely growth in demand for wood and similar fuels on the Isle of Wight by wood source.

For this level of biomass production to be reached market demand will have to develop to similar levels as it is unlikely that it will be viable to export fuel from the Island. However, biomass equipment is unlikely to be installed without confidence in fuel availability. Measures which enable the supply chain to respond to increased demand in a timely manner are required. Some potential measures are listed in Table 2.6 below.

A single focus for information and support activities for wood fuel is desirable to maintain momentum towards increased biomass use. The Woodland Forum has led provision of information about the potential for wood fuel to the forestry community through a series of meetings but may not have the resources or the remit to expand this role to include other wood producers and potential users in the wider community.

Nationally this service is provided by the BioMass Energy Centre. For the Isle of Wight a local contact point could not only promote wood and biomass energy but monitor production and uptake of biomass and administer any locally funded grant schemes. Such a contact point would most likely be hosted by a larger organisation such as Island 2000, The Island Strategic Partnership as part of the Eco-Island initiative or directly by the Council.

Actions to promote wood and agricultural biomass supply	Relevant sectors	Woodlands	Tree surgery	Waste wood	Straw etc.	Energy crops
Grants to improve access to woodlands so timber can be brought to market.		✓				
Increased levels of advice to small woodland owners		✓				
Preferential use of locally produced timber products other than wood fuel to improve market for higher quality logs		✓				
Training in wood fuel standards and production techniques		✓	✓	✓		✓
Increasing availability of skilled labour through provision of Forest Machine Operator certificate training		✓	✓			
Publicity and promotion of available grant schemes such as the BioEnergy Infrastructure Scheme, SE Woodland and Timber Fund, Leader, Energy Crops Scheme etc.		✓	✓	✓	✓	✓
Maintaining flow of information about new opportunities and developments in biomass fuel on the Island to all relevant parties, including architects and developers		✓	✓	✓	✓	✓
Promote production of higher quality firewood, perhaps including a quality assurance scheme		✓	✓			
Independent evaluation of briquettes and pellets made from straw and similar by-products and dissemination of results to wood stove retailers and users					✓	
Providing specialist information on the use of waste wood in boilers and CHP plant and guidelines on sorting and segregation of clean and contaminated timber.				✓		

Table 2.6 Measures to assist the development of the wood fuel supply chain

2.7 Carbon saving

The amount of carbon emissions avoided depends on the fuel it replaces. Many areas on the island are off the gas network and use oil for heating. Assuming that 20% of biomass replaces oil fired systems and 80% substitutes for mains gas the annual CO₂ emissions reductions for the use levels in Table 2.7 are 8000 t in 2011, 18,800 t in 2018, and 35,200t in 2028.

Source	moisture content	Gross production potential	fuel type	current	target production levels (tonnes)			notes
					2011	2018	2028	
Woodland								
stemwood	30%	20,622	chip	0	1,000	9,000	14,500	Some will be inaccessible or used for other purposes or owners will choose not to manage their woodlands
whole tree harvesting addition	30%	4,124	chip	0	0	800	1,450	Could get 20% extra if whole tree harvested adopted universally. This is not likely to happen hence lower estimate.
Arboriculture								
brushwood chip		3,500	chip		0	0	0	Used as mulch and surfacing, expected to continue. May switch to fuel use if prices rise sufficiently
hardwood logs	30%	1,800	firewood	1,800	1,800	1,400	800	firewood use declines as cheaper briquettes are adopted.
	30%		chip	0	0	400	1,000	
softwood logs	30%	1,400	firewood	100	600	200	0	
	30%		chip	0	800	1,200	1,400	
Waste wood								
clean (pallets & untreated packaging)	20%	2,700	chip	0	2,100	2,700	2,700	Initially used at Forest Rd. CHP then in biomass boilers as demand develops.
			pellet	0	0	0	0	Assume pellets are imported not made on the Island
contaminated	20%	2,800	chip	0	2,800	2,800	2,800	1. all supplied to Forest Rd CHP at start. 2. WID compliant CHP (400 kWe) installed to use contaminated wood by 2018
Short rotation coppice or short rotation forestry	30%		chip	0	0	1,371	10,286	120 ha by 2018, 600 ha (2.5% of farmland) by 2028. Average yields increase from 8 odt/ha/yr to 12 odt/ha/yr due to improved planting material, maturing planting and better agronomy.
Agricultural residues								
straw, oil seed rape stems etc.	15%	26,000	briquettes	0	800	4,000	10,000	Briquettes progressively replace firewood logs for log stoves and open fires as raw material is cheaper. Estimates based on planted areas in 2007 June agric census for loW: total cereals 4,825ha; oil seed rape 680 ha; temporary grass 3,124 ha; permanent grass 10,884 ha; rough grazing 874 ha; set aside 973 ha. Straw yield 4.0t/ha. Assume that biomass CHP units (800 kWe) capable of using briquettes are installed to use production over requirements of domestic users (3,000tpa by 2028?).
Total from all sources		62,946		1,900	9,900	23,871	44,936	

Table 2.7 Potential development of wood fuel and agricultural briquette production

3. A strategic approach to developing wood fuel use and reducing carbon emissions

A strategic approach to the development of wood fuel supply and use on the Island is concerned with the broad development of the sector, rather than particular projects or sources of supply. It is long term, in place for at least 3 and probably 5 years, yet may be adapted in response to changing external or internal factors. The goal of a thriving wood fuel supply and use market on the Island would remain even if the approach is adapted.

The current recessionary economic climate will affect sentiment towards wood fuel in the short term, especially in the private sector as companies and individuals struggle to finance capital projects and see that fuel prices have decreased, at least temporarily. However, in the medium to long term the drivers for wood fuel adoption remain strong. Carbon emissions restrictions and carbon trading schemes for the public and commercial sectors will increasingly drive up demand and fossil fuel prices can be expected to increase again when the recession is over. The Renewable Heat Incentive included in the 2008 Energy Bill is expected to start operation in 2010 or 2011 and will provide additional impetus to the wood fuel sector. A strategy should make sure that the capacity to supply matches increasing demand. For the Island as a whole wood fuel can make an important contribution to the ambition for a low carbon eco-island.

Current use is restricted almost entirely to the domestic log market which is expected to continue to grow. To engender confidence in wood as a modern, reliable fuel people's knowledge about it must be improved and the operation of the complete supply chain from woodland to boiler must be demonstrated. Issues to be addressed include:

- making the resource available;
- increasing demand for wood fuel;
- increasing capacity to meet growing demand; and
- continuing information sharing activities and confidence building.

For the Council, with its commitment to the Eco-Island concept, making best use of on-island resources will help meet multiple sustainability goals for reduced carbon emissions, local rural economic development, improving biodiversity values and lower energy costs which might be targeted at those in fuel poverty. As shown in Section 2 the potential supply of wood fuel is significant but limited and can only provide a small proportion of the Island's total energy needs. It is therefore important to make the very best use possible of this renewable resource.

Renewable heat has been neglected in central government policy until recently yet heat makes up almost half of national primary energy requirements¹². Wood, as logs, chip or pellet is an excellent, efficient, very low carbon source of heat in modern equipment. Wood fuel can be used for heating at all scales. Wood fuelled CHP plants are less well proven, particularly the smaller scale units the available wood supply on the island would support. In residential developments it is often difficult to match heat and electricity demand which may lead to heat being 'dumped' to the atmosphere. Wood CHP units are best as base load units or in industrial applications where there is a constant demand for heat and they can run continuously. There may be a particular role for a wood fuelled CHP plant using mixed wood containing treated timber as the technologies employed make the necessary emissions control equipment more affordable.

A hierarchy of uses

Bearing in mind the need to make best use of the limited sustainable supply of wood on the island the following order of importance is suggested in relation to wood fuel use:

1. Reduce energy consumption through design requirements for new buildings, draught proofing, improving insulation of existing buildings and similar measures.
2. Use wood for heating since maximum overall efficiency in delivery of usable energy can be achieved. 80-85% of the embodied energy can be delivered as useful heat.
3. Use in combined heat and power systems. These have slightly lower theoretical efficiency (around 75-80%) but do not normally achieve this in practice unless run as base load heat providers. CHP systems may return higher financial performance than heat only systems (thanks in part to double ROCs for power from April 2009) but are less efficient in delivering carbon reductions than heat only systems.

¹² quoted in *Biomass heating: a practical guide for potential users*, Carbon Trust, 2009
16/12/2008

4. Stand alone electrical generation from wood is wasteful of a limited resource with efficiencies for small scale systems (less than 2MW) of 20-30% and should be discouraged.

Wood chip and wood pellet

Wood chip is already made on the island and wood pellet could be made here on a small scale. Wood chip is less processed and can be made with equipment already available. It is well suited for local production and use in boilers of 80kW and above. It offers lower fuel prices than to wood pellet and lower lifetime costs than fossil fuels. Provided measures to ensure quality standards are met and adequate fuel reception and storage are in place it is as easy to use and reliable in use as wood pellet.

Wood pellet is four times as dense as chip, dry (around 12% moisture content) so it can be packed in plastic bags for small users and has superior flow characteristics to wood chip allowing it to be easily delivered by a blower vehicle to larger boilers. It is better suited to use in small appliances such as room heating stoves and domestic sized boilers. Manufacturing pellets is more energy intensive than chipping. On average, the equivalent of approximately 15% of the energy in the finished product is used in its manufacture and distribution. Because of its density and low moisture content it is better suited to transport and trading over longer distances than wood chip. There is a well developed national and international wood pellet market.

Importing wood fuels

The contribution that wood can make to carbon reduction on the Isle of Wight is constrained by the available resource. This can be expanded to some degree by planting energy crops and making use of alternative biomass such as crop residues but the total amount available on the Island is still limited. Importing wood fuel is an obvious way to increase the amount of biomass available. Transport of large amounts of wood by ferry would add at least £8.00 per tonne to wood chip and slightly less to pellet. This together with the costs of on-island storage and distribution would make it approximately 0.8p/kWh more expensive than locally produced wood chip, raising the cost to over 3.4p/kWh.

Import by sea through Medina Wharf is feasible although additional equipment may be required to handle low density wood fuels. However demand for both chip and pellet is unlikely to support imports on this scale in the medium term. It is a long term option, particularly for pellets which are already distributed by coastal barge from Northern Ireland.

Maximising carbon reduction on the Island

A strategy for optimal carbon reduction on the island will:

1. Reduce demand through energy efficiency measures
2. Make best use of locally available wood fuel. This can be achieved through use as high quality wood chip for production of heat. Contaminated wood can be used in an appropriate CHP plant.
3. Promote the establishment of energy crops in appropriate locations and the use of crop by-products as biomass fuels where there are no adverse environmental impacts.
4. Import wood pellets to achieve carbon emissions reductions beyond what can be achieved from local resources. This is a low risk way to develop demand for pellets and does not preclude local production should demand and available timber resources justify it.

4. Market Development

4.1 The current market

4.1.1 Current and planned biomass projects

Biomass project	Operation timeline	kW	Fuel & Tonnes p/yr	Notes
Open fires/ log stoves	Currently in use	n/a	1,900 t logs	Not known how many households use wood as their main heat/ hot water source
Albany Prison	Currently in use	n/a	n/a wood offcuts and other timber	Small, simple wood boiler takes the arisings from workshops in the prison and uses to heat greenhouse. Self sufficient.
Parkhurst Prison	2009	200kW	200t wood chip	Part of wider programme for wood heating in England's prisons
Elm Farm Biomass CHP	Application made	100kW electric, 200kW thermal	750 - 800 t energy crop	Intended to use Miscanthus/SRC ¹³ . Could use wood chip.
PAN	Awaiting decision	2 x 850kW	1500 t when fully operational, 750t in first stage of development	1009 homes near Newport, heating and hot water to be supplied by biomass to meet Code for Sustainable Homes Level 4. District heating system could be nucleus of wider district heating network in Newport – plans to extend to school and housing assn. nearby.

Table 4.1 Current & planned biomass projects on the Isle of Wight

4.1.2 Other current interest in biomass projects

- The IoW Council Energy Manager is identifying Council owned sites where biomass might be used in existing buildings. There are up to 10 sites with oil boilers where using wood chip will maximise carbon reductions.
- Within 18 months the IoW Council intends to install a biomass boiler in at least one school. It is likely that this will be up to 1MW capacity and use approximately 800 tonnes of wood chip annually.
- St. Mary's hospital has an opportunity to include biomass heating or CHP as part of a heating system refit. The scope for biomass is limited as much of the boiler replacement has been completed. However a CHP system of up to 250kWe could be installed alongside existing gas CHP.
- Housing associations are considering wood fuelled boilers as part of their commitment to renewable energy: Fuel availability and stability of fuel pricing are major concerns.
- A monastery and some large estates with options for self-supply are considering wood chip boilers.
- Energy installation companies Future Energy Systems and Pure Green Energy have interest from several clients on the Island in biomass installation, particularly wood chip and pellet boilers between 80 – 150kW. Lack of reliable fuel supply on the Island has prevented installation to date.

4.1.3 Future Market Development

The long term potential for use of wood fuel and similar biomass is constrained by the sustainable supply. Only limited areas will be available for increasing production, for example through planting of energy crops. If all the potentially available biomass were used it would provide heating and hot water for approximately 29,000 homes. However the full potential will not be realised due to competing uses for biomass and different priorities

¹³ David Newble in *Isle of Wight County Press*, Friday, October 31, 2008
16/12/2008 Potential for Wood Fuel Supply on the Isle of Wight

for management. For example, some woodland will be left untouched or managed primarily for biodiversity conservation rather than timber production or straw used as animal bedding. The long term target of 44,936 t/yr in Table 2.7 would provide heating and hot water for the equivalent of approximately 17,000 homes.

New building heating

The opportunities for biomass use in new domestic and other developments is considerable. The Regional Spatial Strategy indicates that 520 new homes are required annually. More than half the identified sites are classes as large (3903 – 4109 out of 7614- 7814 dwellings)¹⁴ Large sites have greater potential for district heating schemes which can be fuelled by biomass.

Biomass has been shown to be a cost effective way of reducing carbon emissions in larger buildings such as offices, mixed use developments, schools, hotels, residential care homes, hospitals and prisons. Experience in London shows that biomass heating is often chosen as the best way to meet on-site renewable energy generation requirements.

Heating existing buildings

Retrofitting existing housing stock with renewable energy systems is a the next big challenge after energy efficiency improvements have been made. A range of biomass equipment is available which can meet the needs of individual households including stoves and boilers for both logs and pellets. Ready availability of fuel is essential if people are to adopt biomass to complement other technologies such as solar water heating. With an established firewood supply, sales of wood stoves are reported to be increasing rapidly.

Briquettes made from straw and oil seed rape stover have burnt well in informal trials and commercial production of them is likely to start soon. This will provide a competitively priced alternative to firewood logs for use in domestic properties and may increase the rate of wood stove and boiler installation.

Similarly, once pellets are available on the Island their ease of use and cleanliness will favour their adoption despite the expected price being similar to mains gas.

Larger buildings offer opportunities to install automated wood chip boilers. The greatest potential is in premises where there is a consistent heat load throughout the year or historically more expensive fossil fuels such as oil and LPG are used. Examples include plant nurseries, garden centres, swimming pools and leisure centres. Installing wood fuel boilers is not always straightforward. Common problems encountered, apart from the additional capital cost, are the space required for the boiler and ancillary equipment, the location and design of a fuel store and good access for vehicles delivering wood chip. On industrial sites and more rural locations such as glasshouses producing salad crops, access is normally easier. Where access is difficult or space for fuel storage is at a premium, wood pellets may be preferred to wood chip.

District heating

District heating schemes combined with larger scale biomass boilers or CHP units are widely used in continental Europe to provide efficient, low carbon heat and hot water. They are best installed during initial construction but may be installed in existing built up areas. For example, in Denmark they have been progressively installed across towns and cities over the last 30 years and now serve most areas. The high cost of insulated pipes carrying the hot water favours installation in densely built areas although schemes have been successfully installed in lower density locations. For example, the Hoathly Hill Community in East Sussex have installed a 300kW boiler and district heating system to serve 30 buildings spread out across the site¹⁵.

Experience in Europe has shown that many district heating schemes have grown progressively with a series of extensions and additional boilers added over the years.

4.2 Biomass Fuelled Combined Heat and Power

Small scale biomass CHP is a rapidly developing field with a range of technologies at all capacities from 100kWe upwards. Please see Appendix 2 for information on this technology, applications and costings.

¹⁴ GVA Grimley LLP for IoW Council, *Isle of Wight Housing Market Assessment: Final Report April 2007*, para 6.80

¹⁵ see <http://home.btconnect.com/hoathlyhill/hhr/blog.html> and <http://www.woodenergyLtd.co.uk/CaseStudies/district-heating.ashx> for details.

4.3 Incentives & Grants

4.3.1 Financial incentives

Measure	Details	Heat	Electricity
Climate change levy	Renewable heat and power exempt from CCL	✓	✓
Carbon Reduction Commitment	Mandatory system of tradable permits for CO ₂ emissions for larger organisations. Renewable energy generation will release permits for sale. In preparation now for introduction 1 st April 2010	✓	✓
Renewable obligations certificates (ROCs)	Available for electricity generated from renewable, including biomass but registration is complex. Currently worth £51.29/MWh ¹⁶ but this will change when banding of ROCs introduced in April 2009: 1.5 ROCs for biomass power from 'regular' biomass; 2 ROCs for power from energy crops or any biomass CHP plant		✓
Feed in tariff (FIT)	Announced as amendment to 2008 Energy Bill in October 2008. To incentivise small scale (<3MW) power generation. No final timetable or feed in price levels		✓
Renewable heat incentive (RHI)	Similar in concept to FIT but for renewable heat with payments to be made by 'designated fossil fuel suppliers'. Includes biomass heat at all scales.	✓	

Table 4.2 Measures and incentives for use of biomass for energy

4.3.2 Grants and loans for equipment installation

1. Low Carbon Buildings Programme Phase 1 provides grants to householders. Up to £600 for an automated pellet stove and up to £1500 for biomass boilers. 50% grants for community organisations towards capital and installation costs up to £30,000
<http://www.lowcarbonbuildings.org.uk>
2. Low Carbon Buildings Programme Phase 2 provides up to 50% of the cost of installations to the public sector and charities. Maximum boiler size 45kW
<http://www.lowcarbonbuildingsphase2.org.uk/>
3. BioEnergy Capital Grants Scheme provides 40% of the extra cost compare to the fossil fuel equivalent of a biomass boiler/CHP unit for commercial, industrial and community sectors. Competitive rounds of funding held every few months for larger boilers and CHP units.
<http://www.defra.gov.uk/farm/crops/industrial/energy/capital-grants.htm>
4. The Carbon Trust provides interest free loans through Action Energy of between £5,000 and £50,000
<http://www.actionenergy.org.uk/>
5. Many utility companies have funds to support renewable energy installations by community groups. These can include biomass boilers and often look favourably at additional benefits to biodiversity and high levels of community benefit and participation. Examples include:
 - The E.ON Source Fund, <http://www.eon-uk.com/about/source.aspx>
 - Scottish Power's Green Energy Trust <http://www.scottishpowergreentrust.co.uk/content/>
 - EDF's Green Fund <http://www.edfenergy.com/greenpages/edf-energy/showPage.do?name=greenpages.greenfund.apply.til>

Additionally, enhanced capital allowances mean the investment can be written off in the first year.

4.3.3 Grants for supply chain development

1. BioEnergy Infrastructure Scheme (BEIS) is administered by DEFRA and is the principal means to support supply chain development. In the 2nd round up to £200,000 was available for each application. The BEIS is being reviewed as part of the establishment of the new Department of Energy and Climate Change. It is uncertain if further rounds will be held and the funding levels available under them. For details about BEIS see
<http://www.defra.gov.uk/farm/crops/industrial/energy/infrastructure.htm>

¹⁶ Price in ROC e-auction held on 9th October 2008 given on <http://www.nfpa.co.uk/nfpas/trackrecord.htm>
16/12/2008

2. The new Rural Development Programme for England has prioritised wood fuel and biomass energy. For the Isle of Wight funding for smaller projects which add value to woodland produce is available through the Leader Programme (contact carol.flux@iwep.com) with larger projects (over £50,000 dealt with directly by SEEDA, see <http://www.seeda.co.uk/RDPE/docs/RDPE-FarmersGrowersForesters.pdf> for guidance)
3. In some circumstances, for example where producing wood fuel supports a community project or brings specific biodiversity benefits the utility company funds may support equipment for wood fuel development.

4.4 Measures to accelerate growth

In order to accelerate the growth of the wood fuel market on the Island, the Council could take action to actively promote its growth. The following examples show how this has been done in other locations.

Consider wood fuel first: Biomass heating in Barnsley

Barnsley Metropolitan Borough Council was the first local authority in the country to adopt a pro-biomass procurement policy leading to a 40% reduction in Carbon across the Borough with an aim for 60% reduction by 2010.

Facilitate loans to householders: Kirklees RE-charge

The RE-charge is a financial assistance scheme allowing home owners to invest in onsite renewable generation through a second charge on their mortgage without incurring up front capital costs or concerns about payback times. If the householder later sells the property, the money they received from the fund is returned and recycled by the fund to finance further renewables installations.

Additional planning requirements: The Merton Rule

The 'Merton Rule' is a prescriptive planning policy originally implemented by the London Borough of Merton in 2003. It has since been adopted and adapted by many local authorities¹⁷. It requires all new developments - both domestic and non-domestic - to generate at least 10% of their energy needs from renewable on-site sources, if they are over 1000sqm or a development of more than 10 homes. Across the whole of London the Greater London Authority requires that larger developments provide 20% of their energy from on-site renewables.

A refinement of the Rule is that where it is impractical to implement on-site renewable a charge is made on the developer proportionate to the carbon saving that should have been made. The resultant funds could then be used to support additional renewable energy installations elsewhere, perhaps as part of a RE-charge scheme.

Offsetting: The Ashford Fund

The Ashford Sustainable Energy Feasibility Study outlines a 'Merton' style requirement for 20 - 40% on-site renewable energy generation but with the intention that new developments should aspire to carbon neutrality. The marginal cost of reducing carbon emissions on-site increases rapidly as the 'easy' options are implemented. By allowing a buyout (or offset) for the remaining carbon above the point where it becomes uneconomic to implement on-site solutions Ashford is expecting to build up a fund which could be used for investment in complementary carbon saving technologies, for example retrofitting energy efficiency and renewable energy systems in existing buildings. If the fund is used to make loans, even at preferential rates, rather than grants additional carbon saving benefits can be achieved,

Integrated working in local authorities: Suffolk County Council

The property services department and woodland officer in Suffolk County Council worked together to prioritise wood fuel when considering replacement boilers in schools and other council properties. The aim was to reduce carbon emissions and make savings on running costs. The Council worked with a private sector wood fuel supplier, Eastern Wood fuel, to ensure that supply was in place to meet the growing demand. By the end of 2008 21 boilers will be installed in council properties, 17 in schools. The Council programme has stimulated interest in wood fuel heating from the private sector across the county, retains money in the local economy and removed some wood from the waste stream.

Other measures:

Additional actions that could be taken to stimulate demand include

- Sharing information with a targeted group of developers and managers of larger buildings about the benefits of wood fuel and the capacity to supply wood chip that exists on the Island. This would

¹⁷ see <http://www.themertonrule.org/>

complement the work that has been done with woodland owners and contractors aware of the potential market opportunity.

- Accelerated progress towards carbon neutrality by requiring more rapid implementation of the Code for Sustainable Homes than envisaged by central government. This would achieve carbon neutrality before the national target date of 2016. Using BREEAM standards for non-residential developments will extend the impact of this action. These actions were proposed in the consultation to the Island Plan.
- Bringing more capital resources into the island for investment in wood heating by:
 - publicising the opportunities for grant funding that exist, e.g. BioEnergy Capital Grants Scheme
 - Provide information about financing opportunities such as The Carbon Trust's interest free loans for businesses. Information about this scheme is available at http://www.carbontrust.co.uk/energy/takingaction/loans_renewables.htm
 - Partnership with an ESCO provider to leverage investment for wood fuelled boilers and CHP

5. Developing the supply chain

5.1 Wood fuels

Wood fuel is available as logs, wood chip, briquettes and wood pellets. Logs are the only form of wood fuel currently in use on the Island although wood chip is made for other uses. The capacity to produce wood fuel other than logs is limited. This section describes the types of wood fuels, and what is needed to produce wood fuel. It also gives examples of potential production sites.

5.1.1 Types of wood fuel

Standards and quality requirements for wood fuels

A draft European standard for describing all types of solid biomass fuels is in preparation. CEN/TC 335 provides a standard method of describing the physical and chemical properties of biomass fuels including logs, wood chips, wood pellets and briquettes. The aim is to provide a common standard that will allow trade in fuels and also enable combustion equipment manufacturers to easily specify the fuel needed. More information about the standard can be found through the Biomass Energy Centre website¹⁸.

Firewood logs have traditionally been supplied through small local businesses with no written quality standards. Briquettes are a relatively new product and standards are not yet applied to them. Briquettes are made from a wide range of raw materials ranging from sawdust to pea haulm. What they are made from affects the burning properties, quantity of ash produced and the tendency to produce clinker. For example straw has a higher silica content than wood and giving ash with lower melting point than wood ash.

For wood chip and pellets a number of standards have been developed in different European countries. These will in time be replaced by the European standard but the Austrian ONORM standard is commonly used for wood chip with the ONORM and Swedish standards used for pellet. An extract from the ONORM standard is given in Appendix 1

Inclusion of bark and brushwood in chip production or pellet manufacture will increase the ash percentage when they are burnt. It also increases in the amount of NO_x produced on combustion. In places where there is very heavy traffic or other sources of NO_x and are already approaching acceptable limits restrictions on the grade of wood chip or pellets used may be necessary. For pellets and chip to have less than 1% ash ('low' in the ONORM classification) wood without bark or leaves must be used to make them.

Meeting quality standards for fuel is essential if modern stoves and boilers are to operate at their design efficiency. Any new fuel supply capacity must be able to meet these standards consistently. The development of supply capacity for the different wood fuels is discussed below.

Supply chain development

The likely pattern of development of the supply chain is:

1. Tree surgeons and other small scale firewood producers diversify into wood chip production. Some may work cooperatively to set up yards which accept material from third parties to whom a charge may be made. Cooperative working achieves economies of scale and reduces the investment in capital works and purchase of equipment each participant has to make. 3 or 4 yards would be able to supply all areas of the Island using only small delivery vehicles.
2. Contract chipping services using crane fed medium sized drum chippers develop to serve smaller local chip production units.
3. The majority of woodland timber and tree surgery arisings processed by smaller local chip producers able to produce high quality chip with relatively low capital investment.
4. One or two larger wood fuel producers taking in all types of timber including waste timber might also be set up. They would require permits and licenses to handle and transport waste that are not needed if only virgin timber is processed. Compared to waste timber for which a gate fee might be charged, timber from woodlands is expensive. However, the supply of waste timber (particularly clean waste timber) is limited and large processors will probably require timber from woodlands.

Manufacture of pellets and briquettes is most simply and economically done using segregated clean, dry waste wood such as pallets. The limited availability of clean waste wood will restrict pellet and briquette production unless chip drying facilities are available. The economies of scale achieved elsewhere by large pellet production plants will make it difficult for small scale production on the Island

¹⁸ see http://www.biomassenergycentre.org.uk/portal/page?_pageid=77,15108&_dad=portal&_schema=PORTAL
16/12/2008

to compete. One example is the 100,000t/yr Balcas plant at Invergordon which is expected to come on stream in spring 2009. This will supply the whole of Great Britain.

Chip made from contaminated timber can be used in WID compliant boilers and CHP plants. The price that can be achieved for this chip is expected to be lower than for clean chip.



Logs:

- are the most familiar form of wood fuel, widely available on the Island through tree surgeons and other log merchants.
- require good seasoning over a summer for proper combustion.
- well seasoned logs have a moisture content of less than 35%.
- burning quality varies greatly with species with hardwoods traditionally preferred.
- used in open fires, in log stoves and manually loaded boilers for domestic properties.



Briquettes:

- are made from dry sawdust or agricultural materials such as straw.
- vary in size and degree of compression according to the machinery used
- are normally around 15% moisture content
- have a similar energy content to pellets, 4700kWh/t
- used in place of logs in open fires, log stoves and boilers, burning hotter than most logs.



Wood chip is:

- bulky, relatively low density 250 – 300 kg/m³
- variable in moisture content from 45% (green) to 20%
- available in a range of size specifications
- energy density 3500kWh/t at 30% moisture content
- relatively low value so best produced close to point of use,
- low energy use in production
- does not flow easily in hoppers and storage silos
- used in automated boilers from around 50kW capacity upwards



Wood pellets are:

- higher density than chip, around 650/ m³
- of uniform size, normally 6 or 8mm diameter.
- consistent and moisture content around 15%
- are energy dense, around 4700kWh/t
- around twice as expensive as wood chip
- flows like a fluid and can easily be delivered by tanker and blown into a store
- often imported although UK production increasing
- used in room heating stoves and boilers of all sizes
- not readily available on the Island at the moment

5.2 Log production

The market and supply chain for logs is well established on the Isle of Wight. Demand is growing in response to high fossil fuel prices. Increased sales of log stoves are reported. Most logs are produced as a by-product of tree surgery activity using labour intensive manual cross cutting and vertical splitters. The supply can be increased by:

- increasing the range of species used to include softwoods and low density hardwoods that have previously been rejected. When properly seasoned all species are suitable for use in enclosed appliances. Less dense species will require more frequent replenishment and this change may be unpopular with traditional log users. Softwoods and hardwoods such as sweet chestnut are not well suited for use in open fires as they spit embers as they burn.
- thinning hardwood plantations and coppicing to increase the supply of hardwood firewood. This already happens to a limited degree. The straighter, more consistently sized timber from woodlands is more suitable for conversion in a firewood processor. Mechanising firewood production will improve productivity and help reduce costs, providing the machinery is fully utilised.

Most tree surgeons already have their own yards. They are well distributed around the Island and well placed to meet increased demand for logs despite the limited facilities available in some cases. Seasoning wood in the round and making logs on a just-in-time basis avoids the need for covered storage or other infrastructure. If a firewood processor were used throughout the year an open sided barn-like covered store would be needed to store firewood made in the spring and summer. Green timber processed in the summer and put into a covered store would be ready for use in 3-4 months.

5.3 Wood chip production from virgin timber

Virgin timber is defined by the Environment Agency as all or parts of trees produced as a result of forestry or arboricultural work or from processing of such timber (e.g. sawmill offcuts)¹⁹. Virgin timber is not a waste and is not subject to waste regulatory controls. Sources of virgin timber are sawmill offcuts, arboricultural arisings, woodland management and short rotation coppice. There are two wood chip products commonly used for fuel.

G30 W30 chip (see Appendix 1 for specification) is a finer dry chip used in boilers fitted an underfed hearth fuel feed system. A well adjusted brushwood chipper similar to those used by tree surgeons on the Island will produce chip to a G30 specification (80% under 16mm maximum dimension). However, chipping leaves and twigs along with the timber create too high a level of fines in the chip for fuel use in conventional boilers. At 45-50% moisture content freshly chipped material exceeds the 30% moisture content commonly required by smaller boilers

G50 W50 chip is undried (maximum moisture content 50%) with 80% of the chip under 32mm. It is used in larger boiler systems fitted with a step grate fuel feed system. The more expensive step grate system is generally available on boilers of 300kW and larger.

The production method is similar whatever the grade of chip required. The processes involved for virgin timber from different sources is summarised in Figure 5.1.

¹⁹ see the Environment Agency's position statement at <http://www.environment-agency.gov.uk/subjects/waste/1019330/1334884/1721340/>

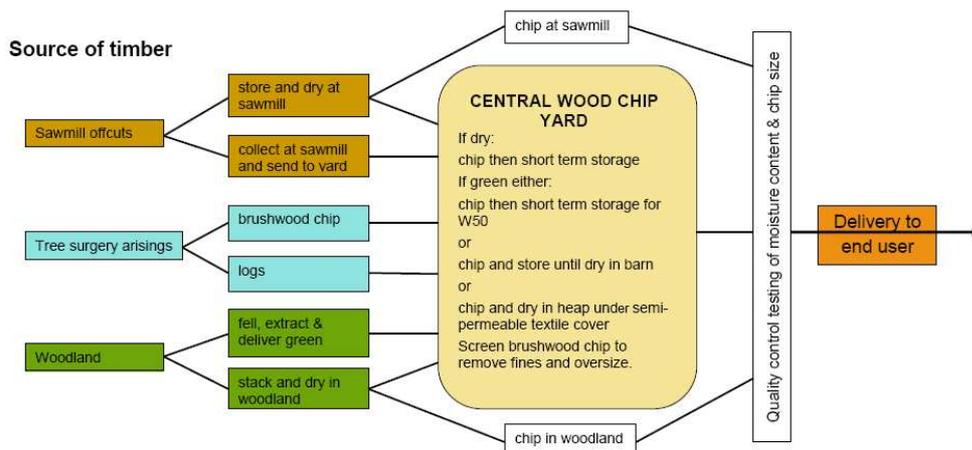


Figure 5.1 Production of chip from virgin wood sources

Equipment and infrastructure required for wood chip production from virgin wood

Producing wood chip from virgin timber is relatively straightforward and can be done either on a small scale at several locations or at fewer larger production units. The benefits and drawbacks of smaller and larger scale production units are summarised in Table 5.1.

The facilities and equipment required are similar at all scales of production. The basic requirements are:

- A chipper. A well maintained disc chipper can give high quality chip with a low fines content from longer logs produced from woodland work. Disc chippers, even when fitted with sliver breakers, are not suitable for chipping short logs found in arboricultural arisings which result in a large number of oversize slivers. A medium sized drum chipper (16" or larger) with integral screen and wide intake will process all logs including 'rings' produced from dismantling large trees. Where large amounts of bigger logs are to be chipped a crane fed chipper is preferable;
- sufficient space to season logs for 6 – 9 months prior to chipping;
- concrete hardstanding to prevent contamination of the chip;
- covered storage for finished chip; and
- good access for vehicles dropping off logs and delivering chip.

Localised small scale production	Centralised production hubs
<ul style="list-style-type: none"> • appropriate for local supply to smaller boilers • less capital investment required especially if appropriate chipper hired in, but • may be difficult to ensure quality with limited infrastructure • storage for chip can often be found in existing buildings • timber storage at ride side in woodlands. Tree surgery logs accumulate and dry in yard before chipping • access to timber stored in woods can be difficult in winter when demand is highest • deliveries in small vehicles to small boilers more economic over shorter distances • backup capability if part of producer network • often complements existing business 	<ul style="list-style-type: none"> • economy of scale gives potential for reduced costs • easier to supply larger amounts, e.g. to CHP plants • quality control systems easier to implement • if fully utilised justifies capital investment in hardstanding and covered storage to prevent contamination of chip • may result in double handling and extra transport for woodland timber • higher daily output from chipper as transport time eliminated • higher throughput may justify investment in screening facilities to improve quality, especially for brushwood chip • high volume may create opportunity for adding value, e.g. pellet manufacture

Table 5.1 Local and centralised wood chip production

In many cases existing facilities can be used. For example, the existing timber yard at Whitefield Wood has sufficient space for stacking timber and construction of a storage barn. It is strategically placed, adjacent to a large woodland area, with good access to the main road system and within easy reach of the Island's main urban areas .



Figure 5.2 Whitefield Wood yard showing gravelled area for timber storage and view back to yard entrance

Farm buildings are often suitable sites for wood chip fuel production. For example, former dairy farms or those that have switched to extensive livestock production often have barns available.



Figure 5.3 Historic farm buildings may have potential for wood chip production. With a concrete floor this barn could be used for chip storage and the yard for timber storage and seasoning before chipping. Limited ventilation might prove problematic with this building if the chip is not thoroughly air dried.

Figure 5.4 More modern farm buildings with good ventilation and excellent access for machinery are ideal for wood chip storage



On the Isle of Wight the likely maximum output of timber from woodland and tree surgery (see Table 2.7) would support 2 medium sized chippers working full time. It would be uneconomic for every small producer to purchase a suitable chipper. One has recently been bought which, if available for contract work, could produce all the fuel grade chip likely to be required over the next few years. Having a specialist contract chipping service may make it easier to maintain consistently high quality.

Because they have a low cost log supply and can minimise investment by hiring in equipment such as chippers and delivery vehicles tree surgeons and firewood producers are able to supply wood chip fuel in relatively low volumes This makes them well placed to supply chip locally in the early stages of market development when just a few hundred tonnes of chip are required each year.

5.4 Wood chip from waste timber

The regulatory framework

As noted above, virgin timber is not regarded as waste. However, if virgin and waste timber are mixed then the whole consignment is regarded as waste. Waste is either clean or treated and all is regulated through the Environmental Permitting regulations and use as fuel through the Waste Incineration Directive (WID). The regulations state that the timber remains waste until it is burnt. Exemptions from environmental permitting may be available in certain circumstances. Clean timber may be used in a non-WID compliant boiler but treated timber can only be burned in WID compliant equipment.

The guidance to the WID²⁰ states that pallets are regarded as clean but all timber resulting from construction and demolition is assumed to be contaminated. In practice pallets can be sorted relatively easily from other waste wood and at some locations only clean waste wood occurs. Chip made from waste wood is attractive for use as fuel due to its low moisture content, often under 25%. The higher price available for clean as opposed to treated chip normally justifies the extra cost of sorting out clean timber.

Packaging Waste Recycling Notes (PRNs) are a potential additional source of income from some waste timber. Producers of large quantities of waste have to show that a certain proportion of it has been recycled. This is done by providing PRNs issued when the materials covered by the regulations are recycled. The PRNs are specific to the material recycled. To generate PRNs the waste recycler must be registered as an accredited reprocessor. PRN prices²¹ vary between £2.00 and £12.00 per tonne but where PRNs are available waste producers often expect to pay a lower gate fee.

The total amount of clean waste timber on the Island is estimated at 2,700 tonnes annually along with 2,800 tonnes of contaminated timber. This estimate should be regarded as indicative as data on the amount of waste wood is not collected at waste transfer stations or the landfill site since it is handled along with the general waste.

Wood chip production

A similar process to production of chip from virgin timber is required for waste timber. The key difference is that waste wood contains nails and similar fastenings which preclude the use of conventional forestry chippers. Instead, a shredder is used to reduce the material to a size that can be used as fuel. To extract nails overband magnets are normally fitted to the shredder. Eddy current separators for non-ferrous metals may also be fitted.

A G50 chip is obtainable in a single pass from a well adjusted shredder but material would have to be re-shredded if a G30 chip is required. Re-chipping also ensures that practically all metal is extracted. A screening system is essential to separate the desired chip from oversize slivers and fines. The oversize can be re-chipped and fines used in briquette or pellet production.

The need to comply with waste regulations and expense of suitable shredding and screening equipment make processing of waste wood uneconomic on a small scale. There is already one waste transfer station on the Island with shredding and screening facilities suitable for fuel grade chip production. Insufficient waste wood is available to support another plant unless waste wood is just one part of the feedstock for the plant or additional value is added to the chip.

Use of waste wood chip

Chip from clean waste wood is suitable for use in all boilers and CHP units provided the size specification is met. It can be competitively priced against wood chip from woodlands. It can also be used as raw material for briquette or pellet manufacture.

Chip from contaminated timber can only be used in WID compliant appliances. Gas clean up equipment is more cost effective with larger boilers and gasifier based CHP systems so treated wood is often used in neighbourhood scale district heating schemes and similar applications. On the Island the limited quantity of treated waste chip is sufficient to supply one 250 – 300 kWe gasifier based CHP plant or provide part of the supply to a larger WID compliant plant. It is anticipated that, at least initially, most of the treated wood will be used at the Forest Road CHP plant. An alternative is export to the mainland.

²⁰ available at <http://www.defra.gov.uk/environment/epp/documents/wid-guidance.pdf>

²¹ see <http://www.letsrecycle.com/prices/prnPrices.jsp>

5.5 Briquettes

Briquettes require sawdust or finely chopped straw at less than 15% moisture content. The production process requires lower pressures than to make pellet and the presses are less costly. The size of briquette made depends on the equipment used and varies from 30mm 'pillows' to 'logs' similar in size to firewood. They are suitable for use on open fires and in log stoves. As they are less compressed than pellets, briquettes are more sensitive to moisture and are normally supplied packed in sealed plastic bags. This also makes them a very convenient fuel to handle.

Raw material costs can be as low as £20/t for straw and similar by-products, so straw briquettes are potentially competitive with firewood for domestic users. With barns and other buildings for storage of raw materials available on many farms several production centres could be set up on the Island. Briquettes used in efficient modern wood stoves could significantly expand the supply of renewable heat to existing housing, offering stable prices and fuel security to users while improving farm incomes.

5.6 Wood pellets

Grade A pellets are made from clean timber without bark. This is either waste from sawmills and wood using companies, post-consumer packaging waste or timber from woodlands that has been debarked. Grade A pellets are required for many pellet stoves and small boilers and must be used if the lowest NOx emissions are required.

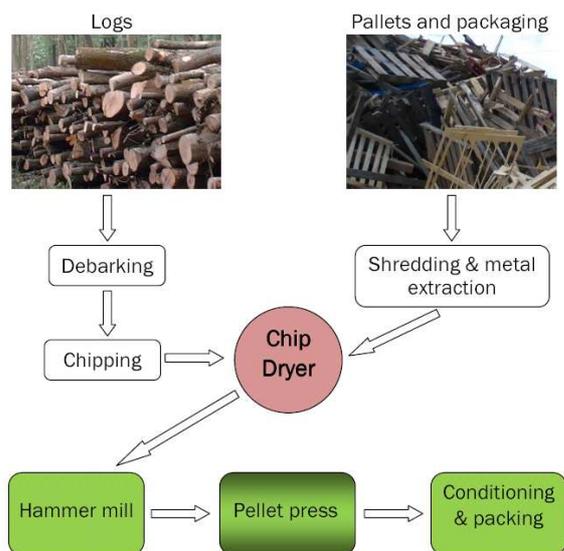


Figure 5.5 The pellet production process

wood may not be suitable for use in all appliances. The limited clean waste wood resource on the Island limits the size of plant that can be supported if only wood is used. By including chip drying in the production process the size of any plant could be increased but would still remain small scale. Small scale units have higher investment costs per tonne of production capacity and require greater labour input during production than large plants.

With new capacity established elsewhere in the UK, limited raw material availability and higher production costs for small scale plants, competitive production of wood pellets on the Island will be difficult to achieve. It is probable that imported pellets will be used rather than local production established. Imported pellets are still a low carbon fuel and will contribute to the realising the Eco-Island vision.

5.7 Development of the wood fuel and solid biomass supply chain

A secure, robust supply chain is essential to create the confidence in users to switch to locally produced biomass. Having more than one source of supply on the Island is desirable to guard against failure of one or

Pellets made from wood containing bark have a higher ash content when burned and are used in larger boilers and for co-firing in power stations.

Machinery for pellet production is available at all scales from a few hundred tonnes a year to tens of thousands of tonnes annually. A fully installed 800t/yr machine using dry feedstock, one of the smallest commercially available units, costs approximately £220,000²².

Pellets are not in widespread use on the Island partly because they have not been readily available. They have particular potential as a fuel for domestic users and are cost competitive where mains gas is not available (see Figure 1.1). Imported pellets could be used to develop the market with a local production plant considered only when there is an established customer base.

Many forms of biomass including energy crops and agricultural by-products can be pelleted. However, pellets made from materials other than

²² Cost given in *Biomass for London: wood fuel demand and supply chains*, London Energy Partnership, in preparation
16/12/2008

more suppliers. Using all the available sources of timber will help to create this robustness. The general factors affecting all potential supply businesses include:

- Wood and similar biomass fuels are a relatively low value product but require significant investment to start production and attention to detail to achieve consistently high quality.
- Investment costs can be a significant barrier to starting production. Unless existing facilities and equipment can be used setting up a new site is likely to cost at least £150,000²³.
- Increasing the scale of production increases investment costs but also allows increased levels of mechanisation. This can improve health, safety and working conditions and reduce the labour costs per tonne. If larger scale equipment is fully used overall cost of production can be reduced.
- On the Island the amount of timber available is insufficient for very large scale production.
- The potential to use existing facilities for storage and share equipment for materials handling make wood fuel production an attractive diversification option for existing businesses.
- The Island is sufficiently compact that distribution of wood and other biomass fuel is within the 25 mile economic delivery distance with a medium sized vehicle from anywhere on the Island.

The potential supply chain structure for different wood resources is discussed briefly below:

Waste wood fuels



Figure 5.6 Slow speed shredder recently purchased by Cheap Skips (IW) Ltd.

The existing waste transfer stations are an established collection system for waste wood. Improved sorting of wood requires only limited investment. At one site there is sufficient capacity to chip and screen all the wood collected at present.

It is likely that this pattern of collection and initial processing will continue as there is little unaccounted resource to support additional shredding exclusively for waste wood. After initial sorting and processing the chip made from clean waste wood can be used directly as fuel. Contaminated chip must be used in WID compliant equipment.

Tree surgery arisings

To date tree surgeons have concentrated on small scale, low cost solutions for the production of logs and sale of chip as mulch and surfacing. Several options are available to develop the wood chip fuel market:

- Some tree surgeons will continue to operate as previously diverting logs and chip to where disposal costs least or is free. This creates opportunities for others to access larger amounts of wood and specialise in wood chip production;
- Several smaller yards could be set up making maximum use of existing facilities. Logs accumulated and dried over several months would be chipped with a large, hired in drum chipper once there are enough to be economic. Covered storage is needed for the resultant chip. Local deliveries can be made with tractor and trailer or a small vehicle. This offers a low cost entry to wood fuel production but may not provide confidence in the security of supply unless several tree surgeons work together as a network supplier. The duplication of hardstanding and storage sheds at each site is a disadvantage of this model.
- One or two larger yards specialising in wood fuel production. These would provide a drop off point for local tree surgeons A chipper could still be hired in periodically for chipping. As new ventures their location could be selected for ease of access and proximity to the markets and resources.

²³ Based on investigations by SEWF for new wood fuel hubs elsewhere in SE England. Rapid increase in demand to around 4,000t/yr is required for viability.

Yards might be set up by new entrants to the wood fuel business. However, there is already interest from several tree surgeons contacted in this study in working cooperatively. This would enable more economic processing, help justify investment in higher specification equipment and provide a greater market presence than they could individually. The example of Island Grains may be a model for joint working. Specific support for producer groups may be available through any further rounds of the BioEnergy Infrastructure Scheme.

The equipment and facilities for wood chip production are similar for timber from woodland and tree surgery so it is likely that that any yard will process timber from both sources. As demand increases the proportion of woodland derived timber processed will increase.

Woodland wood chip

Many Island tree surgeons also undertake woodland management work so can build a common wood chip supply infrastructure. Siting yards close to more heavily wooded areas minimises log transport. Likely locations are near the woodland concentrations in the north east, north west and Brighstone Forest. Timber can be dried at rideside in the woods reducing the need for storage space at the wood chip yard. Chipping can also take place in the woods directly into delivery vehicles.

Despite reduced transport costs for in-wood chipping a centralised production hubs still offers benefits:

- production is not reliant on access to the woods which may be limited by bad weather in winter or the shooting and bird nesting seasons;
- having a stock of wood chip in store enables rapid response to calls for deliveries;
- with no need to move equipment, productivity from chippers and loading equipment is increased;
- quality control and monitoring procedures are more easily implemented; and
- there is higher visibility and reassurance of a secure supply for end users.

Longer lengths of timber are available from woodlands and the range of diameters encountered is smaller and more predictable than for tree surgery waste. This allows the use of disc chippers which are often cheaper to buy than drum chippers and produce a higher quality chip with fewer fines when well maintained and fitted with sliver breakers. One or two specialists in production of wood chip fuel from woodlands may develop as production levels increase.

Energy crops

SRC is most often chipped to final specification during harvesting and dried in large steep sided heaps near the growing site. Delivery vehicles are loaded with the farm equipment already available. Alternative harvesting systems include cutting into larger billets or tree length poles which are dried at the side of the field before chipping and delivery.

6. Distribution and delivery

Wood fuel transport and delivery is a critical part of the supply chain with many options to suit different sizes of boilers and store designs. Final delivery to the end user is a major element in the overall cost of wood fuel with significant in cost dependent on the size of delivery and method used. Poor fuel reception arrangements also increase the 'hassle factor' of wood fuel compared to other fuels so good design and construction of fuel reception and storage is essential. Each building is different so there are limited opportunities for off-the-shelf fuel reception and storage systems, particularly where a wood fuel boiler is being installed in an existing building.

In general, larger deliveries result in lower transport costs per tonne. Minimising the time on site for deliveries also reduces costs. For the supplier of wood chip tipping into an underground store is quick and simple and does not rely on other equipment on site, such as a chip blower. It maximises flexibility as many different vehicles can be used for deliveries. For the end user, it means they are not tied to a particular supplier, so should be able to negotiate the best rate for the fuel. However, constructing underground stores is not always possible due to site lay out or ground conditions, and even where it can be constructed costs are higher than for other above ground stores. In new buildings an underground fuel store should be considered at an early stage of the design so it can be incorporated in the most economical way. Well designed fuel reception and storage reduces operating costs but may add to the initial building cost. The aim in design is to achieve a balance between initial construction cost and continuing operating cost that achieves lowest cost over the lifetime of the boiler and makes operation simple.

A common way of minimising delivery distance and cost is to have a local wood fuel hub serving a number of boilers.

6.1 Wood fuel hubs

A wood fuel hub provides a permanent site for wood fuel production and distribution. Hubs can be stand alone businesses or part of a larger enterprise, for example set up by a sawmill, tree surgeon or waste management company to add value to products arising from their other activities. They can process either virgin or reclaimed timber. The regulatory burden for virgin timber processing is much lower than for waste timber.

The advantages of a hub for include:

- a visible source of wood fuel giving confidence to people considering installing wood boilers;
- a focus for investment where facilities and equipment to ensure high quality fuel is made can be established;
- easier monitoring of quality to ensure it meets specification, including public sector sustainability requirements, compared to managing production from several smaller producers
- the capacity to hold a stock of wood fuel so a rapid response can be made to requests for deliveries
- by aggregating fuel, in particular chip, from smaller producers larger contracts can be serviced from local resources avoiding unnecessary transport

The principal disadvantage of a hub is that it is an extra link in the supply chain and without careful management it may add cost without adding value to the final product.

The scale of operation of hubs greatly influences their viability especially where the initial investment in facilities is large. Analysis by SEWF of several proposed hubs on the mainland shows that in those cases a throughput of 4,000 tonnes annually was required for long term viability. However, each case is different and if some of the facilities were already available a lower throughput would be needed.

Functions of a hub:

A hub will receive raw material process it to meet the fuel specification, store it and make deliveries to end users.

Virgin timber may be delivered as logs 2.4m or more long from woodlands, as short logs and rings from tree surgery or already chipped, perhaps mixed with leaves and other unwanted debris. The processing depends on the end product, wood chip of varying grades, firewood logs or pellets. Common processes include seasoning, chipping and, in some cases, screening to remove oversize chip and fine material. More details are given in Section 5.3.

Similar facilities are needed for fuel production from waste timber. This may be sorted into clean and contaminated timber before processing. Clean timber, which can potentially be used in any boiler will attract a premium to fuel from contaminated timber that has to be used in WID compliant equipment. Timber will be shredded rather than chipped. Ferrous metal extraction and screening are essential.

Investment required

The costs of setting up a wood fuel hub vary considerably depending on the improvements needed at a specific site and the scale of production envisaged. The most basic facilities required for production are a yard with concrete hardstanding, 'TopTex' geotextile fabric to keep the chip dry and a loader for handling the chip. Other equipment would be hired in as required. At all but the most basic hubs a chip storage shed, room to stack timber for 6 months to dry and timber handling equipment are needed.

Recent assessments by SEWF of two farms where hubs were proposed required an investment of between £70,000 and £100,000 in the basic capital items to start production plus working capital. The viability of the hubs was heavily dependent on a rapid build up of throughput to 3,000 – 4,000 tonnes annually. Trading surpluses were small for the first 3 or 4 years.

Hub location

For woodland timber storage in the woodland and chipping straight into a delivery vehicle may be feasible and at first sight has cost advantages due to reduced transport requirements for the finished product. This can work well, for example where a woodland owner is supplying their own boilers but there are a number of disadvantages which generally outweigh chipping in field:

- time is spent moving the chipper which is unproductive and increases the costs per tonne of chipping;
- access to the woodland is most difficult in winter, when demand is highest;
- woodland tracks and access are often not suitable for delivery vehicles;
- poorer control of quality;
- inability to respond to urgent demands for chip; and
- a lack of chip stock and 'just in time' production makes the system vulnerable to equipment breakdown.

A hub can improve the reliability of the supply chain, reduce costs and increase the total amount of available wood fuel.

The factors determining the location of a hub are whether or not suitable facilities such as a storage barn are available, proximity to the timber resource and distance to the wood fuel market. As wood fuel is usually transported in smaller quantities than timber and has a lower density, being close to the end users is often more important than being near the source of timber.

On the Isle of Wight distances are not large and there is no difficulty in transporting timber to any part of the island. Nor is there any part of the Island which is further than the economic distance for chip transport. An advantage in locating hubs close to users is that it increases the options for delivery. For example, a tractor and scissor lift trailer could make deliveries to nearby above ground chip stores.

How many hubs are set up will be determined by the market and demand for wood fuel. A single large hub could serve the entire island and would achieve economies of scale. This would be balanced by higher delivery costs than several smaller hubs nearer demand centres would incur. A dominant market position might reduce the incentive to offer best value and quality.

With the majority of the built up areas in the north and east of the Island up to three hubs might be needed in this area to serve developing demand. Each could eventually process up to 4000 tonnes a year. It is likely that hubs would specialise in either virgin or recycled wood

6.2 Wood chip delivery

For wood chip the most common delivery options are summarised in Table 6.1. Illustrations of the different systems are given below. Tipping vehicles can be used in conjunction with troughs fitted with blowers or augers to fill an above ground or difficult to access store. Drawbacks to this system are the extended time required and noise, particularly where a chip blower is used.

Delivery vehicle	Capacity		Application	Indicative cost £/t	Available on IoW?
	m ³	tonnes			
tractor and trailer	16 - 25	4 - 8	Very local deliveries, tipping into underground stores. Options increased by use of different trailers, e.g. scissor lift trailer for above ground stores	14.75	Yes
7.5 tonne tipping lorry	10	2.5	Local deliveries to small boilers or where access is poor. Cost is typically £10/t greater than for larger delivery vehicles.	20.00	Yes
medium size tipping lorry	30	7.5	For medium sized boilers. Tipping to underground store or used in conjunction with on-site chip blower to fill above ground or remote store. Standard hook lift bins can be used.	11.00	Yes
hook bin 'cartridge' system	30	7.5	A hook lift bin fitted with a walking floor can be used as on-site storage as well as for delivery. Bins are 'docked' with the boiler in-feed system and controlled by the boiler. Delivery is swift and quiet and does not require anyone other than the driver in attendance.	11'00	Not yet
larger fixed body tipper	40 - 60	10 - 15	for larger boilers with underground store	10.00	Yes
chip blowing lorry	40 - 60	10 - 15	Modified animal feed lorry fitted with wood chip blower. Allows delivery to stores up to 20m from access point. Reasonably quiet in operation but may be too noisy for densely built up areas. Delivery of a full load takes over 30 minutes. Can delivery to several smaller boilers with a single load.	16.00	No
walking floor articulated lorry	90	22.5	For the largest boilers and CHP plant requiring more than 1000 tonnes of chip a year. Good access essential.	10.00	No

Table 6.1 Wood chip delivery vehicles and their application

On the Island all these options are available with the exception of chip blowing vehicles and walking floor articulated lorries. It is unlikely that sufficient concentration of production and demand will be established to support a walking floor articulated lorry. A blower lorry would add flexibility to delivery opening up many more opportunities for boiler installations, particularly in existing buildings. Purchasing a blower lorry would be a speculative investment although it might also be used to deliver other materials.



Tractor trailer tipping into an underground store
(source Rural Energy Trust)



Blowing wood chip into a store
(source Midland Wood Fuels)



Delivering into an underground store with 30m³ hook lift bin (South East Wood Fuels)



Delivering chip with a scissor lift trailer
(source: Silvapower website, www.silvapower.co.uk)



Hook lift bin 'cartridge' system at Worcester County Hall
(source: Econergy Ltd. website, www.econergy.ltd.uk)



Trough fed wood chip blower used for delivery of fuel into an above ground silo. The fuel store can be 10-15m from the delivery point but blower is noisy and delivery slow, about 8 tonnes in 30 minutes.

Figure 6.1 Wood chip delivery vehicles (extract in part from Biomass for London: wood fuel guide, London Energy Partnership, 2008)

6.3 Wood pellet delivery

Wood pellet has superior flow characteristics to wood chip and is normally blown into storage tanks for larger users. Specialist pellet tankers are used where demand is sufficient. This is unlikely to happen on the Isle of Wight in the short term. Animal feed lorries can be used to delivery pellets although this is not commonly done. These vehicles are available on the Island although it is probable that larger boilers which would require blown pellet deliveries will opt for wood chip rather than pellet on cost grounds.



Figure 6.2
Purpose built pellet blowing delivery tanker
(source: Energy Crops Ltd.)

For domestic users wood pellet packed in 10 or 20 kg plastic bags is clean and convenient. Briquettes too are normally packed in plastic bags for convenience and limit moisture absorption.

6.4 Importing wood fuel

Wood chip is a bulky low value commodity which it is expensive to transport. The Solent ferry crossing adds £24/t (0.69p/kWh) for chip and £17/t (0.36p/kWh) for pellet to transport costs²⁴. This makes it uneconomic to supply wood chip at current price levels and increases the cost of pellets which may reduce take up by householders. Prices indicated in Figure 1.1 are for imported pellets.

Importation in bulk by ship through Medina Wharf is feasible although no dockside storage is available and some investment would need to be made to upgrade facilities for frequent deliveries. Off loading is currently with a 3m³ grab. The wharf is tidal and able to take ships of 2000t cargo capacity (approximately 3100 cubic meters). This would allow transport of 800t of wood chip at 30% moisture content or the full 2000t of pellet.

Ships take approximately 3½ days to come from Sweden, 2 days from Northern Ireland and 10 hours from Le Harvre. The estimated cost of unloading varies between £2 and £5 per tonne depending on density²⁵. For chip and pellet brought from nearby on the mainland a 400t capacity powered barge is available on the Island.

New developments, such as the opening in spring 2009 of the 100,000tpa Balcas pellet production plant in Scotland, is expected to lead to reductions in the wholesale price of pellets to around £150/t delivered. This would make it difficult for local, small scale production to compete.

²⁴ Assuming a 20 tonne load of wood chip at 30% moisture content and 28 tonne load of pellets at 10% moisture content and no return load. Price for regular journey from ferry companies.

²⁵ Steve Sampson, PD Port Services, personal communication.

7. Production costs for wood fuels

Full costings were not available for all types of woodfuel on the island. The costs given below should be regarded as indicative as until supply is established on the Island precise costs will not be known.

7.1 Wood chip from virgin timber at a central production site

Assuming that:

- Timber comes from local woodland and costs £30/tonne
- Chip delivery is in 30 cubic meter bins
- A yard and storage shed are available with no capital expenditure required to set up,
- The yard rental is shared with other activities such as tree surgery business
- Production is small scale, around 1000 tonnes a year.

The largest part of the price of wood chip from woodlands is the cost of the timber itself. This accounts for 27-40% of the final chip price. Tree surgery arisings may be available at lower cost but they are more expensive to process so the overall cost of chip is similar. Other major costs are chipping and delivery each costing £15.00 - £17.50 per tonne of finished chip at 35% moisture content

The expected cost for the end user is in the range £75.00 - £90.00 per delivered tonne, equivalent to 2.35 – 2.82 p/kWh.

7.2 Wood chip from waste timber

Insufficient information is available for production costs for wood chip from waste timber on the Island to be estimated with confidence. The disposal cost for waste timber is critical to how it is used. Reduction in this cost is a net benefit to the waste processor. For example:

- a) Disposal to landfill now costs £66/t, £30 gate fee plus £36/t landfill tax. This will rise to £72/t in April 2009.
- b) Disposal at the Forest Road CHP is expected to cost £30
- c) Chipping and sale to Slough Heat and Power (indicative costs per tonne):

Shredding and nail removal	£12
Transport to Slough (including ferry)	£25
Payment from Slough Heat and Power	(£25)

Therefore the overall cost of disposal at Slough is approximately £12

There is a clear incentive for waste timber processors to invest in production of quality wood chip fuel, even if this is sold at a discount to other wood fuels. Clean chip, which can be used in any boiler is expected to fetch around £45/t delivered, justifying the cost of sorting it. The lower price for contaminated chip reflects the extra cost of WID compliant combustion equipment required to use it.

7.3 Short rotation coppice

Costs from the 2009 John Nix Farm Management Pocketbook were used in a spreadsheet model with the following assumptions:

- The crop will grow for 12 years
- Yield is 11 odt/ha/yr
- All variable and annual costs, insurance etc included
- Contract planting and harvesting
- Harvesting by direct chipping, rather than cutting in tree length or billets. Chip stored and dried on site.
- Land is assumed to be available at no cost
- The cost of removal after 12 years was not included.

A similar price to woodland sourced chip – £50/tonne at 30% moisture content at the farm gate – gave an internal rate of return of 11% indicating a viable diversification for an existing farmer.

The price of SRC chip for consumers will be similar to wood chip from other virgin wood sources.

7.4 Imported pellets

Quotations for pellets packed in plastic bags were obtained from two manufacturers on the mainland. A small scale producer quoted £180/t without delivery. Delivery costs are estimated to be around £35/t. A larger pellet manufacturer gave a price of £150/t delivered to the Island

Local warehousing, marketing and distribution costs would be in addition to the cost of pellets. The final cost to the user of imported pellets is estimated at between £200 and £250/t, equivalent to 4.27 – 5.34p/kWh.

7.5 Small scale pellet production

Local, small scale pellet production looks to be similar in cost to imported pellets. Assuming that:

- an 800t/year plant costs £200,000 fully installed²⁶ or £50/t over 5 years;
- the plant requires one full time equivalent to operate it;
- clean waste wood available at £35/t delivered and does not require further drying; and
- distribution costs are similar to wood chip;

the price of locally made pellets would be £210 - £225/t, equivalent to 4.48 – 4.80p/kWh. This may be attractive to domestic users and at first sight appears competitive with imported pellets. However, it should be noted that larger mainland producers have the capacity to deliver pellets at lower cost and would be in a strong competitive position towards small scale production on the Island.

Setting up small scale pellet production is not always easy. One company in the South East has worked for more than two years to set up production and is only now starting to produce commercial quantities of pellet.

7.6 Briquettes

There are many makes and styles of briquetting press with varying outputs, running costs and labour requirements. The cost of raw materials is also variable and although one estimate of “under £20 per tonne” was given more data is required for an informed opinion of the likely cost of production and sale.

An indicative price of £280 per tonne was quoted by one prospective producer of straw briquettes. The sale prices of briquettes available at the ‘Woodwarming – it’s wonderfuel’ event at Newport Football Club in November 2008 were:

Briquette supplier	cost £/kg	cost p/kWh
sawdust briquette (locally made)	0.300	6.34
sawdust briquette (locally made)	0.495	10.47
sawdust briquette (imported from Sweden)	0.500	10.57
straw briquettes (estimate)	0.280	6.09

7.7 Expected price trends

The price of wood fuel on the Island is influenced by similar factors elsewhere in the UK. The difficulty of trading across the Solent partially isolates the island market, increasing costs of importing equipment and making it difficult for wood fuel from the mainland to compete with locally made products. In the past this isolation has depressed island timber prices and now means that a higher proportion of the Island’s timber will be available for wood fuel production than in other areas where there is ready access to alternative markets.

Across England prices for wood chip fuel for use in modern heating boilers have been rising steadily from early expectations of around £50/t or even less 3 or 4 years ago. It is possible to produce chip at this price, but only from waste wood or tree surgery arisings where a gate fee for dropping off the material can be charged.

Larger power stations have until now paid considerably less than £50/t but are able to take mixed clean and contaminated wood chipped to a much lower specification than for smaller boilers. With an increasing number of larger biomass power stations being built nationally supplies of this cheap wood are becoming shorter and wood prices for power stations are expected to rise in the medium term. Timber from woodlands and SRC may be redirected to power stations with the price paid there acting as the lowest price for wood fuel.

²⁶ see *Biomass for London: wood fuel demand and supply chains*, London Energy Partnership, 2008
16/12/2008

Delivered prices for seasoned (30% moisture content) G30 grade wood chip are now £75 – 90/t. At this price production from woodlands is viable where costs for felling and extraction are low. On the Isle of Wight where many woodlands, particularly in the private sector, are small and have limited access operational costs are high and it will not be viable to manage them for wood chip production at current prices.

This is similar to the pattern across the UK. Low cost sources of wood from the waste stream and co-products from sawmills and tree surgery are still being brought into the supply chain, keeping prices at current levels. Once these are fully committed prices will begin to rise and incentivise woodland managers to bring additional supplies to the market. There may be a lag in the response to increased prices due to the time required to plan management of woodlands. As production increases a shortage of forestry contractors may develop, particularly in SE England limiting the rate of production increase.

An upper limit to wood fuel prices has historically been influenced by fossil fuel prices. Wood fuel prices were set below fossil fuel prices to compensate for the greater capital cost of wood fuel boiler and fuel storage and handling facilities.

Heat meters can be used to measure the energy supplied by wood and allow a comparison with the price of fossil fuels. They are normally installed at the boiler so boiler efficiency is taken into account when comparing costs with fossil fuels. Paying for metered heat rather than the fuel itself (by weight or volume) provides an incentive to fuel suppliers to reduce moisture content and transfers any risk from variable moisture content to the fuel supplier. Payment for energy delivered requires boilers maintained to a high standard to maintain efficiency. This creates the potential for wood fuel suppliers to offer energy rather than wood fuel supply in a package which includes routine boiler maintenance and ash removal. In this arrangement the customer receives a monthly bill for energy supplied, analogous to receiving a gas bill.

The author expects the loose link between fossil fuel and wood fuel prices to continue although there is potential for them to become decoupled as carbon emission reductions become more important (and expensive) for end users. The introduction of the Renewable Heat Incentive (in 2010 or 2011?) will also tend to increase wood fuel prices.

Over the next 3 to 5 years provided the rate of boiler installations continues along current trends, the author expects the price of wood chip to reach £ 95 - £120 (2.65 – 3.44p/kWh). At this level management of many long neglected woodlands will become viable and planting of energy crops such as short rotation coppice will become an attractive alternative for farmers. This also reflects an increased natural gas price predicted by the long term futures market in Europe.

8. Training needs

A rapid increase in demand for wood fuel will stimulate employment in the sector and will require additional skilled workers throughout the supply and boiler service sectors. The main areas where extra skills will be required are:

8.1.1 Woodland management and harvesting

Most harvesting will be done using labour intensive chainsaw based methods. This is particularly so in the private woodlands that will be brought into management as the demand for wood chip increases due to small size of many woods, poor accessibility and ground conditions that would not permit the use of heavy machines. training needs are likely to be for:

- chainsaw operation and maintenance. Although there are reported to be a pool of qualified chainsaw operators on the Island it is likely that additional cutters will be required as demand increases.
- certificated Forest Machine Operators for timber extraction and mechanical harvesting equipment. The FC requires certificates for people working in their woods and better training will improve productivity and reduce damage in all woods.
- there may be additional opportunities for horse drawn extraction, particularly on sensitive sites.

8.1.2 Wood chip production.

The training needs are likely to be for:

- chipper operation and maintenance to maximise the quality of chip produced
- wood fuel standards, achieving quality chip production and monitoring to ensure chip specification is met.
- certificates for the operation of loaders and other ancillary equipment

8.1.3 Boiler installation and maintenance

Boiler installation is likely to be carried out by off-island specialist at least initially. There is though a need to develop a core of skilled and experienced people on the island for the on-going maintenance and servicing of the boilers. It is likely that these people will be drawn from existing boiler engineers working with different fuel systems.

9. Actions to promote wood fuel use

A great deal of good work has already been done, notably through the Woodland Forum, to inform and enthuse the woodland owners and managers about the benefits of wood fuel use. The wider public was targeted through the *Wood warming – it's wonderfuel* event in November 2008. The challenge now is to change interest from potential producers and users of wood fuel into commitments for new boilers and stoves and ensure that the capacity to supply fuel matches increasing demand. Some actions that may help to do this are given for consideration below.

To develop supply capacity

1. Forestry Commission woods have a well developed road network. In contrast, private woodlands are often hard to access for timber harvesting and extraction. This increases the cost of timber and makes it difficult to make it available in a timely manner. The value of timber thinned is not normally sufficient to meet the cost of improving access. To address this:
 - a. The grants available from the Forestry Commission (Woodland Management Grant and Woodland Improvement Grant) should be actively promoted.
 - b. Additional sources of funding should be developed, for example directly from SEEDA as part of RDPE or through the Leader programme if this can be .
2. The small size of private woods means conventional harvesting and extraction equipment is not appropriate at all sites. To enable more appropriate mechanisation and improved productivity
 - a. The work done by the FC's Technical Development Branch, Small Woods Association and others on small scale harvesting and extraction should be reviewed and best practice made available to local woodland owners and contractors, possibly through training workshops.
 - b. A study tour for woodland owners and contractors to see best practice in similar woods in SE England could be organised
 - c. Consideration for setting up a model working woodland to demonstrate small scale harvesting best practice.
3. As demand for wood fuel rises forestry contractors will require additional equipment. Making grants available for this under RDPE Leader would help overcome the problems of contractors wanting to upgrade their equipment as the demand starts to rise, and having it under-used just after purchase.
4. There is one new chipper on the island suitable for fuel wood chip production and an older forwarder mounted machine which is reaching the end of its life. This leaves the supply vulnerable to failure in these essential pieces of equipment. An additional medium sized crane fed drum chipper which can process both woodland timber and tree surgery logs would greatly strengthen the supply chain. However, with limited initial demand it is hard for a private contractor to justify buying such a chipper without grant aid.
5. By committing to installation of several boilers requiring delivery of wood chip by a blower lorry the Council can provide justification for a fuel supplier to invest in a chip blowing vehicle, possibly as part of a wood fuel hub. This would greatly increase the number of locations where wood chip could be used. Suffolk Council has worked with Eastern Wood fuel to implement a planned programme of boiler installation which has supported a chip blowing vehicle.
6. The need for wood fuel hubs is specifically mentioned in SEEDA's information about RDPE. Support for the development of two or three hubs should be made available through the RDPE Leader if the grant requested is less than £50,000 or directly from SEEDA for larger requests.
7. A full training needs assessment should be made to ensure skilled people are available to meet growing demand for woodland workers. A programme to deliver the required training should be arranged with local providers.
8. Training for producers using the accredited 'Ignite' training course will help ensure high quality supplies of wood fuel is produced. This could be organised as a cooperative project under Measure 421 with other RDPE Leader groups where wood fuel is a particular priority, such as the New Forest or Lodden and Eversley to minimise costs.
9. Develop a quality assurance scheme for logs to ensure that the public can buy them knowing that the logs are properly seasoned and will give the best performance in all appliances. This could be used to establish a market for softwood logs for use in enclosed wood stoves and boilers.

To stimulate wood fuel use and market development

10. The planning system can be a relatively low cost tool for increasing wood fuel use by requiring a substantial proportion (20% or more) of energy in new developments to be supplied from on site renewable sources. This 'Merton Rule' style requirement has proved effective in London and elsewhere in increasing uptake of wood fuel and other renewable energy sources.
11. A consider biomass first rule for the Council's own properties shows confidence in and commitment to the sector. Ideally this should be to both new buildings and replacement boilers. For replacement

boilers this could be as they reach the end of their life or a special assessment could be made to identify sites with particular promise for wood fuel.

12. Make use of the first boilers installed on the Island (and before that others in SE England) as demonstration units, making local case studies available. This approach could be extended to domestic installations showing best practice with wood stoves, pellet heaters and log boilers.
13. A continuing campaign of information and education including:
 - a. material and events targeted at specific interest group covering, for example, pellet use, quality assured seasoned logs, locally made straw briquettes, how best to use reclaimed wood.
 - b. a promotional campaign targeting larger buildings off the gas network which would provide greatest economic and carbon saving benefits. Hotel owners, M&E engineers, developers and public bodies are typical stakeholders who can influence these decisions.
 - c. participate in and promote continuing professional development events covering wood fuel use and designing for it. The target group includes M&E engineers, architects and others involved in decisions about building new facilities.
 - d. Continuing promotion of grants available for wood fuel production and installation of boilers and other combustion equipment and interest free loans available to business through the Carbon Trust. This would highlight the opening of grant windows for schemes such as the Bio Energy Capital Grants Scheme.
14. Help overcome the obstacle of the high initial cost of installing wood fuel systems by:
 - a. considering the introduction of a top-up capital grants or low or no interest loans scheme, perhaps funded through the energy utilities green funds. This would help reduce the extra funding required compared to a fossil fuelled system after available grants such as the Bio-Energy Capital Grants Scheme, reducing payback times.
 - b. investigating partnerships to provide an ESCO for the Island, so reducing the need for up front capital expenditure.

Appendix 1 - Wood fuel specifications

1. Wood chips

The wood-chip fuel must conform to the following specification:

Size Classification						
Chip Designation	Maximum % Particulate Size				Maximum Extremes	
	<4%	<20%	60-100%	<20%	Area cm ²	Length cm
G30	<1mm	1 - 3mm	3 - 16mm	>16mm	3	8.5
G50	<1mm	1 - 6mm	6 - 32mm	>32mm	5	12
G100	<1mm	1 - 11mm	11 - 63mm	>63mm	10	25
G120	<1mm	1 - 63mm	63 - 100mm	>100mm	12	30
G150	<1mm	1 - 100mm	100 - 130mm	>130mm	15	40

Moisture Content Classification		
Chip Designation	Moisture Content in % (wet basis)	MC Definition
W20	<20	Air Dried
W30	20-30	Undercover Stored
W35	30-35	Limited Undercover Stored
W40	35-40	Wet
W50	40-50	Green

Material Density Classification		
Chip Designation	Material Density in kg/m ³	Density Definition
S160	<160	Low
S200	160-250	Medium
S250	>250	High

Ash Content Classification		
Chip Designation	Ash Content as % of fuel weight	Ash Content definition
A1	<1	Low
A2	>1	High

The above definitions have been extracted from ONORM M7 133 and DIN 66 165 specifications for wood chip fuel.

2. Wood pellets

The wood-pellet fuel must conform to the following specification:

Size Classification		
Pellet Designation	Maximum diameter	Maximum Length
D06	6 mm ± 0,5 mm	33 mm
D08	8 mm ± 0,5 mm	43 mm
D10	10 mm ± 0,5 mm	52 mm

Ash Content Classification		
Pellet Designation	Ash Content as % of fuel weight	Ash Content definition
A1	<1	Low
A2	>1	High

3. Cleanliness

Both wood-chips and wood-pellets must **be free from** the following contaminants:-

<ul style="list-style-type: none"> General contamination such as slate, stones, metal, rubber, plastic & other unidentified foreign bodies
<ul style="list-style-type: none"> Heavy metal compounds as a result of treatment (eg Copperchrome Arsenate (CCA) identified by green colour)
<ul style="list-style-type: none"> Halogenated organic compounds , eg lindane (identified by yellow colour)
<ul style="list-style-type: none"> Creosote (identified by dark brown stain and smell)
<ul style="list-style-type: none"> Painted wood, MDF, hardboard, fibreboard

NB

The above definitions have been extracted from ONORM M7 133 and DIN 66 165 specifications for wood chip fuel.

South East Wood Fuels Ltd provides this document for indicative purposes and in good faith but accept no responsibility for its accuracy or for the implementation of the standards by any individuals or organisations.

Appendix 2 - Wood fuelled CHP systems available in the UK as at October 2008

Small scale biomass CHP is a rapidly developing field with a range of technologies at all capacities from 100kWe upwards. The main technology options are:

- combustion combined with a steam turbine, reciprocating steam engine, hot air turbine or Stirling engine. At a small scale steam turbines are less efficient with conversion to power dropping below 20% although systems down to 500kWe are offered. Stirling engine systems also have relatively low power conversion rates but are robust due to the external combustion design. Higher power output rates are claimed for reciprocating steam engines and hot air turbines.
- gasification with an internal combustion engine or any of the alternative power generation systems listed above. Gasifiers combined with internal combustion engines have electricity generation efficiencies of 25-28% but require a fully cleaned gas with very low tar levels to operate reliably.

Most small scale biomass CHP systems are designed as modular units, capable of being combined into units of up to several megawatts. Many, in particular the gasification based systems, are able to process timber contaminated with paints, glues and other coatings and comply with the waste incineration directive (WID).

A list of CHP units available in the UK and contact details for suppliers are given below. Capital costs for biomass CHP plants are very variable, depending on the technology chosen and scale of the plant. For the suppliers where prices were available the range was £1315 - £4000 per kilowatt of electrical output

Biomass CHP plants benefit from receipt of renewable obligations certificates (ROCs) on their electrical output currently worth £51.29/MWh²⁷ which compensates for the high capital costs at this early stage of the technology development. Under new arrangements for ROCs which will be introduced on 1st April 2009 double ROCs worth over £100/MWh will be allocated to biomass CHP production²⁸ further increasing the incentives for biomass CHP.

NB The table below is not exhaustive and does not provide any information about the quality of the technology or equipment.

Manufacturer	Technology	Thermal output (kWth)	Electrical output (kWe)	Calculated overall efficiency (%)	Max MC (%)	Approx cost quoted (£)	£/kWe
AES (Alternative Energy Systems)	US company offering high efficiency boiler (Italian) combined with 'Spilling' reciprocating steam engine (Geman)		120 -1200				
Bioflame	combustion unit (patented) with steam boiler and turbine	twice electrical?	400 – 3000+	??	??	??	
Biomass CHP Ltd	Downdraft gasifier + IC gas engine	200	130	45-57	50	260,000	2000
Biomass Engineering Ltd	Downdraft gasifier + IC gas engine	500	250	73	20*	300,000 – 400,000	1400
Evonik	Combustion and steam turbine WID compliant & GC CHP		500 - 20000	??	??	??	

²⁷ Price in ROC e-auction held on 9th October 2008 given on <http://www.nfpa.co.uk/nfpas/trackrecord.htm>

²⁸ see www.berr.gov.uk/files/file43622.pdf for details of the banding arrangements

HelioDynamics Ltd	Combustion powering thermal oil boiler driving Organic Rankin Cycle generator	600	120	??	??	??	
Innovation Technologies Ireland Ltd	Downdraft gasifier (Fluidyne) + IC engine	70 200 550	35 100 or 1100	60	35	230,000	2300
ITI Energy Ltd***	Gasifier + IC engine	5000	1900 (1700 net)	~ 70%	20	£2.5m +/- 20%	1315
Keld Energy Ltd.	Gasifier feeding gas turbine. designed as modular CHP for dealing with chicken farm waste. 50% turndown capacity. Should be suitable for wood	400	200	?	?	?	
Mawera Technology Ltd	combustion fired Stirling engine to 70kW _e Organic Rankin Cycle (Turboden) up to 1.5MW _e Steam turbine to 2.5MW _e	various	70 - 2500	varies with technology 77-90	50		
Prime Energy Solutions	combustion and steam turbine?? WID compliant.		various	??	??	??	
Pure Power	Gasification WID compliant		1000- 10000	??	??	??	
Stirling Denmark ApS	Combustion or Updraft gasifier + Stirling engine	145 - 215	35**	85 - 90	50	140,000	4000
Talbotts	Indirect combustion fired hot air microturbine	200	90	76	40	350,000	3800
Turboden	biomass boiler with ORC CHP unit	2300 - 6950	500 - 1500	97			
Waste to Energy Ltd	Downdraft gasifier with modified diesel engine	100	100	49	20		
CTU - Conzepte Technik Umwelt AG	Gasifier with internal combustion engine	700	300	??	25-40	not known	

* drying using a part of the heat enables use of wetter chip

** 75 kW_e Stirling engine in development

*** Can take a range of fuels and designed for compliance with WID

Source: Information from suppliers, their websites, and staff from The Biomass Energy Centre

Contact details for suppliers of wood fuelled CHP systems

Many have been tested with a range of other biomass products

AES

Combining technology from Italy and Germany to offer a tested CHP package.

Gasifying boiler from Italy (www.uniconfort.com/index_eng.html) and steam engine generator from Germany (www.spilling.de/english/index.php). There is a UK agent but I don't know who it is. Might be worth contacting the equipment suppliers directly.

Alternative Energy Solutions
312 Laura Street
Wichita, KS 67211
USA

phone: 316.201.4143
fax: 316.264.7827
info@aesenergy.net
www.aesenergy.net

Bioflame Ltd

From agricultural background but well developed plant with patented combustion system. Sold as waste to energy plant but also suitable as energy generation unit using waste wood. WID compliant.

Andrew Springett, Commercial Director
Bioflame Ltd
South View Yatts
Pickering
North Yorkshire YO18 8JN

t: +44 (0) 1751 472831
f: +44 (0)1751 472595
e: enquiries@bioflame.com
www.bioflame.co.uk

Biomass CHP Ltd

Formerly Exus Energy and before that B9 Energy Biomass Ltd.

Unit 27, Templemore Business Centre,
Northland Road,
Derry City,
Co. Londonderry BT48 0LD

Brian Williams, Technical Director
Tel:
e: brianw_at_b9energy@hotmail.com
www.exusenergy.com

Biomass Engineering Ltd

Junction Lane,
Sankey Valley Industrial Estate,
Newton-le-Willows WA12 8DN

Andrew Connor – Project Manager
Tel: 01925 220338 Fax: 01925 220135
e: a.connor@biomass.uk.com
www.biomass-uk.com

CTU - Conzepte Technik Umwelt AG

Bürglistrasse 29
CH- 8400 Winterthur
Switzerland

Tel. +41 (0)52 262 61 61
Fax +41 (0)52 262 00 72
info@ctu.ch
<http://www.ctu.ch>

Evonik Industries

Part of larger German company. Installs biomass CHP based on conventional combustion and steam turbine.
20+ installations across Europe. WID compliant and said to meet GQ CHP standard

Hans-Peter Ickemeyer
Director, Sales and Communications
Evonik Power Minerals Ltd.
5 Kew Road
Richmond TW9 2PR

t: 020 8334 7256
f: 020 8334 8173
m: 07768 582572
www.evonik.com/powerminerals-uk

HelioDynamics Ltd

Manor Farm
14 Alms Hill
Bourn
Cambridge B23 2SH

Tel: 01954 713 971
Fax: 01954 713 979

Graham Ford, CEO
e: ford@heliodynamics.com
www.heliodynamics.com

Innovation Technologies Ireland Ltd

47, Manse Road,
Ballycarry,
Carrickfergus,
Northern Ireland BT38 9HP

Ian Millikan
Tel: 028 9337 3379 Fax: 028 9337 8039
e: info@innovation-tech.co.uk
www.innovation-tech.co.uk

Doug.Williams@orcon.net.nz
www.fluidynenz.250x.com

ITI Energy Ltd

Innovation Technology Centre
Brunel Way
Rotherham
South Yorkshire S60 5WG

Tel: 0114 254 1233 Fax: 0114 254 1235
e: info@iti-energy.com
www.iti-energy.com

Keld Energy Ltd

Dr Alex Driver
The Old Vicarage
Little Salkeld, Penrith
Cumbria CA10 1NN

t: 01768 881278
f: 01768 881278
m: 07775 947186
e: info@keld-energy.com

Mawera Technology Ltd

31, Enterprise Industrial Park,
Britannia Way,
Lichfield,
Staffordshire WS14 9UY

John Clissett
Tel: 01543 258844 Fax: 01543 416311
e: jac@mawera.co.uk
www.mawera.co.uk
www.mawera.com

Prime Energy Solutions

Irish-Swedish company using proven Swedish wood fuelled CHP system. varying sizes according to need.
Plan to open London office in June/July 08. Have proposals for CHP linked with new mixed use development in London.

Derek Madden
Prime Energy Solutions
Unit 10/11,
The Nestor Complex,
Monksland Industrial Estate,
Athlone,
Co Roscommon.
Eire

t: 00353 90 649 0642
m: 00353 877938911
e: derek.madden@primeenergysolutions.ie
www.primeenergysolutions.ie

PurePower Holdings Ltd

1.5-5MW gasification based CHP units. Owns and operates WID compliant plants where fuel exists. Usually low grade waste wood

Adam Overfield
Managing Director
PurePower
Suite 11
Springboard Business Centre
Ellerbeck Way
Stokesley TS9 5JZ

t: 01642 715 387
f: 01642 715 301

or
Park Street
Cirencester
Gloucestershire GL7 2BN

t: 01285 651166
f: 01285 641171

Stirling Denmark ApS

Diplomvej, build. 373 - DTU - 2800
Lyngby,
Denmark

Prof Henrik Carlsen
Tel: +45 45 25 93 70 Fax: +45 45 25 93 71
e: hc@stirling.dk
www.stirling.dk

Sustainable Energy Ltd

2 Alexandra Gate
Cardiff CF24 2SA

Gabriel Gallagher
Tel: 02920 894940 Fax: 02920 894941
e: gabriel.gallaghersustainable-energy.co.uk
www.sustainable-energy.co.uk

Talbotts Ltd

Drummond Road,
Astonfields Industrial Estate,
Stafford ST16 3HJ

Tel: 01785 213366 Fax: 01785 256418
e: enquiries@talbotts.co.uk
www.talbotts.co.uk

Turboden

Turboden s.r.l.
Viale Stazione, 23
25122 Brescia
Italy

tel.: +39.030.3772341
fax: +39.030.3772346
mail: info@turboden.com

Waste to Energy Ltd

Eyston,
Borley Green,
Sudbury,
Suffolk CO10 7AH

Tel: 01787 373007 Fax: 01787 373535
e: info@waste-to-energy.co.uk
www.wastetoenergy.co.uk