HAWKINS WRIGHT

Volume 1, Issue 1 – **8 May 2009**

Forest Energy monitor

BIOMASS & PELLETS — MARKETS — INVESTMENTS — LEGISLATION

SNAPSHOT...

	March	April
Energy wood/biomass (delivered to heating plant, Sweden)		
€/MWh	**16.90** (Q408)	**-**
Industrial wood pellets (CIF ARA) - ENDEX		
€/tonne	**141.27**	**137.52**
€/MWh	**29.93**	**29.14**
Wood pellets - Germany (Residential grade, bulk, delivered		
€/tonne	**234.68**	**218.68**
€/MWh	**49.72**	**46.33**
Wood pellets - Austria (Residential grade, bulk, delivered		
€/tonne	**207.00**	**202.00**
€/MWh	**43.90**	**42.80**
Wood pellets - NE USA Residential grade, delivered, in bags		
$/tonne	**-**	**313.00**
$/MWh	**-**	**66.30**
Coal (CIF ARA)		
$/tonne	**58.54**	**64.93**
€/MWh	**6.43**	**7.04**
Crude oil (Brent Index)		
$/barrel	**47.29**	**51.08**
€/MWh	**23.24**	**24.87**
Carbon (EUA December 09)		
€/t CO_2	**11.56**	**13.31**
FE^m Biomass Co-firing Index (BCI)		
€/MWh	**9.23**	**10.32**
FE^m BCI Pellet Spread		
€/MWh	**20.70**	**18.82**

For sources and definitions see footnotes on Page 2

MARKET BRIEFING

FOREST BIOMASS AND WOOD PELLET PRICE INDICATIONS

		Q108	Q109	Mar 09	Apr 09	*Change year-on-year*
EUROPE						
Energy wood/biomass - Sweden[1.] delivered to heating plant	*Skr/MWh*	159	174 (Q4)	n/a	n/a	-
	€/MWh	16.94	16.90 (Q4)	n/a	n/a	-
Industrial wood pellets (ENDEX)[2.] CIF Amsterdam, Rotterdam, Antwerp (ARA)	*€/tonne*	126.33	140.28	141.27	137.52	*+25.52*
	€/MWh	26.77	29.72	29.93	29.14	*+5.41*
Wood pellets/brickettes - Sweden[1.] Delivered to heating plant	*Skr/MWh*	265	279 (Q4)	n/a	n/a	-
	€/MWh	28.23	27.15 (Q4)	n/a	n/a	-
Wood pellets - Germany (residential grade)[3.] delivered, bulk: <6 tonne, 100-200 km, incl. taxes	*€/tonne*	190.48	233.59	234.68	218.68	*+36.65*
	€/MWh	40.36	49.49	49.72	46.33	*+7.76*
Wood pellets - Austria (residential grade)[4.] delivered, bulk: <6 tonne, incl. taxes	*€/tonne*	187.00	204.33	207.00	202.00	*+34.00*
	€/MWh	39.62	43.29	43.90	42.80	*+7.20*
Coal[6.] CIF ARA (average next month future) (EEX)	*US$/tonne*	137.99	71.44	58.54	64.93	*-70.03*
	€/MWh	13.20	7.85	6.43	7.04	*-5.22*
Crude oil[7.] Brent Index (ICE)	*US$/barrel*	96.09	45.58	47.29	51.08	*-58.57*
	€/MWh	41.21	22.46	23.24	24.87	*-19.87*
Natural gas[7.] EU - one month future (ICE)	*€/MWh*	23.44	18.91	12.97	11.84	*-14.05*
FE[m] Biomass Cofiring Index (BCI)[8.]	*€/MWh*	18.42	10.45	9.23	10.32	*-8.16*
FE[m] BCI Pellet Spread[8.]	*€/MWh*	8.35	19.27	20.70	18.82	*+13.57*
NORTH AMERICA						
Energy chips/residuals (North East USA)[8.] mixed grades, delivered	*US$/MWh*	14.80	15.30	-	-	*+0.50*
Wood pellets - NE USA (residential grade)[9.] delivered next month in bags: 3 s.tons,	*US$/tonne*	-	-	-	313.00	*n/a*
	US$/MWh	-	-	-	66.30	*n/a*
Coal (thermal) - Central Appalachia[10.] prompt quarter delivery, 12,500 Btu/ton	*US$/s.ton*	71.45	68.25	68.39	68.95	*-19.30*
	US$/MWh	9.76	9.32	9.34	9.42	*-2.64*
Crude oil[10.] West Texas Intermediate (WTI), spot	*US$/barrel*	97.94	42.91	47.94	49.65	*-62.93*
	US$/MWh	62.97	27.59	30.82	31.92	*-40.46*
Natural gas[10.] Henry Hub (NYMEX)	*US$/MMBtu*	8.75	4.72	4.00	3.56	*-6.73*
	US$/MWh	30.18	16.02	13.80	12.28	*-23.20*

Sources: 1. Swedish Energy Agency; 2. ENDEX; 3. Deutscher Energie-Pellet-Verband e.V.; 4. proPellets Austria; 5. EU Commission; European Energy Exchange; 7. ICE; 8. Hawkins Wright research; 9. pelletsales.com (sample of offers); 10. Energy Information Agency.

Notes: a. All wood pellets are assumed to have a calorific value of 4.72 MWh/t (17 GJ/t). Other calorific value assumptions are available on request. b. The Biomass Cofiring Index is the price at which the cofiring value of biomass equals the cost of the coal and carbon it displaces. c. The BCI Pellet Spread is the difference between the BCI and the price of industrial wood pellets quoted by ENDEX. d. Where the original data is weekly or daily, the monthly and quarterly figures shown here are simple averages of the original.

BIOMASS & PELLET MARKET ANALYSIS

Biomass and pellet markets have been largely untouched by this year's collapse in fossil energy prices. A combination of steadily growing demand for energy wood and a contraction in the supply of readily available sawmill and forest residues has underpinned biomass and wood pellet markets in Europe and North America.

In both regions, the arrival of spring has brought a slight easing of spot prices as suppliers seek to minimise the costs of carrying stock through the summer. The price of industrial wood pellets for prompt delivery quoted by *ENDEX* on 4 May was €131.59/t cif ARA (or €27.88/MWh assuming a calorific value of 4.72 MWh/t), down from €141.06/t (€29.88/MWh) a month earlier.

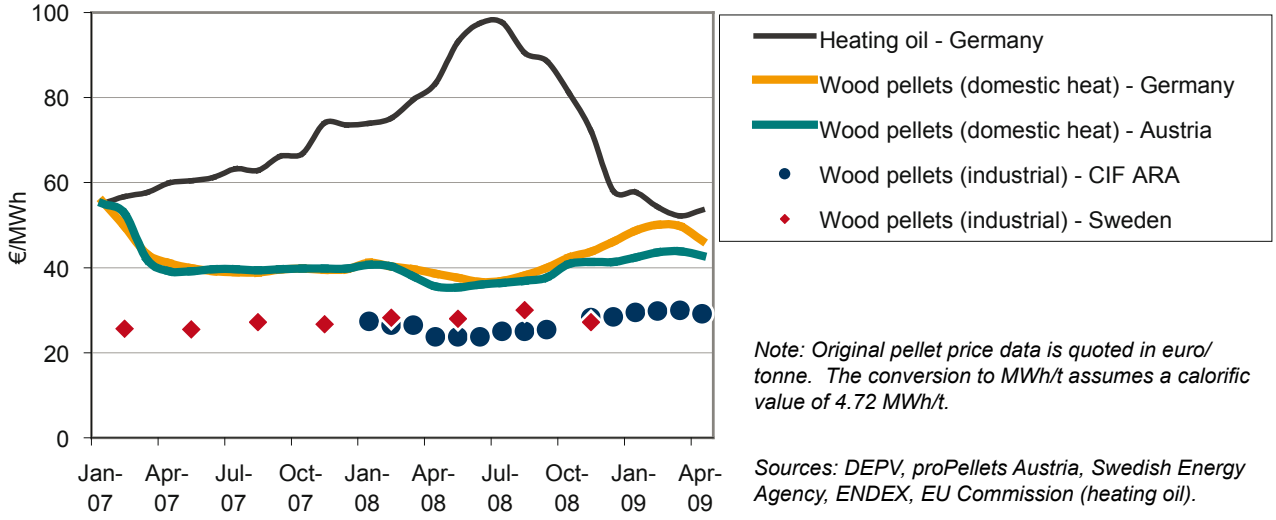
The price that an individual industrial buyer might actually pay for wood pellets is closely linked to the size and length of the contract. Anecdotal reports suggest longer-term contracts of a year or more have seen hardly any slippage, with prices still in the mid-€130s cif ARA (~€27.50MWh). On the other hand, traders report that an industrial buyer with enough storage capacity to accept delivery of a large volume of pellets early this summer might expect to pay a spot price below €120/t (~€25.40/MWh). Spot prices may well drop further as northern Europe's scarce biomass storage capacity fills up during the next couple of months.

The price of pellets for domestic and commercial heating has also started to move lower in continental European markets in recent weeks. However, European traders judge that the seasonal decline in prices is less pronounced than usual. In Germany, *DEPV* – the German Pellet Association – reports that the average price in April was €219/t (for <6 tonnes delivered in bulk), down from €235/t in March, but this is still 20% higher than in April last year. Likewise in Austria, the average price reported by *proPellets* was €202/t in April, down from €207/t in March, but again 20% higher than in April 2008.

Much the same is true in North America where, although the availability of price data is patchy, pellet producers have clearly embarked on their spring sales promotions. Our survey of suppliers delivering to the north eastern states of Vermont, Maine, New Hampshire and New York puts the average price for May delivery at $313/tonne (for a 3 ton delivery in bags). At current exchange rates $313/t equals about €233/t.

The greater seasonal strength of Europe's pellet heating market is partly explained by this year's

Prices of wood pellets in selected European countries, compared to heating oil – Jan 2007 to Apr 2009



Note: Original pellet price data is quoted in euro/ tonne. The conversion to MWh/t assumes a calorific value of 4.72 MWh/t.

Sources: DEPV, proPellets Austria, Swedish Energy Agency, ENDEX, EU Commission (heating oil).

unusually long and cold winter. This has left both household and supplier stocks of pellets particularly low. Demand has also been driven higher by the strong growth in sales of domestic and commercial pellet boilers and stoves, growth that has been stimulated by new subsidies to fund the installation of pellet boilers, as well as by the Russian/Ukrainian dispute which yet again cut off natural gas supplies to large areas of central and eastern Europe over the New Year. Energy security at a household level, as well as at a national/regional one, is an important concern that is motivating growth in wood pellet demand, particularly in the eastern parts of Europe which are most dependent on Russian gas and imported heating oil.

The tightness of feedstock supplies (see page 5) has supported prices of energy wood and has pushed up costs on both sides of the Atlantic, costs which pellet producers have tried at least partly to pass on to the consumer. Costs aside, the limited availability of residues has forced many users of energy wood to look elsewhere for their feedstock. To some extent they have been helped by a sharp fall in pulpwood demand over the past six months. In both North America and Europe, pulp production is currently running at a level about 15-20% lower year-on-year. Panel producers – usually big users of residues and low grade wood, including pulpwood and recovered wood – have been hit even harder by the recession; OSB production in North America in Q1 was 40% lower year-on-year.

Pulpwood is normally outside the reach of energy buyers, but with demand from traditional end-users falling, prices of pulpwood have dropped to levels barely higher than those of energy wood. Consequently, in Sweden for example, pulpwood is now being chipped for energy uses, either for heat and power or pellets. The same is true elsewhere, although in some areas the trend has been delayed by the need for investment in equipment to chip and process logs rather than residues. In many cases these investments are now under way, although inevitably they will push up costs.

The growth in energy wood demand is therefore changing the nature of pulpwood and chip markets, with important implications for the traditional forest industries. These are permanent changes that will not simply be reversed when pulp, paper and sawn timber demand recovers. Energy wood is creating a floor beneath the pulpwood market, and given the scale of our governments' renewable energy targets – and the need to mobilize more costly sources of energy wood – it is a floor that is far more likely to rise than to fall in the future. This will eventually place upward pressure on pulpwood prices and increase the competition between energy and traditional pulpwood buyers.

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FOREST BIOMASS FEEDSTOCK AVAILABILITY – FOREST AND SAWMILL ACTIVITY

The collapse in the house building and construction sectors, first in North America and more recently in Europe, continues to have a devastating impact on timber markets. As harvesting and sawmilling activity has declined there has been an inevitable reduction in the availabiity of sawmill and forest residues, squeezing the supply of woody biomass feedstock.

In the USA, seasonally adjusted housing starts in March 2009 were 48% lower than in the same month last year. While it is tempting to believe that the worst of the housing recession in the USA may be behind us, this is probably not the case in Europe. Any significant recovery in house building – and therefore in sawn timber demand – is probably several quarters away given the stock of unsold and repossessed houses on the market.

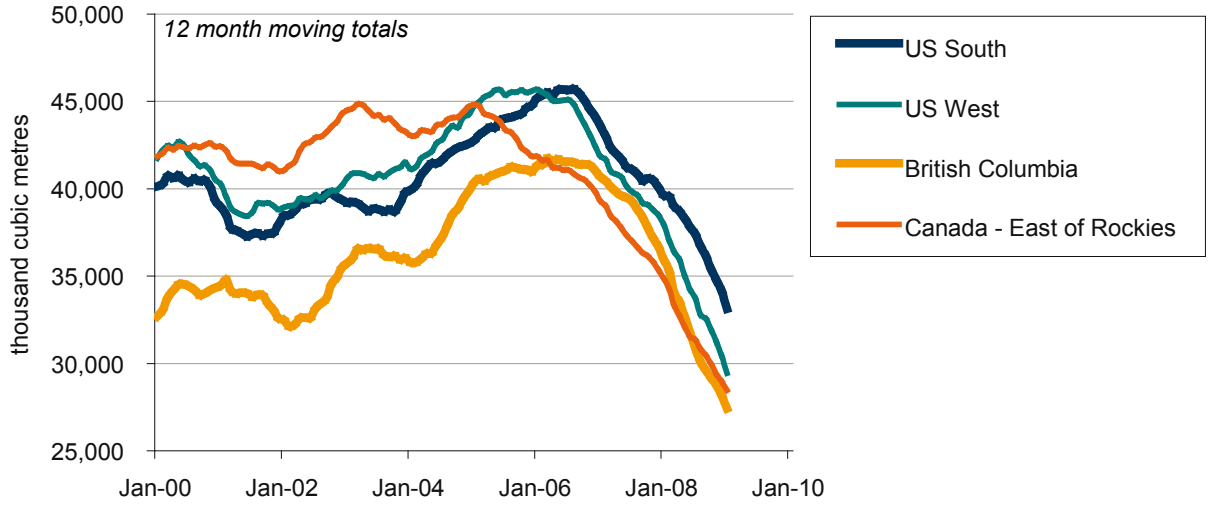
Sawn timber production in North America has plummeted as demand has shrunk. Canadian production in February was 31% lower year-on-year, and sawmills in the BC Interior have seen production fall by 37%. These figures continue a trend which has been underway since mid-2006: it is now 32 consecutive months since Canadian sawn timber production has shown any growth year-on-year.

The restricted supply of residues has kept prices in North America relatively firm, particularly for clean chips and sawdust. Some pellet producers have resorted to whole-log chipping which is more expensive, although this is partly offset by the falling price of pulp logs as pulp producers scale back production.

European timber markets are also very weak and companies continue to announce the downtime and closure of sawmills. UPM-Kymmene's Forest and Timber Division reported a 37% decline in deliveries in Q1 2009. Stora Enso's deliveries dropped by 24% in Q1 and the company announced further sawmill closures and rationalisations – in Finland, Latvia, Poland and Austria – which, together with previously announced measures, will reduce this year's sawmilling capacity by 800,000 m^3.

Meanwhile in Finland, the Forest Industries Association announced that the timber industry's purchases from private forest owners totalled 2.3 million m^3 in Q1 2009, 51% less than during the first three months of last year.

North American softwood lumber production – January 2000 - January 2009



Source: WWPA (Lumber Track). Original data converted to cubic metres by Hawkins Wright

ENERGY AND CARBON MARKET BRIEFING

Energy prices have stabilised – and some have increased – during the past few weeks, but it is still far too early to conclude that this marks the start of a new upward trend. After their precipitous drop from $145/barrel in July last year to a low of $37/barrel in December, Brent Crude prices rallied to $51/barrel on 5 May. Oil prices in the US have followed a similar pattern; West Texas Intermediate stood at $54/barrel on 5 May, up over 50% since the market low at the end of last year.

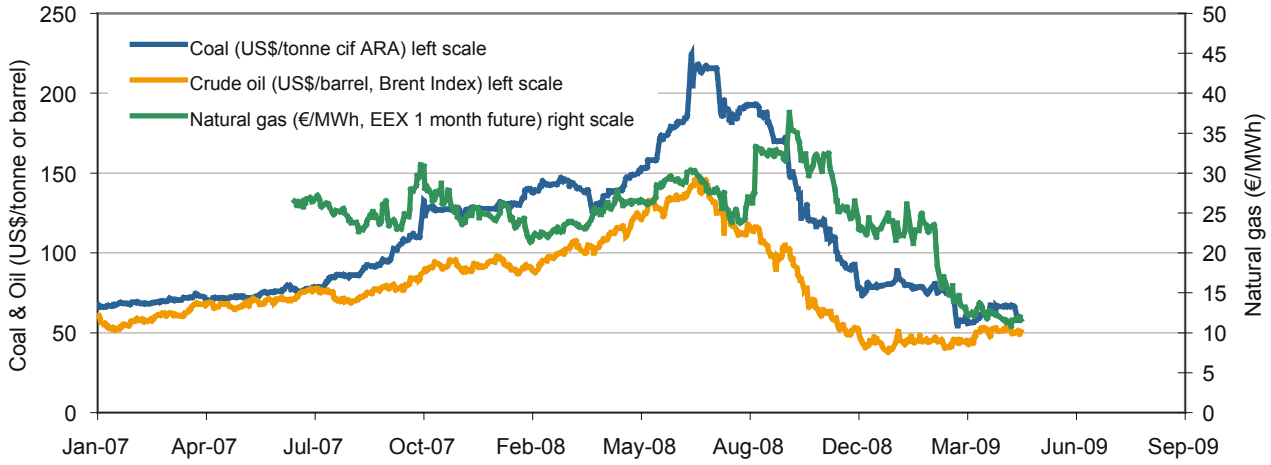
The recovery is largely based on new-found confidence that the economic policies being pursued by governments on both sides of the Atlantic will have the effect intended; i.e. that our economies will soon climb out of recession in response to the massive amounts of cash being injected into the system. Maybe they will – although we have our doubts – but this does not mean that energy markets will avoid some nasty setbacks along the way.

One such setback may be brewing in the oil market. The combination of low current demand and expectations of higher future demand has created a big differential between the price of oil for delivery today (about $51/barrel) and the price for delivery in a few months time (e.g. $64/barrel for May 2010). The cost of money and shipping is currently so low that it is profitable for traders to exploit this 'contango' by buying and holding oil for future delivery. The result is that crude oil inventories have climbed to record levels in Europe and America. There are reports that all storage tanks in Rotterdam are full or have no unreserved space available. There are also said to be 20 very large crude carriers (VLCC) at anchor in the Rotterdam/Amsterdam area being used as floating storage tanks. There may be another 30 VLCCs and 40 smaller vessels being used for similar purposes elsewhere.

Oil stocks are also high and at near record levels in the USA; on 1 May, crude oil stocks stood at 375 million barrels, the highest level since September 1990. The obvious implication is that the oil market is setting itself up for a sharp reversal if investors' confidence in an economic recovery takes a knock.

Coal prices in Europe also seem to have levelled out after the sharp decline from last year's high. The price of thermal coal cif ARA, which in percentage terms has dropped even more than that of oil, is trading at around $60/t for spot delivery. This hardly marks a recovery, but it is a few dollars higher than the lows seen in March.

Commodity energy prices — Coal, oil and natural gas



Sources: EEX and ICE

Carbon prices Europe and the USA	
EUA Futures Contracts (€/t CO2)	
4 May 2008 (Chg month on month)	
Dec-09	14.78 (+2.26)
Dec-10	15.47 (+2.27)
Dec-11	16.16 (+2.28)
Dec-12	17.11 (+2.24)
RGGI Futures Contracts ($/t CO2)	
5 May 2008 (Chg month on month)	
Dec-09 (V09)	3.51 (-0.11)
Dec-10 (V09)	3.62 (-0.15)

Sources: European Climate Exchange (ECX) and Chicago Climate Futures Exchange (CCFE)

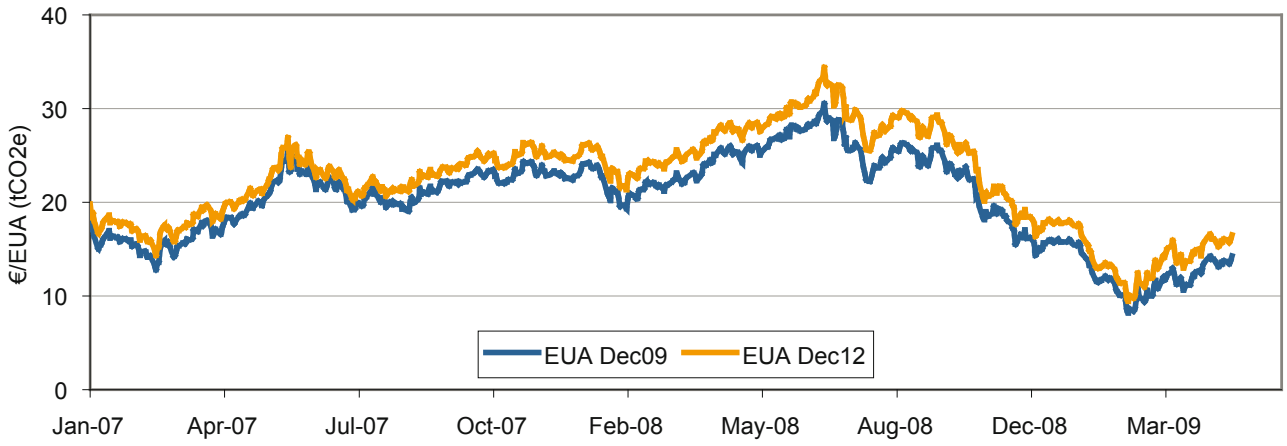
The one area where energy prices have not recovered, nor even stabilised, is natural gas. In Europe, the price of gas on the European Energy Exchange averaged €11.84/MWh in April and is still trending lower from last year's high of over €37/MWh.

In the US, The Wall Street Journal describes the market as "awash with gas". Unlike oil, whose decline is explained by weaker demand, the US natural gas market is also having to cope with higher production following the discovery of large new gas fields in Louisiana, Texas, Arkansas and Pennsylvania. US gas production increased by 7.2% in 2008, reversing a downward trend that was previously thought to be irreversible. The benchmark Henry Hub price of gas in early May was $3.30/MMBtu ($11.37/MWh), down from over $13/MMBtu ($47/MWh) in June last year. As a result, natural gas is now cheaper than coal in some parts of the USA and more utilities are switching from coal to gas.

Low fossil energy prices are clearly an impediment to the development of renewable energy technologies, including bioenergy. Most second generation biofuels are probably viable only when oil prices are $70/barrel or more. This may be a bit of a generalisation, but it is broadly true. Also, as discussed on page 9, low coal (and gas) prices make cofiring with biomass less attractive than it used to be. This does not mean that bioenergy developments will not take place, but it will mean that taxpayers and consumers will need to put their hands deeper into their pockets to support them.

One way will be by tightening the carbon markets, pushing carbon prices ever higher. However, quite the reverse seems likely to happen in the short term. The EUA Dec09 contract settled at €14.26/tCO_2 on 4 May, well up from the February low of €8.20/tCO_2, but far below last year's high of €30/tCO_2. As with oil, the past weeks' recovery has been based on expectations that the outlook for industrial output in the EU is not as dire as previously thought. But with the EU Commission now expecting GDP to contract by 4% in 2009, and by 6% in Germany, the market may soon need to reassess this year's demand for emission allowances. Expecting the market to be long on allowances, *Point Carbon* analysts predict a slump in carbon prices later this year – possibly revisiting the single-digit lows of Q1 – before a gradual recovery sets in in 2010.

Carbon markets — European Emission Allowances (EUA)



Source: European Climate Exchange (ECX)

BIOMASS COST DRIVERS – LOWER FREIGHT RATES ARE OFFSET BY THE STRENGTH OF THE US DOLLAR

The Baltic Dry Index, which tracks the spot price of shipping key dry commodities, receded to a low of less than 700 points in December, from a high of 11,600 in May last year. Since then it has recovered a little, stabilising in a range of 1,500-2,100 points since February. At the end of April the BDI stood at around 1,840.

However, since wood pellets and wood chips are mostly shipped under long-term contracts, the decline in the Baltic Dry Index doesn't necessarily reflect the true cost of shipping biomass in today's market. Furthermore, most shipping contracts are priced in US dollars, meaning that for non-US companies, even if their US dollar cost had declined during the past six months, these gains would most likely have been offset by the appreciation of the US$ against their domestic currency. Our estimates show that for non-US based companies tied into long-term contracts, unfavourable exchange rate movements might have boosted their shipping costs by as much as 25% in local currencies during the past six months.

It is difficult to quantify a "typical" $/tonne price for shipping biomass. A company tied into a contract agreed two years ago might be paying significantly more than a company tied into a recently signed agreement, and no two contracts are the same. Anecdotal information suggests that biomass suppliers tied into long-term contracts signed before the financial crisis are typically paying $55/t for trade from British Columbia and US West Coast to North Europe and between $28-35/t for trade from the US Gulf. The spot rate for these routes went as high as $75-80/t during 2008, but collapsed to as low as $17-20/t by the start of 2009. It is understood that long-term contracts signed this year have been settled at below $25/t for trade from North America to ARA (Amsterdam/Rotterdam/Antwerp). Freight rates to Immingham, UK, are typically $3-4/t higher and to Fredericia (Denmark) and Helsingborg (Sweden) they may be as high as $42/t.

Freight rates seem likely to remain depressed through 2009. Although the Baltic Index has risen by over 175% since December, the increase has been attributed to one-time factors as opposed to improved economic conditions. For example, Australia's bumper wheat harvest has played a key role. Traders have also take advantage of low freight rates to store commodities at sea while waiting for prices to improve. But with global trade looking likely to remain depressed at the same time that the global shipping fleet is forecast to grow, a general recovery in ocean freight rates appears distant. For shippers of biomass looking to renew their contracts, this should provide an opportunity to lock in significantly lower rates.

Baltic Dry Index

Source: Baltic Exchange

THE FE^{m} BIOMASS COFIRING INDEX

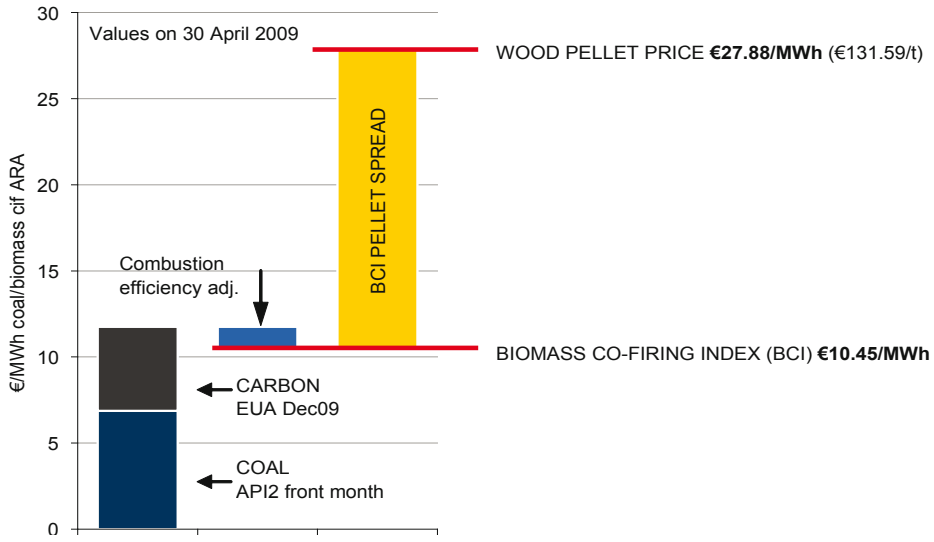
The **Biomass Cofiring Index (BCI)** is a tool that we have developed to track the competitiveness of cofiring biomass, relative to burning coal, in a typical European electricity generating plant. Given the scale of Europe's renewable electricity targets (see page 12) – and the flexibility of power producers to switch between feedstocks – it is an analysis that has a bearing on the price which cofiring generators will be willing to pay for biomass as well as on the formation of policy instruments designed to promote biomass electricity production.

The calculation of the BCI, using values on 30 April 2009, is illustrated in the chart below. Starting in the bottom left hand corner it incorporates, first, the spot price of coal (€6.88/MWh – or €48.01/t – cif ARA). To this is added the price of emission allowances needed to cover the carbon emitted by the combustion of a MWh of coal (€4.86/MWh-coal). An adjustment is then made to reflect the lower combustion efficiency of biomass (in this case wood) relative to coal. The result is the Biomass Co-firing Index (or BCI), the price per MWh of biomass, at which, before all national incentives, subsidies and penalties, the co-firing value of biomass equals that of the coal which it displaces. **On 30 April 2009 the BCI stood at €10.45/MWh cif ARA.**

Clearly every generator will have different technical parameters and the level at which biomass is competitive with coal will differ between plants. Logistics will also be an important influence. Nevertheless the intention of the BCI is to provide a simple benchmark which can be used to analyse the impact of changing economic conditions on a typical European co-firing power plant. The parameters in our BCI model are based on those used by the IPCC in its climate modelling. These are available to FE^{m} subscribers on request. The BCI will be reported in all future issues of *Forest Energy Monitor*.

Once the BCI has been established it can be compared with the market price of biomass, the difference between the two being what we have termed the **BCI Spread**. For example, the latest price of wood pellets for May delivery quoted by ENDEX is €131.59/t cif ARA, or €27.88/MWh (assuming a calorific value of 17 GJ or 4.72 MWh/t). Therefore, the BCI Pellet Spread was **€17.43/MWh** (27.88 minus 10.45). It is this spread – the difference between the market price of biomass and its co-firing value – which must be

*Calculation of the **Biomass Co-firing Index (BCI)** and the **BCI Pellet Spread***



Source: Hawkins Wright analysis

bridged by policy instruments if co-firing is to be commercially attractive to electricity generators. Different countries have different ways of supporting renewable technologies: feed-in tarrifs, green certificates, etc. In the UK the gap is bridged by a system of tradable Renewable Obligation Certificates (ROCs) and Climate Change Levy Exemption Certificates (LECs). Other European countries use different instruments, or none, which helps to explain the enthusiasm for co-firing, or the lack of it, in different countries.

Banding of ROCs in the UK
from April 2009

Generation type and feedstock	*ROCs/ MWh*
Cofiring regular biomass	0.5
Cofiring energy crop	1.0
Cofiring regular biomass with CHP	1.0
Dedicated regular biomass	1.5
Cofiring energy crop with CHP	1.5
Dedicated regular biommass with CHP	2.0
Dedicated energy crop	2.0
Dedicated energy crop with CHP	2.0

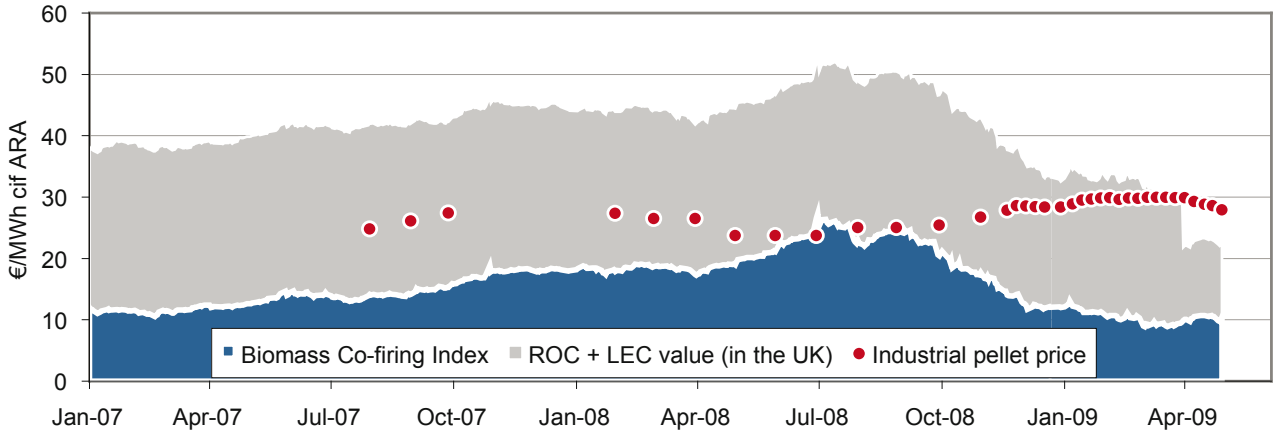
Source: OPSI: Renewables Obligation Order 2009

Until 1 April 2009 all generators of renewable electricity in the UK received one ROC per MWh_e. Last month, however, the government introduced a system of banding to give extra support (i.e. a larger number of ROCs per MWh) to emerging renewable technologies and less support (fewer ROCs) to established technologies. See the table.

Consequently, a power station cofiring regular biomass – including wood pellets – now receives only half a ROC/MWh_e. At the last e-ROC auction, ROCs were selling for £52.65/MWh_e. At current exchange rates, and using typical calorific values and generating efficiencies, half a ROC (plus a LEC at £4.70/MWh) is worth approximately €12.38/MWh of biomass to a UK cofirer. This is less than the BCI Pellet Spread (€17.43/MWh) and consequently we calculate that cofiring wood pellets is unprofitable, relative to coal, all else being equal. (See the chart below.) However, for a generator which qualifies for a full ROC or more – by using an energy crop, for example – cofiring should still be commercially attractive. A full ROC+LEC is worth €22.87/MWh which should be enough to bridge the gap between the Biomass Cofiring Index and the cost of a typical biomass energy crop.

Biomass is an integral part of many generators' renewable energy strategies and clearly the cofiring of regular biomass and pellets will not be abandoned outright. But if the economics of co-firing pellets remains unattractive for too long, expect UK generators to put pressure on the government to review the allocation of ROCs and where possible to switch to other, less expensive, sources of biomass.

United Kingdom: *The value of cofiring biomass (the Biomass Cofiring Index plus the value of ROCs) compared to the price of wood pellets, 2007-2009*



Note: Assumes a generator receives 1 Renewable Obligation Certificate per megawatt hour until 31 Marcch 2009 and 0.5 ROC / MWh thereafter.
Source: Hawkins Wright analysis. Pellet prices cif ARA: 2007-08, www.pelletsatlas.info; 2009, www.endex.nl.

WOOD BASED BIOENERGY PRICE INDICES FROM FOEX

By Timo Teräs and Matti Sihvonen, FOEX Indexes Ltd., Helsinki, Finland

Transparent price information is seen as an essential element in the rapidly growing trade of woody biomass. Responding to this need, the specialized forest industry index provider *FOEX Indexes Ltd.*, based in Finland, will soon start publishing price indices for pellets and other woody biomass.

Price indices based on opinion surveys already exist, but statistically reliable price time-series data, based on actual trades and usable as price benchmarks, are not currently available. FOEX, which is well known for its audited and trade-marked *PIX* price indexes (for various pulp, paper, paperboard and recovered paper products) last year started two projects to develop biomass price indices: ***Pelletsbio*** on industrial wood pellets and ***Forestbio*** on other forest biomass. Both time-series will be based on the calorific value of biomass and most likely they will also be reported as a price per tonne.

These indices will be reliable price benchmarks which can be used for various purposes: for example, in managing price risks; in energy-trading; and as a basis for normal business transactions. They can also be used for various administrative tasks: measuring inventory and trade values, for example. Users are likely to include, amongst others: forest owners, pellet producers and biomass suppliers, energy companies and utilities, traders, financial institutions, governments, researchers and the trade press.

Pelletsbio focuses on wood pellets sold to industrial end-users (big power plants and to a sample of local/regional medium-sized users).The final aim of Pelletsbio is to publish a pan-European (or even a global) index based on regional pellet price indices which will be developed in the following order:

1. Price for large-scale use of industrial pellets delivered to ARA (Amsterdam, Rotterdam and Antwerp) or to an equivalent North Sea/Atlantic port
2. Nordic and Baltic countries
3. Germany, Austria and Switzerland

The collection of historical and current price information is underway for these regional indices. A test version of the index has already been completed in Austria, based on co-operation between FOEX and *pro-Pellets*. Similar work in the Nordic countries will be completed shortly.

Work on the **Forestbio** index has focused on the Nordic countries. The scope will soon be widened into new geographical areas.

The FOEX rules and practices guarantee full confidentiality of the commercial data. Only averages will be published. To ensure that the indices are statistically representitive, data from both sellers and buyers are included. Also, extreme values are removed before the final average is calculated. Full anonymity of all the parties involved is guaranteed.

The new indices will provide a useful tool for managing the risks of future price volatility of wood-based bioenergy in its various forms. They will also cover many other internal or external needs of the participating companies. Readers are encouraged to contact FOEX for participation and for any further information. For contact details, see the FOEX web-site: *www.foex.fi.*

Forest Energy Monitor will publish the new indices as soon as they become publicly available.

INVESTMENT & TECHNOLOGY

THE UK PLANS A HUGE EXPANSION IN BIOMASS POWER CAPACITY

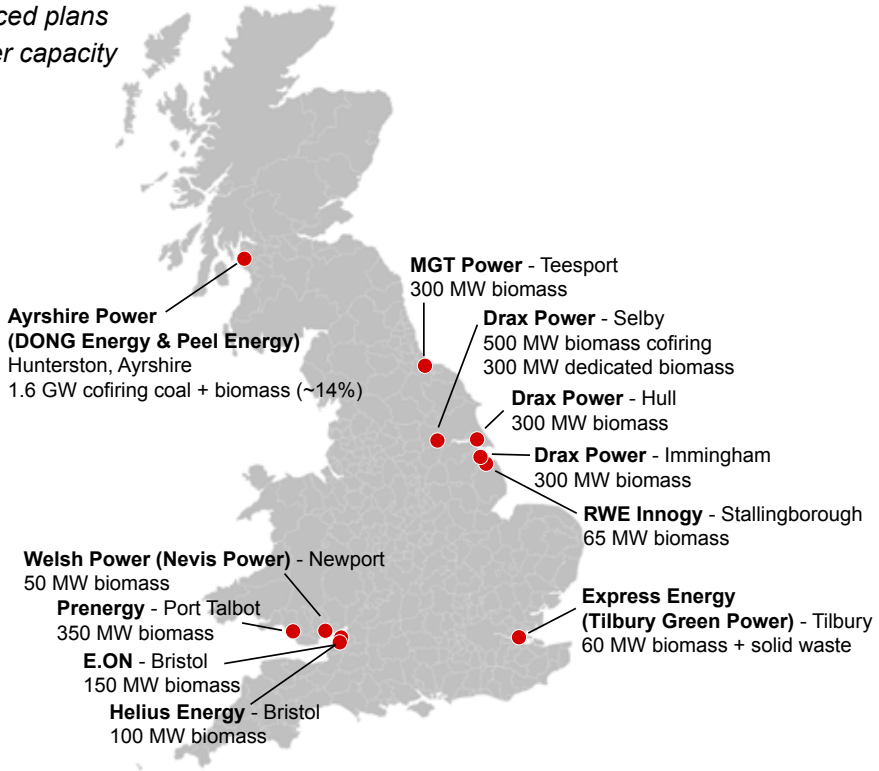
The United Kingdom has arguably the most ambitious GHG emission reduction targets in Europe. Under the EU Renewable Energy Directive the UK is committed to increasing the renewable energy share of the country's final energy use to 15% in 2020, from just 1.3% in 2006. Although in percentage terms most other countries have higher renewable energy targets for 2020, no other EU country is starting from such a low base.

In terms of renewable electricity, the UK's targets are even more ambitious. Last year the government published its draft renewable energy strategy which proposed that electricity suppliers should generate 30-35% of their electricity from renewables by 2020, up from just 5.3% in 2007. Although some of the big utilities are questioning the wisdom of aiming at such a high target, arguing that over-investment in the supply of intermittent wind energy may crowd out investment in much more reliable baseload nuclear energy, the government shows no sign of reducing it.

If the target is confirmed when the final Renewable Energy Strategy is published later this summer, it will require the construction of up to 30 GW of new renewable power capacity to replace the many coal and nuclear plants that are scheduled to close over the next decade. The government envisages that much of the new capacity will be wind – particularly offshore wind which it thinks could provide 14 GW of the new capacity, up from <1 GW today – but inevitably biomass will have an important role. Biomass, including biogas, is currently the UK's largest source of renewable electricity (with a capacity of about 1.5 GW in 2007, 2% of total power capacity), but this will need to increase sharply if the targets are to be reached.

Over the past year there has been a steady flow of announcements of projects to build biomass power capacity in the UK. Once built, some of these plants will be largest of their kind in the world. Given that the UK will be able to supply only a relatively small fraction of the necessary feedstock (of which more later)

Great Britain: Recently announced plans for investment in biomass power capacity



Source: Hawkins Wright research

UK Electricity generating capacity 2007 *gigawatts*		
Conventional steam (coal)	36.823	44%
CCGT (gas)	26.973	33%
Nuclear	10.979	13%
Gas turbines and oil engines	1.404	2%
Hydro - natural flow	1.420	2%
Hydro - pumped storage	2.744	3%
Wind	1.042	1%
Other renewables (excl wind/hydro)	1.565	2%
Total	**82.950**	**100%**

Source: BERR

they will become major players in the global biomass markets. The most significant projects are shown on the map on the previous page. The list is not exhaustive – for example, existing biomass plants and smaller biomass CHP projects are not shown – and some of the projects are at a very preliminary stage of development, but it gives a sense of the scale of investment that is being contemplated and the consequences for feedstock demand.

The largest of the investments is a series of projects being developed by **Drax Power**, the UK's largest electricity generator with a capacity of 4 GW_e at its giant power station near Selby in Yorkshire. Drax has been co-firing biomass with coal for several years: in 2008 it is estimated to have used approximately 200,000 tonnes of biomass, principally wood pellets. The company is currently building a new 400 MW co-firing facility which will increase the power station's co-firing capacity to 500 MW_e, or 12.5% of the total output. When it is completed in mid-2010, Drax calculates that it will be the largest co-firing power station in the world and will be consuming around 2.0 million tonnes/year of biomass, again mostly imported wood pellets.

This is just the start, however. In October last year Drax announced Project Willow, a 60:40 joint venture with **Siemens Project Ventures** to build three 300 MW_e dedicated biomass power plants. One of these – the so-called Heron Renewable Energy Plant – will be built on land at the south west edge of the Port of Immingham. A second – the Ouse Renewable Energy Plant - will be built on land adjacent to the existing Drax Power Station. The site of the third plant is likely to be near Hull. Construction of the first plant is expected to start in 2010 and to be completed in 2014. The other two plants will come on stream through 2017. The full project costs of the three plants, including infrastructure, is put at around £2.0 billion ($2.9 billion).

Each of the three dedicated biomass power plants will consume 1.3-1.4 million tonnes/year of biomass, depending on the type of material used. (The figures here assume wood pellets at 17 GJ/t.) So, by the time the third power plant is on stream, Drax should have a biomass electricity capacity of 1.4 GW_e and will be buying up to 6.2 million t/y of wood pellets or equivalent biomass.

Eighty kilometres further north, **MGT Power** is planning a similar scale biomass power plant near Teesside. The 300 MW_e Tees Renewable Energy Plant, complete with a dock and 120,000 t of biomass storage, will be built on disused land in Tees Port. The feedstock for the plant will comprise woodchips, mostly imported from sustainably managed SRC plantations which MGT and its partners are developing in Europe, North America and the UK. Assuming that all the feedstock will be green woodchips at about 10 GJ/t (40% moisture), the annual biomass requirement will be around 2.3 million t/y. The company has received the approval of local authorities and is now awaiting Section 36 approval from the government. Subject to this, and financing, the Teeside plant could be operating from 2012.

On the other side of Britain there is another cluster of projects around the Bristol Channel. The largest is the 350 MW_e plant being developed by **Prenergy Power**. The project has already received Section 36 approval and is under construction at Port Talbot. When it comes on stream, which is expected to be in 2012, Prenergy calculates that it will supply 70% of Wales's renewable energy target. The feedstock for the

plant will be mainly chipped forest residues from the south-east USA and from Canada, although some may come from the UK (by rail) at a later date. The company estimates that its annual biomass requirement will be approximately 2.0 million t, which implies that it expects the chips to have an average energy content of about 13.5 GJ/t and a moisture content of 20-25%.

In nearby Newport, **Nevis Power,** a subsidiary of **Welsh Power**, has planning permission to build a 49.9 MW_e biomass power station. Again, it is a dockside site and will receive feedstock by sea. The company estimates a requirement for 380,000 t/y of biomass, including energy crops, a figure which implies an intention to use green wood chips, possibly SRC.

On the opposite side of the Bristol Channel there are two projects near Bristol. Both are at a fairly early stage of development. **Helius Energy** has signed an option to lease a site in Avonmouth Dock, where it is proposing to construct a 100 MW_e biomass power plant. Previously Helius initiated the 65 MW_e project at Stallingborough in Lincolnshire which it sold last year to **RWE Innogy**, although Helius remains involved in the construction and start up of the plant.

At Portbury Dock on the other side of the River Avon, **E.ON** has taken an option on a site for a 150 MW_e biomass power plant. The company has not yet decided to go ahead with the project; much is likely to depend on the development of government policy and the attractiveness of other investment opportunities. E.ON operates what is currently the UK's largest dedicated biomass power plant (44 MW_e) at Stephen's Croft, near Lockerbie in Scotland. It has also received approval for a 25 MW_e power station in Sheffield based on recovered wood.

At Tilbury, on the Thames estuary to the east of London, **Express Energy** is developing the *Tilbury Green Power* project to build a 60 MW_e plant based on biomass and SRF (solid recovered fuel from the organic fraction of municipal waste). Woody biomass is expected to provide 50% of the plant's energy input, implying a requirement for about 300,000 t/y of green wood chips. In the early years, 90% of the biomass will be imported from Europe and North America, but this percentage is expected to fall over time as UK sources

The estimated feedstock requirement of biomass energy projects under development in the UK

Company	Location	Capacity *MW_e*	Estimated biomass feed-stock requirement [1] *million GJ/year*	Likely biomass feedstock (where known)
Drax Power (cofiring)	Selby, Yorks	500	36	Pellets
Drax Power (dedicated)	Selby, Immingham, Hull	3 x 300	70	Pellets/chips
MGT Power	Tees Port, Teeside	300	23	Chips (mainly SRC)
Prenergy Power	Port Talbot, Wales	350	27	Chips (forest residues)
Welsh Power	Newport, Wales	50	5	Chips (probably SRC)
Helius Power	Bristol - Portbury Dock	100	8	
E.ON	Bristol - Avonmouth	150	12	
RWE Innogy	Stallingborough, Lincs	65	6	Forest residues & 'waste' wood
Tilbury Green Power	Tilbury, Essex	60	3[2]	Biomass + SRF
Ayshire Power	Hunterston, Ayrshire	225	16[3]	Pellets/chips
Total		**2,700**	**206**	

Note: 1. Assumes 8,000 operating hours/year. The generating efficiency in cofiring is assumed to be 40%, dropping to ~36-37% for the large dedicated biomass power plants and to 30% in sub-100MW plants. 2. Assumes 50% of Tilbury's energy input is biomass. 3. Assumes 14% co-firing with biomass at Hunterston. Source: Hawkins Wright research

are developed. Express Energy, which is partly owned by **Cargill**, has applied for Section 36 approval.

Finally in Scotland a consortium of **DONG Energy** and **Peel Energy** is proposing to build a 1.6 GW_e coal and biomass power station on land next to the Hunterston nuclear power station on the Firth of Clyde. Acording to the initial plans, biomass in the form of wood pellets and chips would comprise at least 14% of the energy input, but there are reports that this could rise to 25% in the future. Assuming a 14% cofiring ratio implies a requirement for about 950,000 t/y of pellets or equivalent biomass. The Hunterston project is at a very early stage of development and, being predominantly a coal plant, it will doubtless be beset by environmental controversy. Although DONG and Peel say that the proposed power station will be 'carbon capture ready', recent statements by Mr Ed Milliband, the Secretary of State for Energy & Climate Change, suggest that the go-ahead may not be given until CCS technology is ready to be deployed.

Of course it is possible that some of these biomass projects will not proceed: in the current economic climate financing any project is problematical to say the least. However, there are known to be other projects under consideration which could replace any that fall by the wayside. The total capacity of the 12 projects profiled here amounts to 2.7 GW_e, a figure which, given the renewable energy targets set by the government, is more likely to be an under-estimate than an over-estimate of the eventual outcome.

In the table on the previous page we have estimated the biomass requirements of each of the projects in millions of GJ/year. The total annual requirement of 206 million GJ greatly exceeds the availability of woody biomass in the UK, at least in the medium term, a fact which explains why all the projects are located in ports or close to the coast. The government's strategy foresees the supply of an additional 1.0 million dry t/y of wood from UK forests by 2020 and the planting of 350,000 ha of perennial energy crops (yielding an average of, say, 10 t/y of dry matter per hectare). Together these new sources of woody biomass might yield about 80 million GJ/y of energy, but this is barely 40% of the requirements of just the 12 projects discussed here, before even starting to consider the UK's requirements for renewable heat and eventually biofuels.

Clearly, if these projects go ahead – and we will be following them closely in future editions of *Forest Energy Monitor* – the UK will become a very major importer of biomass: 206 million GJ/y equates to about 12 million t/y of pellets or 20 million t/y of green woodchips, equivalent to the wood requirements of at least four world-scale pulp mills. Satisfying this demand will be a major opportunity, and a challenge, for the entire feedstock supply chain, from forest and plantation owners, to pellet producers, traders, shipping companies and port operators globally.

VATTENFALL'S CAPITAL EXPENDITURE PROGRAMME: REPLACING COAL WITH BIOMASS

Vattenfall has outlined its capital expenditure programme during the period 2009-2013. It plans to spend SEK 191 billion (€17.8 billion), of which SEK 53.4 billion (€5.1 billion) will be on renewable technologies. Two thirds of the renewable energy capex will be spent on wind energy investments. In comparison, bioenergy will receive SEK 6.7 billion (€625 million) of investment over the next five years.

The greater part of Vattenfall's biomass investments will be in Denmark where its so-called MaxBio project will replace up to 724,000 t/y of the coal used by its Danish power stations with approximately 1.6 million t/y of biomass, reducing emissions by 1.5 million tCO_2/y. On completion in 2018, all the units at the company's three main thermal power stations in Denmark will be able to use 100% biomass or biomass co-fired with coal. Some of the conversions are already well advanced. For example, the Amager 1 unit at

the Amagerverket plant near Copenhagen will be able to use up to 40% biomass from this year and all three conversions are due to be complete by 2013.

Also, a new straw-fired unit is currently being built at the Fynsverket plant in Odense. When the new unit is on-stream later this year it will burn 170,000 t/y of straw instead of 87,000 t/y of coal. Vattenfall is also investigating an option to replace the gas-fired CHP-plant at Hillerød with a unit using biomass.

A Vattenfall spokesman estimates that the biomass requirement of the company's Danish power stations will be approximately 1.6 million t/y. Of this, approximately 280,000 t/y will be straw and the balance of about 1.3 million t/y will be wood pellets and chips, although other biomass materials will be considered. It is reported that the supply of the biomass requirement has already been contracted.

Examples of other biomass investments outside Denmark include a new 60 MW biomass-fuelled line in Vanaja, Finland. The new line will come on stream later this year. In 2009 biomass will account for 19% of the site's power output, up from 13% in 2008, and will rise to 36% in 2010. As a result, the emissions from Vanaja will drop by an estimated 71,000 tCO_2/year. The Vanaja plant currently uses about 180,000 m^3/y of wood chips (say about 100,000 t/y), an amount that will double when the investment is completed.

The company also says that it is working on biomass cofiring projects at some of its German and Polish coal-fired plants. Due to biomass shortages in central and southern Europe it is also taking a position in the domestic Polish biomass market " to mitigate the effects of biomass shortages and be active throughout the value chain".

Link: www.vattenfall.com

INVESTMENTS & TECHNOLOGY IN BRIEF...

CANADA

Ontario's Ministry of Natural Resources has granted a licence to **Canadian Bio Pellet** to produce 360,000 t of pellets in its first year of operation at its proposed plant in Ingleside. The permit will allow the company to produce 450,000 t of pellets in subsequent years. Construction of the C$80 million plant is pending final approval from the Ministry of Environment. If approved, the plant is scheduled to start up in mid-2010

BRAZIL

Klabin is investing US$10 million at its Monte Alegre mill in a project to produce tall-oil, a by-product of the pine pulping process. The project is due to be completed before the end of this year and will allow the mill to improve its energy self sufficiency which today stands at 70%.

Klabin is the biggest producer, exporter and recycler of paper in Brazil. The company is a market leader in packaging paper and board, corrugated boxes and industrial sacks, and also produces and sells timber.

NORWAY

Biowood Norway, a joint venture between Hafslund Varme og Infrastruktur AS (78%) and More og Romsdal Biobrensel AS (22%), is moving ahead with plans to build a 450,000 t/y pellet plant near Averøy, Norway. The plant is under construction and is expected to start up in late 2010.

As part of the wood procurement process, Biowood Norway recently signed a long-term wood chip transportation contract with Kawasaki Kisen Kaisha ('K' Line). Under the terms of the agreement, 'K' Line will supply Biowood Norway with two chip carriers. Delivery of the ships is scheduled for Q4-2010, at which time they will start supplying wood chips (1.2 million m^3) from the North Atlantic region to the port of Averøy in Norway where they will be converted to pellets which will be sold in Norway and elsewhere in Europe.

NETHERLANDS

RWE Power has awarded a €500 million contract to Alstom to supply two boilers for its new 1.6GW Eemshaven power station in the Netherlands. The new boilers will be coal fired units designed to co-fire up to 10% biomass. The two units will reportedly be the most modern plants of their kind and will reach an optimal efficiency of

FIRST ENERGY CORPORATION CONVERTS 312 MW COAL PLANT TO BIOMASS

First Energy Corporation has announced plans to convert one of its coal-fired power stations in Ohio into what will be one of the US's largest generators of biomass power. The company intends to retrofit units 4 and 5 at its RE Burger Plant, on the Ohio River near Shadyside, to generate electricity from biomass. The company was facing a 31 March deadline to either repower the units, fit new scrubbers or shut the plant down.

The estimated cost of the project is US$200 million. On completion the Burger Plant will be able to produce up to 312 MW of electricity, the same as its current coal-fired capacity. We can assume that the plant will require around 26 million GJ of biomass annually, equivalent to around 2.1 million t of forest residues. The biomass will be supplied by RenewaFuel LLC which will build a cluster of mills to produce 'energy cubes' or briquettes for the Burger plant. Ultimately First Energy expects to use biomass from an energy crop grown specifically for the purpose.

The project will mark progress towards Ohio's renewable energy targets: the state's renewable energy portfolio standard requires 25% of energy to come from advanced and renewable sources by 2025. It will also boost First Energy's portfolio of renewable energy capacity to over 1.1 GW, including 376 MW of wind power and 451 MW of pumped storage hydro.

The company supplies electricity customers in Ohio, Pennsylvania and New Jersey and its generation subsidiaries own or operate nearly 14 GW of capacity.

Links: www.firstenergycorp.com
www.renewafuelllc.com

INVESTMENTS & TECHNOLOGY IN BRIEF...

46%. The Eemshaven power station is expected to start up in 2011/2012.

CHINA

Anhui Wenergy, a Chinese state-owned enterprise, has announced plans to build two 30 MW biomass power stations in Anhui Province, China. **A-Power Generation Systems** will provide the equipment in a deal reportedly worth US$75 million.

CANADA

Lignol Innovations Ltd, a subsidiary of **Lignol Energy Corporation** based in Vancouver, has been awarded a C$3.4 million grant to pursue its research into producing cellulosic ethanol from under-utilized forest resources, including lodgepole pine killed by mountain pine beetle.

The funding will support research at the company's industrial-scale biorefinery pilot plant. Lignol's technology is based on the original 'Alcell' pulping process that was first developed by Repap Enterprises and General Electric in the 1980s and 1990s.

USA

Peregrine Energy will build a biomass cogeneration plant at **Sonoco's** Hartsville paperboard mill in South Carolina. The US$135 million CHP plant will produce 50 MWe of electricity (which will be sold to **Progress Energy)** as well as supplying low pressure steam to the recycled board mill.

The plant will replace Sonoco's existing coal-fired boilers and will use local forestry thinnings and logging residues. Construction awaits the issue of an air permit, but the plant is expected to be operational by 2012.

USA

Madera Energy Inc. is pushing ahead with plans for its **Pioneer Renewable Energy** project**,** a US$250 million 47 MW biomass CHP plant that it plans to build in Greenfield, Massachusetts. The company hopes to start construction in 2011 and begin commercial operations in 2013. The plant will use approximately 275,000 t/y of woody biomass, mainly forest residues sourced from within a radius of 50 miles. Some process residues and some recovered wood may also be used.

Meanwhile, **Florida Biomass Energy** is moving forward with plans to build a 60 MW biomass power plant near Port Manatee, Florida. The project is now being reviewed by Florida's Departments of Community Affairs and Environmental Protection.

POLICY & LEGISLATION

THE POLICY DEBATE SHIFTS TOWARDS BIOMASS SUSTAINABILITY

One of the thorniest policy debates facing the bioenergy industry today, and very likely for many years to come, concerns sustainability criteria for different biomass feedstocks. Despite the best efforts of a proliferation of life cycle analysts to provide unequivocal answers about biomass sustainability – each of whom approaches the problem from a slightly different angle – it is is a debate which inevitably provokes a great deal of controversy.

In Europe the focus of the sustainability debate was originally on biofuels and their impact on food security and biodiversity, as well as on the indirect GHG effects of land use change associated with the production of biofuel feedstocks. In policy terms, these questions were addressed by the biofuel sustainability criteria built into the EU Renewable Energy Directive. These criteria require that biofuels must result in at least a 35% GHG saving from 2013, rising to at least a 50% saving in 2017 if they are to count towards the EU's 10% renewable transport fuel target. (For biofuel plants built after 2017 the GHG saving threshold is 60% from 2018.) These targets should not be particularly onerous for the second generation biofuel technologies which are under development, but they might be for many first generation systems, particularly if the effects of indirect land use change (ILUC) are eventually taken into account. Governments and institutions across Europe are now busy developing the methodologies, audit and certification systems necessary to track life cycle emissions of all the different biofuel feedstocks.

A similar policy debate is now brewing in the United States where California's Air Resources Board (or CARB) has just approved the country's first Low Carbon Fuel Standard. This will require the carbon intensity of transport fuels used in California to be reduced by an average of 10% by 2020, starting with a 0.25% reduction in 2011. The policy will work by issuing tradable credits and debits for fuels which have a carbon intensity which is lower or higher respectively than the overall intensity requirement for each year. The measure has been opposed vigorously by the corn ethanol lobby which feels victimised by the inclusion of ILUC effects in the legislation's life cycle calculations. These calculations reveal that mid-western corn ethanol, for example, has a higher carbon intensity than conventional gasoline and diesel. Although the legislation will not ban the use of corn ethanol it will certainly put it at a disadvantage which could inhibit investment. However, the development of second generation biofuel technologies – particularly forest and plantation-based systems – should receive a significant boost from the legislation since they will benefit from the lowest carbon intensity weightings of all.

Carbon intensity of fuels included in California's Low Carbon Fuel Standard

Includes effects of indirect land use change	*gCO2e/MJ*
Corn ethanol (Mid-West average)	99.40
CARBOB (conventional gasoline)	95.86
ULSD (mineral diesel)	94.71
Sugarcane ethanol (Brazil)	73.40
Biodiesel (soybeans)	68.93
Biomass-based diesel	47.36
Electricity	34.90
Hydrogen	33.09
Advanced renewable ethanol (forest waste)	22.20
Cellulosic ethanol (farmed poplar)	20.40

Source: California Air Resources Board

The Californian legislation is important as it is likely to be used as a model by other US states. Eleven northeastern states and a coalition of mid-western states are contemplating a similar policy and the new administration in Washington DC is also seeking to develop a standard at a national level.

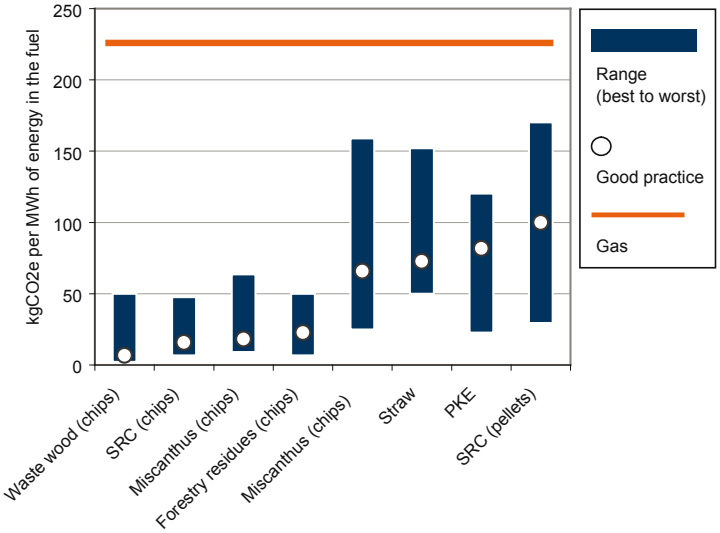
It is likely to be only a matter of time before the legislative spotlight shifts from biofuels towards the biomass used for heat and power. During the negotiations leading up to the EU Renewable Energy Directive there was pressure on the EU Commission to include sustainability criteria for biomass as well as biofuel. This was resisted, mainly on the grounds that unlike agricultural feedstocks, biomass does not usually

compete with food crops for land. Although an intellectual case could be made for biomass sustainability criteria, it was argued, the benefits were outweighed by the likely costs and knock-on effects. However, the Commission had to agree to study the question of biomass sustainability criteria and to publish a report by the end of this year. Lobbyists on both sides of the argument are now setting out their stalls.

Last year, in the lead up to the final negotiations of the EU Renewable Energy Directive, the Gallagher Review of the Indirect Effects of Biofuels (published by the UK's Renewable Fuels Agency) had an important influence on the thinking of EU policymakers. A recent report by the UK's Environment Agency – Biomass - carbon sink or carbon sinner? – may have a similar influence with respect to biomass sustainability criteria.

The EA study analyses the carbon footprint of a range of biomass materials used to generate heat and power. Not surprisingly, the type and source of biomass, and particularly the conversion efficiency of the combustion technology (preferably CHP), have a big influence on the GHG emissions over the life cycle. The chart gives examples of the GHG emissions of different biomass feedstocks supplied under best and worst case scenarios. The report stresses that if the biomass is grown intensively with high levels of fertilisers, or if it is transported for long distances, particularly by road, and if establishing an energy crop involves ploughing up grassland, the carbon savings can be greatly reduced, and in some circumstances negated.

Green house gas emissions from different biomass fuels and production practices



Source: Minimising GHG emissions from biomass energy generation, Environment Agency, UK, 2009

The report advocates policies which encourage 'best practice' and recommends the setting of minimum standards of GHG savings for biomass feedstock. For pellets the recommended minimum GHG saving, compared to gas, is 65% and the maximum threshold for GHG emissions is 79 $kgCO_2e$/MWh. The report suggest that these targets should not be too difficult for most feedstocks to meet, but they are high enough to discourage poor operating practices.

Renewable energy producers already pay close attention to the sustainability of their intended feedstock. Many demand FSC or similar forest certification standards and sustainability is an integral part of any planning application. For this purpose the report's analysis will be valuable. Complications may arise, though, if the results are used to devise legislation that discriminates between different feedstocks. At the moment, accounting for carbon emissions takes place at the point of combustion. All biomass is assumed to have zero CO_2 emissions, in the same way as all gas, for example, is assumed to emit the same amount of CO_2 whether it is sourced from the North Sea or Siberia or shipped as LNG from Abu Dhabi. If different biomass feedstocks are now to be judged on their whole life cycle emissions then, in fairness, the same should apply to all fossil fuels. Some argue that this would require the creation of a chain of custody system to track every cubic metre of gas, every barrel of oil and every tonne of coal. Whether European legislators have the stomach to take on such a task remains to be seen.

THE EU WILL FAIL TO MEET ITS 2010 RENEWABLE ENERGY TARGETS

The EU Commission has published a progress report on the EU's development of renewable energy in the electricity and transport sectors, highlighting the patchy progress which has been made so far and the EU's likely failure to reach its 2010 indicative targets.

The targets for the share of renewable electricity and transport fuel were laid down in 2001 and 2003 respectively. Although these have been largely superceded by those set out in the Renewable Energy Directive which comes into force this month, the Commission is required to report progress towards the 2010 goals every couple of years.

Renewable electricity
Share in 2006 and target for 2010 in selected EU countries

percent	2006	2010 target
Austria	61.6	78.1
Sweden	52.3	60.0
Finland	26.5	31.5
Denmark	25.9	29.0
Italy	18.3	22.5
France	14.3	21.0
Germany	12.6	12.5
Neth	7.9	9.0
UK	4.6	10.0
EU-27	**15.7**	**21.0**

Source: EU Commission

The progress report notes the uneven progress of the last two years. By 2006, the year examined in the report, only two member states – Germany and Hungary – had reached reached their 2010 targets for electricity, although presumably some others may have joined them during 2007 and 2008. Only Germany had reached the renewable transport fuel target by 2007.

The report confirms earlier analysis that the EU targets for 2010 are unlikely to be reached in either sector: the EU could achieve a 19% share in electricity, rather than 21%, and a 4% share instead of 5.75% in the transport sector.

The reasons for the uneven progress are not new. Despite the Commission launching infringement proceedings against various Member States, the current legal framework is inadequate. Known barriers still exist concerning administrative procedures, grid access, and guaranteeing adequate support from Member States. The report notes the need for further activity in the biomass sector in particular. The need for a new and stronger legislative framework – as will be provided by the Renewable Energy Directive – is highlighted.

POLICY & LEGISLATION IN BRIEF...

UNITED STATES

It came as no surprise given President Obama's pre-election statements, but the declaration by the Environmental Protection Agency that carbon emissions are a threat to human health surely marks a turning point in US policy.

Just days later, the House Energy Committee tabled a wide ranging energy and climate bill. The so-called Waxman-Markey bill, also known as the **American Clean Energy and Security Act 2009** combines energy and climate legislation in one bill. The main elements of the draft include: a federal Energy Efficiency Resource Standard (EERS) to reduce cumulative electricity usage by at least 15% and cumulative natural gas usage by at least 10% by 2020; a Renewable Electricity Standard (RES) to increase the share of renewables to 25% by 2025; and a greenhouse gas cap or standard that reduces emissions to 20% below 2005 levels by 2020 and to 83% below 2005 levels by 2050.

UNITED KINGDOM

The UK government's ambition to lead the way in climate change policy is demonstrated in its announcement of legally binding carbon budgets – an adjunct to the Treasury's fiscal budget – that require GHG emissions to be reduced to 34% below 1990 levels by 2018-2022.

This target is far above the UK's Kyoto commitment to a 12.5% GHG reduction by 2012 and is intended to set the UK on a path to reduce emissions by 80% by 2050.

CANADA

The City of Montreal plans to ban the installation of new residential wood-burning stoves in an effort to tackle the city's air polution problems. Although wood pellet stoves will be exempt from the bylaw, the ban includes wood burners retrofitted with more environmentally friendly components.

THE PEVERSE EFFECTS OF A LOOPHOLE IN US TAX LAW

During the past two months, company filings in the US have exposed the use of a tax loophole which is allowing US pulp producers to take advantage of a generous fuel tax credit for using black liquor as a source of fuel. This loophole is rewarding US pulp and paper companies with a cash windfall which could total $6 billion in 2009. It is a handout with perverse, counter-productive and anti-competitive consequences.

Although originally conceived to encourage the use of biofuels in transportation, the tax credit is now being widely used by kraft pulp manufacturers across the country. The 'subsidy', a tax credit for mixing alternative fuels with fossil fuels, is worth $0.50/gallon (€0.10/litre). For many US pulp mills, the continuation of the tax credit will ensure their survival during the current global economic downturn. Pulp producers in the rest of the world, however, argue that the credit represents an unfair subsidy which is distorting the competitive landscape. The credit is an unfortunate echo of the biodiesel 'splash & dash' controversy – which resulted in the imposition of countervailing import duies by the EU – and it highlights once again how a supposedly innocuous policy initiative can have significant yet unforeseen consequences.

Black liquor is the solution of lignin, hemi-cellulose, and inorganic residues recovered from the digester of a kraft pulp line. A kraft pulp mill generates about 1.5 tonnes of black liquor (measured as dry content) per tonne of pulp manufactured. About 50% of the solids in black liquor are organic residues rich in carbon which provide substantial combustion energy. This organic fraction is burned in a recovery boiler and the heat is recovered in the form of process steam. If the pulp mill is integrated with an adjacent paper mill, the steam is used to dry the finished sheets. In a stand-alone pulp mill the excess steam can be used to drive turbines to generate electricity. This practice of burning black liquor to generate energy dates back to the 1930s and has developed to the extent that modern pulp mills have become totally energy self-sufficient and often produce a saleable surplus of heat and/or power.

Worldwide, the pulp and paper industry currently processes about 187 million tonnes of black liquor (measured as dry solids) per year in the production of around 125 million tonnes of chemical pulp. With chemical pulp production in the US close to 45 million t/y, the US pulp and paper industry is thought to process over 60 million tonnes of black liquor per year.

The alternative fuel mixture tax credit and refund payment was introduced in 2005 as part of the US Transportation Act. It aims to encourage the use of alternative energy sources in place of fossil fuels. By mixing a renewable source of energy with a fossil fuel, the claimant qualifies for a tax credit worth $0.50 per gallon of mixed fuel consumed. The law was originally introduced to encourage the use of ethanol and other biofuels in cars and trucks. Unlike conventional tax credits which offset taxes owed, claimants are entitled to receive cash payments since the credit is refundable.

In 2007, Congress passed legislation to allow liquid fuel derived from biomass to qualify as an 'alternative' fuel. In September 2008, the Internal Revenue Service took this a step further when they published a bulletin report on the US tax code in which it stated that the legislation also covered black liquor. The report highlighted that 'alternative fuels' only need to contain 0.1 per cent of a taxable fuel (eg mineral diesel) to qualify for the credit. For kraft pulp mills, the significance of this new interpretation of the law was huge; by adding a tiny amount of diesel to their black liquor streams, pulp mills can demonstrate they have switched to a blend of fossil and alternative fuels, and thereby qualify for the credit. Perversely, the credit is therefore being granted not because fossil fuel consumption is being reduced, but because it is being increased, albeit in small amounts.

At least two companies have already revealed the receipt of substantial refunds through Q4 2008 and more are expected to announce tax benefits for Q1 2009. Amazingly, for some pulp and paper companies their black liquor credits this year could be greater than their current market capitalisation. The current regulation is due to expire at the end of this year, but it has already been extended once and could be again.

Assuming a typical mill burns 250-300 gallons of black liquor for every tonne of pulp produced, the credit could be worth between $125-$150 per tonne of pulp. Some financial analysts suggest the credit could be worth even more, up to $300/t. Whatever the precise number, and bearing in mind that market pulp is currently trading at $560-640/t (depending on the grade) the impact on the industry's cost curve is significant. Even using the more conservative estimates US softwood pulp mills would be among the lowest cost producers in the world. A refund of $125/t would give a US bleached hardwood kraft pulp mill a cost structure comparable to a Chilean producer, one of the lowest cost regions in the world.

Top US pulp producers - estimate of eligible pulp capacity
(thousand tonnes/year)

International Paper	11,570
Domtar	2,830
Temple-Inland	2,395
MeadWestvaco	2,360
Weyerhaeuser	1,730
Packaging Corp. of America	1,650
Sappi	815
Verso	795
Rayonier	670
RockTenn	395

Source: JP Morgan

The repercussions will be felt globally. Idled pulp mills in the US could restart, and those mills which were previously 'high cost' will start to generate returns despite the current trough in pricing. As the tax credit encourages US producers to increase production during a period of over-supply, it increases the already enormous burden of downtime on producers in Canada and Europe and elsewhere.

Most US companies have successfully applied for the tax credit and it can be assumed that every kraft pulp mill is exploring the option. Meanwhile it seems that pulp producers in the rest of the world are trying to co-ordinate a response to have the 'subsidy' rescinded. Producer associations in Europe, Canada and Latin America are believed to be exploring the legality of the tax credit. A possible response will be to lobby governments to impose countervailing duties on imports of chemical wood pulp (and possibly paper) from the US. However, such a procedure is time consuming, and in Europe could take a year and a half to implement.

It is more likely is that the credit will be rescinded by Congress on its expiry in December. Despite the best efforts of the US pulp industry to keep the legislation in place, US tax payers are unlikely to welcome the news that they are subsidizing a procedure (the burning of black liquor) which needed no encouragement in the first place and which is completely counter-productive in terms of fossil energy consumption. Meanwhile, US Senator Max Baucus, chairman of the U.S. Senate Finance committee that oversees tax legislation, is working "to ensure that the credit is used in a manner that is consistent with the spirit and intent of the law."

CONVERSION FACTORS

Properties of solid biofuels: net calorific value, moisture, bulk and energy density

	NCV, dry matter 0% moisture		*Moisture content*	NCV, as received		Bulk density	Energy density, as received
	MWh/t	GJ/t	*%*	MWh/t	GJ/t	kg/m3	GJ/m3
Stem wood chips	5.1-5.6	18.5-20.0	*40-55*	1.9-3.1	7.0-11.0	250-350	2.5-3.2
Whole tree chips	5.1-5.6	18.5-20.0	*45-55*	1.9-2.8	7.0-10.0	250-350	2.5-3.2
Sawdust	5.3	19.0-19.2	*45-60*	1.7-2.8	6.0-10.0	250-350	1.6-2.5
Bark (birch)	5.8-6.4	21.0-23.0	*45-55*	2.2-2.8	8.0-11.0	300-400	2.2-3.2
Bark (coniferous)	5.1-5.6	18.5-20.0	*50-65*	1.4-2.5	5.0-9.0	250-350	1.8-2.5
Wood pellets	5.3	19.0-19.2	*8-10*	4.7	17.0	650-750	11.0
Briquettes	5.3	19.0-19.2	*8-10*	4.8	17.3	650-750	11.0
Energy grasses	4.8-4.9	17.1-17.5	*15-30*	3.1-3.9	11.0-14.2	70	0.8-1.4
Peat (sod)	5.9	21.2	*39*	3.3	12.0	380	4.7
Peat (pellets)	5.5-5.8	19.7-21.0	*9-16*	4.6-5.2	16.6-18.7	680-770	11.2-14.4
Straw (chopped)	4.9	17.4	*17-25*	3.4-3.9	12.4-14.0	80	1.1-1.4
Corn residues	5.1	18.4	*50*	2.2	8.0	-	-
Coal	7.8	27.9	*10*	6.9	24.8	-	-
Heavy fuel oil	11.5	41.0-41.3	*0.3-0.5*	11.4	40.9-41.2	-	-
MSW from households	5.1-6.5	18.5-23.4	*25-36*	3.3-4.7	11.7-16.9	150-200	2.5-3.6
Black liquor	3.5-4.2	12.5-15.0	-	-	-	-	-
Lignin powder/ pellets	7.1	25.4	*30*	4.8	17.1	-	-

Sources: FAO. VTT, Vapo Oy, Sodra, Lignoboost

Energy content of different fuels

tonnes of oil equivalent (toe)

Crude oil (41.87 GJ)	1.00
Barrel of oil (toe/barrel) (Assuming 7.33 barrels/ tonne)	0.14
Diesel (42.7 GJ/t)	1.02
Biodiesel - RME, FAME (37.3 GJ/t)	0.89
Gasoline (42.7 GJ/t)	1.02
Ethanol (26.7 GJ/t)	0.64
Hard coal (29 GJ/t)	0.69
Dry wood, spruce (0% moisture)	0.46
Dry wood, beech (0% moisture)	0.44
Green wood, freshly harvested (60% moisture)	0.14
Chips from short rotation coppice (50% moisture)	0.18
Saw mill residues, chips etc. (40% moisture)	0.25
Wood dried several years in open air (20% moisture)	0.34
Wood pellets (8-9% moisture)	0.40
MSW from households (0% moisture)	0.50
Miscanthus (0% moisture)	0.42
Rape seed (0% moisture)	0.63

Sources: AEBIOM, BP

Unit conversion factors

Energy and power

Energy *To:*	Mega-joule (MJ)	Gigajoule (GJ)	Megawatt hour (MWh)	BTU
From:	Multiply by...			
Megajoule MJ)	1	0.001	2.78×10^{-4}	947.8
Gigajoule (GJ)	1000	1	0.278	947,817
Megawatt hour (MWh)	3,600	3.60	1	3,412,140
BTU	0.00106	1.06×10^{-6}	2.93×10^{-4}	1

Power *To:*	Kilowatt (kW)	Megawatt (MW)	kilocalo-ries /hour	BTU /second
From:	Multiply by:			
Kilowatt (kW)	1	0.001	860	0.95
Megawatt (MW)	1000	1	859,845	947.82
kilocalories/hour	0.0012	1.16×10^{-6}	1	0.00
BTU/second	1.06	1.06×10^{-3}	907.18	1

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