

Forest Energy

monitor

BIOMASS & PELLETS — MARKETS — INVESTMENTS — LEGISLATION

SNAPSHOT...		
	Jul-14	Aug-14*
Industrial wood pellets Hawkins Wright - CIF ARA		
\$/tonne	178-182	178-182
€/MWh	37.7-38.6	37.7-38.6
Industrial wood pellets PIX Pellet Nordic Index - CIF Baltic/N.Sea		
€/MWh	28.87	-
Wood pellets - Germany (Residential grade, bulk, delivered)		
€/tonne	248.63	246.53
€/MWh	52.68	52.23
Wood pellets - Austria (Residential grade, bulk, delivered)		
€/tonne	242.7	243.00
€/MWh	51.36	51.48
Wood pellets - NE USA (Residential grade, delivered, in bags)		
\$/tonne	342.34	342.89
\$/MWh	72.53	72.65
Coal (CIF ARA)		
\$/tonne	74.49	77.15
€/MWh	7.87	8.29
Carbon (EUA December 14)		
€/tCO ₂	6.00	6.25
Electricity (UK Base Load)		
UK£/MWh	35.64	37.93
Wood Pellet Spread (UK 100% conversion)		
UK£/MWh	20.63	23.21
Clean Dark Spread		
UK£/MWh	10.04	12.34
Clean Spark Spread		
UK£/MWh	5.79	6.73

For sources and definitions see footnotes on Page 2 *Aug-14 is based on data available up to 28 August 2014.

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MARKET BRIEFING

FOREST BIOMASS AND WOOD PELLET PRICE INDICATIONS

		Q213	Q214	Jun14	Jul14	Aug14*	Change on Aug13
EUROPE							
COMMERCIAL & RESIDENTIAL HEATING							
Energy wood/biomass - Sweden ¹ delivered to heating plant	Skr/MWh	305.00	266.00	–	–	–	–
	€/MWh	35.64	28.91	–	–	–	–
Industrial wood pellets - PIX Pellet Nordic Index ² . CIF Baltic Sea or North Sea port	Skr/MWh	257.72	264.26	263.83	266.55	–	–
	€/MWh	30.09	29.20	29.02	28.87	–	–
Wood pellets - PIX Pellet Continental Index ² . Medium-scale commercial heat in Germany/Austria delivered within 50km in bulk, excluding taxes Lot size: 26t Germany, 17t Austria	€/tonne	238.24	230.85	226.31	226.00	224.88	-22.50
	€/MWh	50.47	48.91	47.95	47.88	47.64	-4.77
Wood pellets - Germany (residential heat) ³ . delivered, bulk: <6 tonne, 100-200 km, incl. taxes	€/tonne	266.52	252.15	248.69	248.63	246.53	-27.57
	€/MWh	56.47	53.43	52.69	52.68	52.23	-4.39
Wood pellets - Austria (residential heat) ⁴ . delivered, bulk: <6 tonne, incl. taxes	€/tonne	242.13	241.93	241.70	242.70	243.00	-14.00
	€/MWh	51.30	51.26	51.21	51.36	51.48	-2.03
ELECTRICITY GENERATION ECONOMICS							
Industrial wood pellets ⁵ CIF Amsterdam, Rotterdam, Antwerp (ARA)	\$/tonne	–	179.83	178-182	178-182	178-182	–
	\$/MWh	–	38.10	37.7-38.6	37.7-38.6	37.7-38.6	–
Coal (CIF ARA)	US\$/tonne	80.68	74.83	73.20	74.49	77.15	+1.62
	€/MWh	8.85	7.82	7.72	7.87	8.29	+0.16
Natural gas (UK))	€/MWh	26.13	19.21	17.56	16.14	17.59	-8.28
Electricity (UK Base Load)	UK£/MWh	48.94	40.12	38.00	35.64	37.93	-9.60
UK Carbon cost (EU ETS plus UK CPS rate)	UK£/tCO ₂	8.28	9.29	9.45	9.67	9.90	+1.15
UK Renewable Obligation Certificate (ROC)	UK£/MWh	44.00	41.59	41.67	41.31	40.51	-3.06
UK Clean Spark Spread	UK£/MWh	0.29	4.39	5.31	5.79	6.73	+7.99
UK Clean Dark Spread	UK£/MWh	21.09	15.47	12.50	10.04	12.34	-8.32
UK Wood Pellet Spread (100% coal-to-biomass conversion: i.e. 1xROC/MWh)	UK£/MWh	33.12	23.96	22.55	20.83	23.21	-7.69
NORTH AMERICA							
Pine pulpwood (Average US South) ⁵ . delivered (Timber Mart-South)	US\$/s.ton	27.94	30.10	–	–	–	–
Wood pellets - NE USA (residential grade) ⁶ . delivered next month in bags: 3 s.tons,	US\$/tonne	313.93	333.18	331.24	342.34	342.89	+22.84
	US\$/MWh	66.51	70.59	70.18	72.53	72.65	+4.84
Coal (thermal) - Central Appalachia ⁷ . prompt quarter delivery, 12,500 Btu/ton	US\$/s.ton	58.80	61.11	60.00	60.49	59.94	+7.11
	US\$/MWh	6.61	6.87	6.75	6.80	6.74	+0.80
Natural gas ⁷ . Henry Hub (NYMEX)	US\$/MMBtu	4.01	4.62	4.59	4.05	3.87	+0.46
	US\$/MWh	13.83	15.94	15.83	13.97	13.34	+1.58

Sources: 1. Swedish Energy Agency; 2. FOEX; 3. DEPV; 4. proPellets Austria; 5. Timber Mart-South; 6. woodpellets.com (sample of offers); 7. Energy Information Agency; 8. Hawkins Wright research. Where the original data is weekly or daily, the monthly and quarterly figures shown here are simple averages of the original. Note:* Aug-14 averages are based on data available up to 22 August 2014. a). All wood pellets are assumed to have a calorific value of 4.72 MWh/t (17 GJ/t), except the PIX Pellet Nordic Index where the assumption is 4.8 MWh/t. b). The calculation of Clean Dark, Spark and Wood Pellet Spreads assumes efficiency factors of 38%, 49% and 36% respectively. c). CO₂ emissions are assumed to be 0.97tCO₂/MWh and 0.49tCO₂/MWh for coal and natural gas-fired generation respectively. The calculation of spreads does not take into account the costs of inland freight/storage, plant operation, maintenance or capital expenditure.

BIOMASS AND WOOD PELLET MARKET ANALYSIS

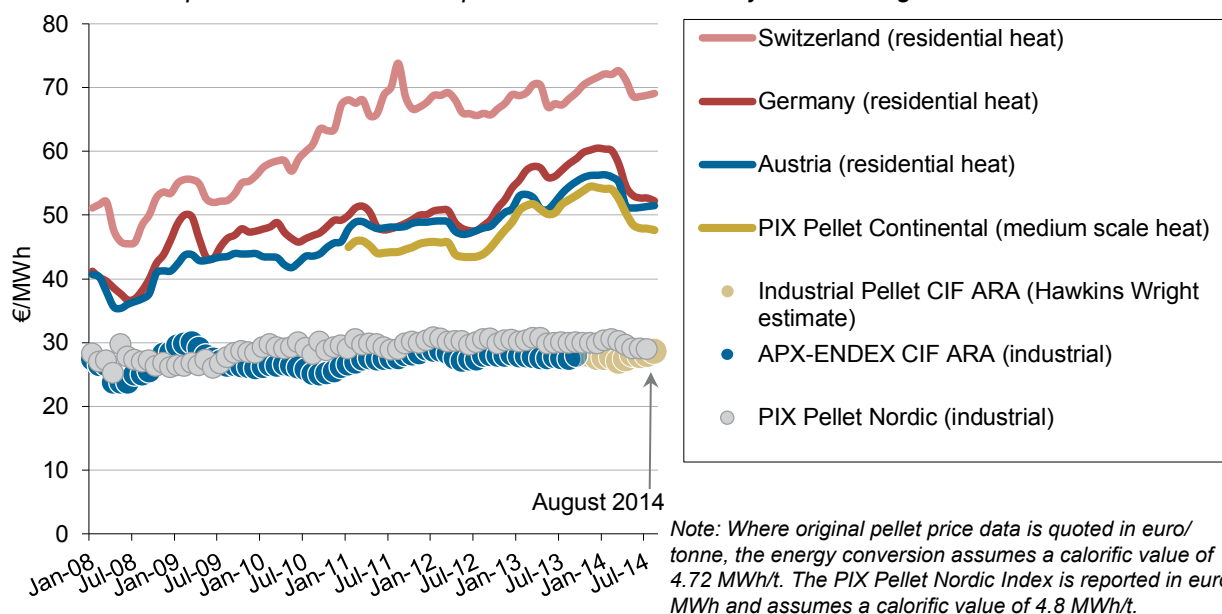
The industrial pellet sector has been dealing with the fallout from DECC's decision not to award an Investment Contract to Drax's second unit, and the news that no biomass conversions will be supported by Contracts for Difference in the upcoming allocation round (which opens on 14 October).

In this context, the main developments in the sector have related to sustainability and the attractiveness of the Renewables Obligation (RO) as a mechanism for supporting biomass conversions in the United Kingdom. Regarding sustainability policies, announcements from DECC and the EC (see p. 14&15) have been welcome, but companies operating in the Netherlands will be frustrated that we do not yet have clarity on the sustainability that will apply there. An agreement regarding the criteria has been under negotiation over the past months and it was hoped that it would be finalised during the summer. This has now been delayed, but a representative of the Sustainability Directorate at the Ministry of Infrastructure and the Environment has indicated to us that an agreement may be published in the second half of September.

The industrial pellet price remained flat in August, at around \$180/t, as spot trades remained thin on the ground. This seems unlikely to change noticeably any time soon, as long as the market remains dominated by a relatively small number of buyers purchasing almost entirely through long term contracts. However, European buyers may still have experienced a slight increase in price due to less favourable \$/€ exchange rates, which in essence pushed the industrial pellet price up by €2.22/t from July to August.

The consistent and impressive growth seen in the biomass heating market in recent years continues to be maintained. Data from DEPI shows that pellet production in Germany rose by 3.3% in Q2 2014, exceeding industry expectations. Total output from German pellet manufacturers in the quarter equalled 551,810 tonnes, 99.4% of which was in the form of A1/A2 pellets. The growth of markets outside of Germany can also be seen in the figures; according to DEPV, pellet exports have been well above last year's levels.

Prices of wood pellets in selected European countries – January 2008 to August 2014



Sources: DEPV (Germany), proPellets (Austria), Pellet Preis (Switzerland), APX-ENDEX and FOEX (PIX Pellet Nordic and Continental Indices). From October 2013, when APX-ENDEX stopped publishing prices, CIF ARA prices have been estimated by Hawkins Wright

Despite this, the industry has not been without its challenges this year, not least due to low seasonal demand and the resultant downward pressure on prices. In terms of pricing, the residential pellet price in Germany dropped in August for the eighth month in a row, to €246.53/t, according to DEPV. This leaves the price at €27.57/t lower than the same time last year, a decrease of 10.4%. However, the five month decline in Austrian pellet pricing looks to have ceased, with two consecutive increases reported by ProPellets in July and August. The bulk delivered price for residential heating pellets in Austria is now €243.00/t, 5.7% lower than August 2013.

In the medium scale heating market, FOEX reported its PIX Continental index for bulk pellet deliveries at €224.84/t for August, which is €22.50/t lower year on year.

Awareness of the environmental and economic benefits of biomass heating is certainly growing. More and more countries are looking to encourage deployment of the technology and many are attempting to kick-start development of the sector with injections of public funding and training schemes to ensure that an appropriately skilled workforce is in place. Although there have been some enclaves in the US with a significant biomass heat market for many years, there is now a drive to increase the environmental performance and innovation of the sector. Many states are supporting a shift away from low-tech stoves/heaters, moving instead towards more modern automated boilers. New financial support schemes (see p.16) are simultaneously driving up performance standards for these systems in order to increase efficiency, reduce emissions and improve safety.

The opportunities for expansion of biomass heating in the US are significant. Therefore as more US states embrace biomass heating in their renewable energy incentive schemes the likelihood of substantial growth of the industry is becoming more certain.

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Hawkins Wright Ltd.
2A Blake Mews, Kew,
Richmond, Surrey, TW9 3GA,
United Kingdom

Tel: +44 20 8747 5840
Fax: +44 20 8181 6199
Email: post@hawkinswright.com
Web: www.hawkinswright.com

EDITORIAL:

John Bingham - Research Director
Direct tel: +44 20 8747 5844
john.bingham@hawkinswright.com

Fiona McDermott - Research Manager
fiona.mcdermott@hawkinswright.com

Contributors:

Tom Wright - Research Director

SUBSCRIPTION ENQUIRIES:

Angelica Choy
Tel: +44 20 8747 5840
angelica.choy@hawkinswright.com

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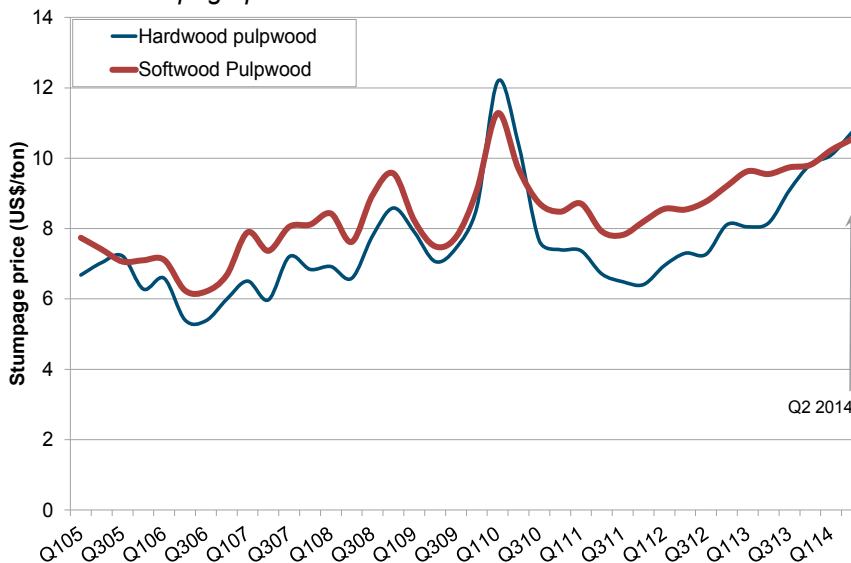
BIOMASS FEEDSTOCK AVAILABILITY

Despite the fact that the US housing market is still struggling to gain momentum, lumber prices in the region have recently risen higher than expected. The price of southern pine 2x4s, for example, dropped to \$394/mfbm during Q2 2014 due to the usual summer decline, but has since increased to an estimated \$445/mfbm at the start of Q3 (according to data from *Equity Research Associates*). An oversupply in the OSB market seems likely to suppress prices sooner or later, but for the time being prices are remaining stable. ERA reports the price for August at \$210/thousand ft², versus the 2014 year-to-date average of ~\$217/thousand ft².

Stumpage prices, meanwhile, look to be continuing their upward trend. *Timber Mart-South* reported record prices for hardwood sawtimber of \$29.93/green short ton (GST) in Q2 2014, which is an increase of \$5.87 on Q2 2013. Pulpwood stumpage prices have also increased from Q1 to Q2 this year, by \$0.31/GST and \$0.65/GST for pine and hardwood respectively.

However the price rises for delivered fibre have been somewhat more dramatic, with Timber Mart-South reporting quarterly and yearly price increases for all five timber products. The South-wide delivered price of hardwood pulpwood reached a record high in Q2 of \$32.22/GST, \$1.42 higher than the previous record (set in Q1 2010). Pine pulpwood prices rose by \$0.40/GST in Q2 to a delivered price of \$30.10/GST

US South stumpage prices 2005-2014



Source: *Timber Mart-South*

The price of forestry residues in the south-east also increased in the last quarter; pine in-woods chips rose from \$16.73/s.ton in Q1 to \$17.12 in Q2 2014.

In Q2 the fob price of process residues (which includes sawdust, bark and trimmings) rose by \$3.51/s.ton for hardwood (to \$13.80) and by \$1.45/s.ton for pine (to \$15.29).

Elsewhere, reduced sawmilling activity in Germany over the summer months has caused a drop in the availability

of sawmill residues in the south, north and west of the country. Fibre demand in Germany has also declined, with both panelboard and pellet mills decreasing their production levels over the summer months. This has left the market fairly well balanced. The fibre surplus, largely in the form of sawmill residues but also woodchips, that had been available in Q2 2014 seems to have since been mostly absorbed. Woodchip buyers have begun building up their winter stocks and this, combined with increased deliveries to some pulpmills, has drawn down the woodchip stockpiles that had accumulated at some sawmills earlier in the year.

WOOD PELLET TRADE STATISTICS H1 2014: KOREA, JAPAN AND THE UK

The numerous wood pellet tenders issued by Korean genco's at the end of 2013 and start of 2014 (see FEM #37 p.5) resulted in a 433% increase in imports to the country of in H1 2014 versus H1 2013.

Over 670kt of pellets were imported from Jan-June, compared to 126kt for the same period in 2013. Vietnam and Canada remain the most important suppliers, but the largest proportional increases have come from China and Thailand. Starting from a baseline of less than 1kt each in 2013, These two countries became the fourth and fifth largest suppliers to Korea in H1 2014.

Korean wood pellet imports H1 2014 v. H1 2013

	Q1	Q2	H1 2014	H1 2013	% change
Vietnam	96,706	130,393	227,099	24,467	+828%
Canada	75,589	92,308	167,897	3,119	+5283%
Malaysia	32,286	42,196	74,481	30,429	+145%
China	23,850	56,493	80,343	624	+12773%
Thailand	21,012	20,749	41,761	206	+20172%
USA	17,249	20,923	38,172	1,130	+3278%
Indonesia	10,886	14,496	25,382	13,135	+93%
Russia	1,579	9,685	11,264	50,683	-78%
Other	2,239	1,752	3,991	1,978	+102%
Total 2014	281,396	388,994	670,390	125,772	+433%
Total 2013	54,974	70,798	125,772		
% change	+412%	+449%	+433%		

Source: Korea Customs Service

After a few months of relatively quiet trading conditions for Korean utilities in April-May, their pellet procurement activities began to increase again in June-July. Tenders were issued in these months for a total of ~273,000t of wood pellets, mostly for delivery before the end of November. We therefore expect to see a continued flow of imports to the country in both Q3 and Q4 this year, with total imports liked to exceed 1Mt.

The situation in Japan remains much more modest; total imports are still fairly small and the annual increase is minimal. In total 48kt of pellets were imported to Japan in H1 2014, a 16% increase on H1 2013. Canada is still the dominant supplier to the country, accounting for 93% of imports.

In contrast to the growth in Korea and Japan, official UK trade data shows that imports actually decreased by 15% in the first half of 2014. This is likely due to Drax and E.ON using up some of the stockpiles which they built up at the end of 2013. Another contributing factor will be the lower than expected activity at E.ON's Ironbridge plant due to it only having one operational unit. Similarly, Drax only began commissioning its second converted unit in May. We expect imports to increase in H2 2014 as Drax's pellet demand rises.

Japanese wood pellet imports H1 2014 v. H1 2013

	Q1	Q2	H1 2014	H1 2013	% change
Canada	26,399	18,274	44,673	37,717	+18%
Thailand	989	835	1,824	390	+368%
Vietnam	634	338	972	2,013	-52%
New Zealand	280	-	280	-	N/A
USA	94	35	129	119	+8%
Malaysia	76	52	128	770	-83%
Indonesia	49	76	125	297	-58%
TOTAL 2014	28,521	19,610	48,131	41,454	+16%
Total 2013	20,969	20,431	41,454		
% change	+36%	-4%	+16%		

Source: Japan Ministry of Finance

UK wood pellet imports H1 2014 v. H1 2013

	Q1	Q2	H1 2014	H1 2013	% change
USA	427,577	728,730	1,156,307	1,027,698	13%
Canada	222,043	206,762	428,806	837,006	-49%
Russia	724	648	1,372	176	678%
Total 2014	650,345	936,140	1,586,485	1,865,144	-15%
Total 2013	608,584	1,256,561	1,865,144		
% change	7%	-25%	-15%		

Source: UK Trade Info

ENERGY AND CARBON MARKET BRIEFING

Following on from our assessment in FEM #39 (p.6) further signs of a downturn in the coal market are now beginning to appear. Data from the UK Department of Energy and Climate Change shows that imports of coal to the UK fell by 12.4% in H1 2014, to 21.8 million tonnes. Furthermore, the consumption of coal in UK power stations decreased by 21.2% year on year.

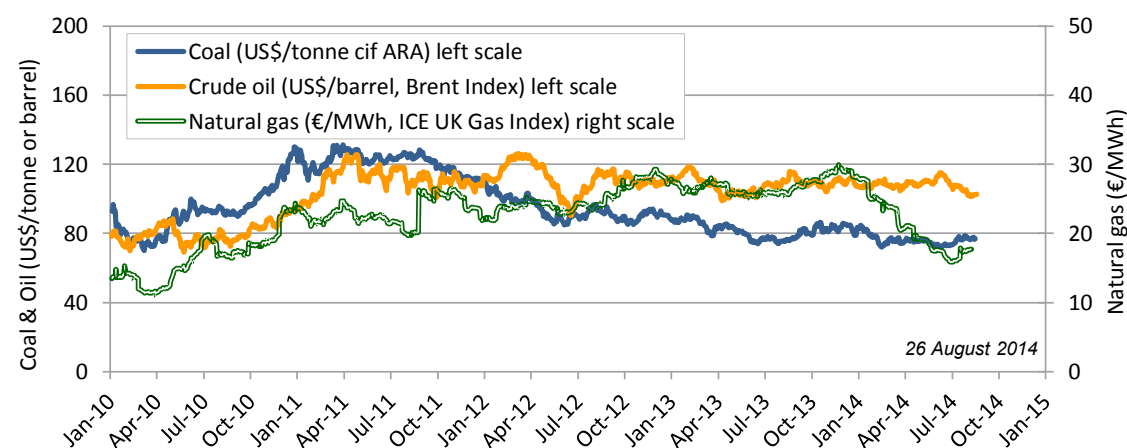
The reasons for this shift are numerous; the mild winter, low power demand, increased competitiveness of gas, and coal plant outages and closures have all been contributory factors. However the increasing role of renewables in the energy mix has also been influential. The UK wind sector has been consistently setting new records and for the first time in August generation from wind exceeded that from coal on five separate days. At its highest, on 17 August, wind power accounted for 22% of UK power generation versus 13% from coal. The remainder came from natural gas (26%), nuclear (24%), biomass (3%), solar and hydro.

Data from the *Franhofer Institute* shows that the situation in Germany is similar, with rising output from renewables continuing to displace conventional fossil fuel generation. Renewables accounted for 28% of electricity generation in H1 2014, including 17% from wind and solar, and 11% from biomass and hydro. Generation from brown and hard coal fell by 4% and 11% respectively, compared to the first half of 2013. By comparison, wind power contributed 5% of generation in the United States during the first half of the year, according to data from the US Energy Information Administration. A rise in wind output of 9%, assisted by a more than doubling of output from solar, meant that renewables as a whole accounted for 14.3% of electricity generation over the period.

One implication of the shifting energy market is that we are sure to see more non-profitable plants being moth-balled and decommissioned. Indeed RWE this month said it was considering closing 1GWe of generating capacity in Germany by 2017, in addition to the 12.6GW of capacity it has already taken offline since the start of 2013. The stations under consideration for closure include the 610MW Gersteinwerk, 110MW Goldenberg and 285MW Hamm C units. However RWE is still hoping to keep other, presumably more profitable, coal stations in its fleet operational. This includes its Aberthaw station in the UK where it will invest £12M in NOx reduction technology to enable the plant to comply with IED emissions requirements.

Meanwhile, the price of natural gas in Europe appears to have bottomed out, reaching its lowest level since June 2010 (of €15.85/MWh in July), before beginning a slight upturn in July/August.

Commodity energy prices — Coal, oil and natural gas



Sources: EEX and ICE

ELECTRICITY GENERATION ECONOMICS

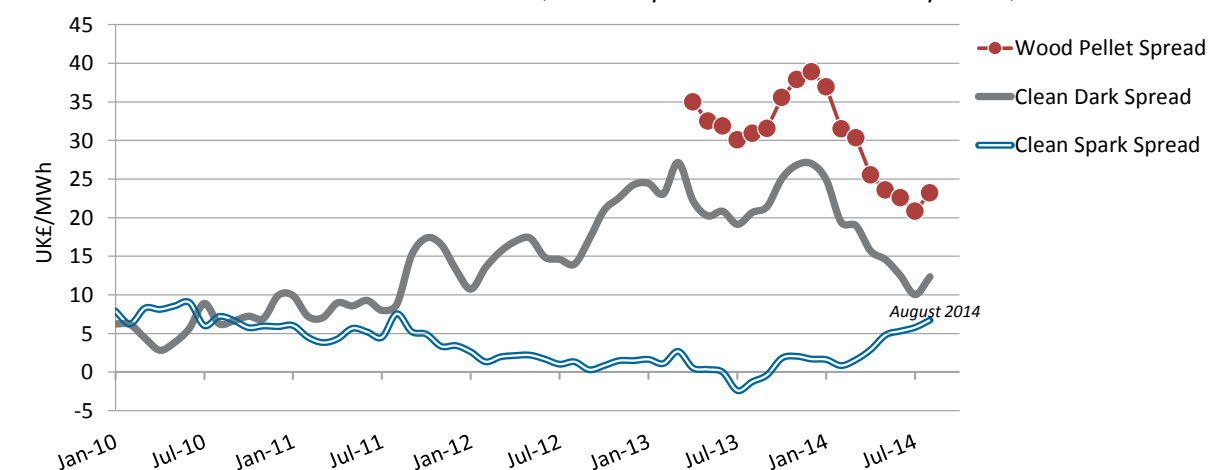
After seven consecutive months of decline, the UK power price has finally begun to rise again, to an average of £39.40/MWh in August. This is still £8.13/MWh lower than August 2013, but is at least an improvement on the £35.84/MWh low experienced in July. Both natural gas and coal prices increased slightly in August. However, while coal prices are now roughly where they were this time last year, natural gas prices are now £8.16/MWh lower. Combined with relatively stable carbon costs, this means that the clean dark spread now stands at £12.34/MWh, and the clean spark at £6.73/MWh. The higher power price has been offset slightly by a decrease in ROC prices, bringing the pellet spread to £23.21/MWh.

The calculation of Clean Dark, Clean Spark and Wood Pellet Spreads
United Kingdom - August 2014

		Wood pellet 100% conversion	Coal	Natural gas
Electricity price (Base load)	£/MWh	39.40	39.40	39.40
Fuel price (input energy)	£/MWh	-22.30	-6.61	-14.04
Plant efficiency		0.360	0.380	0.491
Fuel price (output energy)	£/MWh	-61.94	-17.41	-28.58
Carbon cost (EU ETS price)	£/tCO ₂	-	-5.00	-5.00
Carbon cost (UK Carbon Price Support)	£/tCO ₂	-	-4.94	-4.94
Total carbon cost (per tCO₂)	£/tCO₂	-	-9.94	-9.94
CO ₂ emissions factor	tCO ₂ /MWh	-	0.97	0.41
Total carbon cost (per unit output)	£/MWh	-	-9.65	-4.09
ROC price (1xROC/MWh)	£/MWh	40.51	-	-
LEC price (1xLEC/MWh)	£/MWh	5.24	-	-
Combined value of incentives	£/MWh	45.75	-	-
CLEAN SPREADS (electricity price, minus fuel, minus carbon, plus renewable electricity incentives)		23.21	12.34	6.73

Note: the calculation of the Wood Pellet Spread is based on a 100% coal-to biomass converted unit that receives support – in the form of 1xROC – under the Renewables Obligation. Source: Hawkins Wright.

Generation economics in the UK: Clean Dark, Clean Spark and Wood Pellet spreads, 2010-2014



Source: Hawkins Wright research.

INVESTMENT & TECHNOLOGY

ENVIVA'S PLANS FOR A NEW CLUSTER OF PELLET MILLS BASED AROUND THE PORT OF WILMINGTON BEGIN TO TAKE SHAPE

The uncertainties that some investors may be feeling about the future intentions of European utilities and policy makers has slowed the growth of North American wood pellet capacity to some extent, but they have by no means stopped it entirely. Several new projects have been announced or confirmed during the summer, potentially amounting to 3.5-4.0Mt/y of new supply. Some of these announcements have been about projects that are genuinely new, while others are confirmation of projects that have been developing for a year or more and which have now become more certain.

The biggest of the announcements is the firming-up of **Enviva's** plan to build a cluster of pellet mills based around a new export hub at the Port of Wilmington in North Carolina. This has been the subject of press speculation since last year, but recent statements by the Governor, the NC State Ports Authority and by the company have now revealed much more about the intended project. Enviva's statement on the project falls short of an explicit confirmation that the investment will proceed. Nevertheless, a statement by the Governor's office implies greater certainty and provides more detail. The Governor's press release announced plans for two new mills, one of which will be in Richmond County and the other in Sampson County in North Carolina. The capital cost of these two NC mills would amount to \$214 million and together they would create 160 permanent jobs, plus many more indirectly. According to the NC Ports Authority and other sources a third mill may be built in Laurens County in South Carolina once due diligence has been completed.

The capacity of each mill will be 500kt/y, identical to that of Enviva's two existing mills at Northampton NC and Southampton VA. The construction timeline is dependent on the completion of the permitting process. The Sampson mill – close to Junction 355 on Interstate 40 – will be developed first, followed about six months later by a plant near the town of Hamlet in Richmond County.

The new mills would deliver their pellets to an export terminal that Enviva intends to build at the Port of Wilmington. The export terminal will be very similar to the company's existing Chesapeake terminal, near Norfolk VA which serves Enviva's other mills in the region. The company has taken a 21 year lease on a 7.2 acre (2.9ha) site where it intends to build two 45kt storage domes, a truck and rail unloading terminal, conveyors and a ship-loading system. The estimated capital cost of the terminal will be \$35-40 million. Like Chesapeake, the Wilmington terminal will be designed to load 1.5Mt of pellets onto 25-30 vessels every year.

The main difference between Enviva's two terminals will be that two thirds of Wilmington's pellets would be delivered by rail. (At Chesapeake all the incoming pellets presently arrive by truck.) The pellets that arrive at Wilmington by rail (using the CSX railroad) would come from the more distant pellet mills at Hamlet and Laurens. Pellets from the Sampson mill would be trucked. The distance by road from the site in Sampson County to the port is 75 miles (120km), while the distances from Hamlet in Richmond County and from Laurens SC, are 130 miles (210km) and 280 miles (450km) respectively.

If completed, the new Wilmington cluster of mills would almost double Enviva's pellet manufacturing capacity, adding 1.5Mt/y to the company's present capacity of 1.57Mt/y.

Drax contemplates a further expansion of its integrated pellet supply

Meanwhile **Drax** is looking towards a further expansion of its integrated pellet supply. The company is already building two 450kt/y pellet mills in the US South, at Amite MS and Morehouse LA. These mills are due to come on stream in Q1 and Q2 2015 respectively. In its half-year financial report Drax confirmed that it is now looking at accelerating its investment in a third mill that would feed its new Baton Rouge export

terminal that is due to be completed in Q1 2015. This would have a capacity of 0.5Mt/y and – although the company has not confirmed this – it seems most likely to be located at Magnolia in Pike County, MS. (See FEM #38, p3.)

Drax is also considering an investment in an export terminal on the US east coast that would serve new company-owned pellet mills as well as those of third party suppliers. If Drax eventually converts four of its six coal units to biomass – which is its stated intention, although the fourth conversion is not yet part of the company's base case plan – it will require approximately 10Mt/y of wood pellets by 2017.

Highland Pellets plans to build a 500kt/y pellet mill in Arkansas

Another large project, which has kept a low profile until now, is a plan by **Highland Pellets** to build a 500kt/y export oriented industrial pellet mill at Pine Bluff, Arkansas. Though little has been revealed about the company's offtake agreements and source of finance, the backgrounds and experience of the management team suggest that the project should be soundly based. Two of the executive directors, Mike Ferguson and Scott Jacobs are also co-founders and directors of **AgriRecycle Ltd.** which has already built and still runs several other pellet mills in the US, though Pine Bluff will be the largest. Highland Pellets expects to break ground in October 2014 and to begin delivering pellets in Q2 2016.

The company's website says that Highland's fibre supply "is fully contracted for ten years", which would put it in an almost unique position in the US pellet industry. The pellets produced by Highland Pellets

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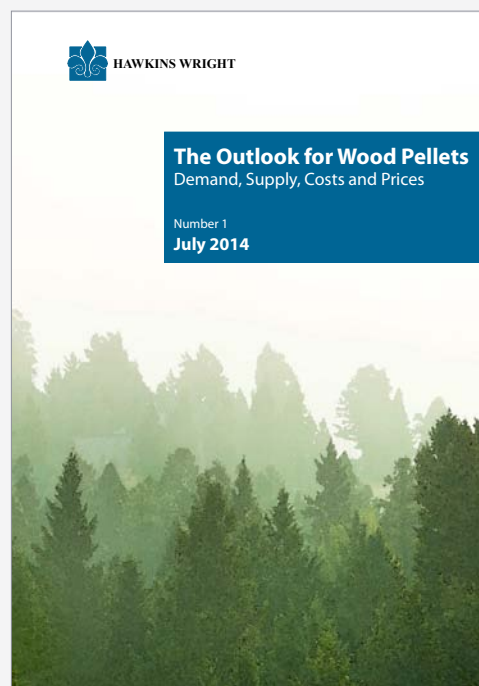
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John Bingham (john.bingham@hawkinswright.com), or
Fiona McDermott (fiona.mcdermott@hawkinswright.com)

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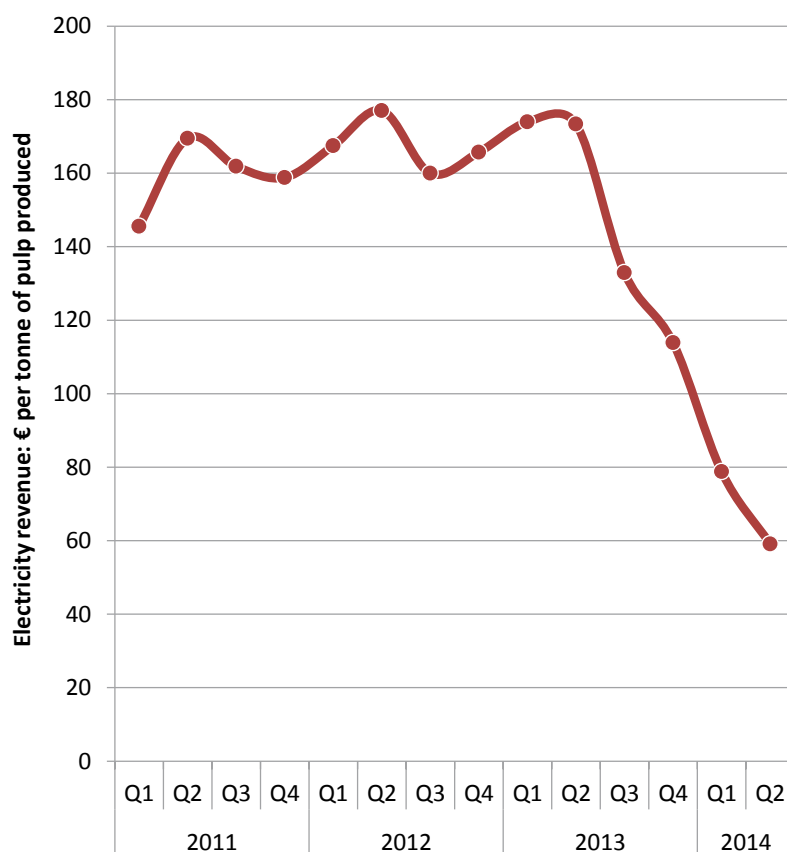
will be railed or barged to an unidentified export terminal on the US Gulf coast about 300 miles to the south. The Arkansas River connects with the Mississippi River, giving Highland access to several potential export terminals between Baton Rouge and New Orleans. Coincidentally, we notice that barges would pass by Drax's terminal, though at this stage there is no reason to think that this is Highland's intended destination.

ENCE CLOSES ITS PULP MILL AT HUELVA, SPAIN, AND WILL CONVERT THE SITE TO GENERATE BIOMASS ELECTRICITY EXCLUSIVELY

Ence, the Spanish pulp and energy company, has announced that its 410kt/y pulp mill at Huelva in southern Spain will close and that the site will in future be used exclusively to generate biomass electricity. Once the conversion is complete, Huelva will have a capacity of 72MW of electricity, generating at least 500GWh/year.

The Huelva mill is one of the world's higher cost pulp mills, one that has been struggling to compete internationally. Until last year the losses sustained on pulp production at Huelva were offset by the revenues from co-generated electricity generation. However, last year's reform of renewable energy feed-in tariffs in Spain and a sharp reduction in electricity pool prices have significantly reduced the company's revenues. (See FEM #37, p9.) Though pool prices are now recovering to a near 'normal' level of around €50/MWh, from a low of just €17/MWh in February, Ence had previously warned that Spain's energy reforms jeopardised the future of the Huelva pulp mill. Indeed, the company now reports that Huelva has lost money in each of the past three quarters, running up a loss of €49 million in the first half of 2014 alone.

Ence's electricity revenues per tonne of pulp produced, 2011-2014



Source: Ence financial data, adapted by Hawkins Wright

As shown in the chart, net electricity revenues per tonne of pulp have dropped from approximately €170/t in mid-2013 to less than €60/t in Q2 2014. These data apply to the company as a whole, combining the results of Huelva along with the better performing pulp mills at Pontevedra and Navia in northern Spain. The results of Huelva on its own will have been worse.

To some extent, the decline in electricity revenues has recently been mitigated by a fall in wood costs. As described in FEM #37, Ence enforced a €3.50/t reduction in the price paid for locally-sourced eucalyptus pulpwood earlier this year. This is now being reflected in lower average wood

costs across the group. Per tonne of pulp produced, wood costs have fallen from €210 in February to €198 in June. However, as approximately a quarter (300,000m³/y) of Huelva's wood is imported, this benefit has accrued mostly to the two northern mills.

Wood supplies in the province of Huelva have also been impacted negatively by the conversion of eucalyptus plantations to agricultural crops such as strawberries and citrus fruits, necessitating the trucking of wood from further away.

The Huelva site currently has an installed co-generation capacity of 117MW, of which 68MW is biomass-fired in two turbines (using black liquor from the pulping process) and 49MW is natural gas fired. These three units generated 814GWh in 2013. In addition there is a 50MW stand-alone biomass-fired power station. This started up in late-2012 and generated 376GWh last year. Black liquor will no longer be available when the pulp mill closes, so the generating assets at Huelva will be adapted and consolidated such that the capacity is reduced to a total of 72MW, generating upwards of 500GWh/y of renewable electricity.

Ence also co-generates electricity at its two other pulp mills, Pontevedra (35MW producing 214GWh in 2013) and Navia (77MW producing 525GWh). In April 2014 the company commissioned a new 20MW independent biomass power station at Mérida, 190km north of Seville. The €63M plant achieved a load factor of 85% in July and Ence expects to take over the plant from the EPC contractor in September.

ONTARIO POWER GENERATION COMPLETES THE CONVERSION OF ATIKOKAN'S COAL-FIRED POWER STATION TO BIOMASS

Ontario Power Generation has completed the conversion of the coal-fired Atikokan power station to biomass and the station is now operating on biomass exclusively. The Atikokan power station – the first in North America to have been converted from coal to wood pellets – will operate mainly as a peaking plant and will consume approximately 90kt/y of pellets. These will be supplied by two companies, **Rentech Inc** and **Resolute Forest Products**, each of which has a long term contract to deliver 45kt/y from their new mills near Atikokan and in Thunder Bay respectively.

Resolute Forest Products has confirmed that construction of its new 45kt/y mill is expected to start up in Q4 2014. In August, Rentech also reported that its 100kt/y pellet mill was on schedule to start "within the month". The Rentech mill will supply the local power station with 45kt/y and the remaining production will be railed to Rentech's pellet export terminal that is under construction at the Port of Quebec, over 2000km to the east. The export terminal will also handle the production of Rentech's 450kt/y pellet mill that the company is building at WaWa, ON. Wawa's production will mainly be used to service a 10-year contract to supply 400kt/y to Drax's power station in the United Kingdom. The first delivery of pellets is scheduled for late 2014.

Ontario Power Generation is also in the process of converting its Thunder Bay power station. This too will in future be used as a peaking plant and will therefore require a relatively small volume of pellets, about 15kt/y. Following extensive trials, these will be black pellets – most likely steam-exploded – for which OPG has conducted a tender, the result of which has not yet been confirmed. By using black pellets OPG can avoid almost all the capital costs normally associated with a coal to biomass conversion.

INVESTMENT AND TECHNOLOGY IN BRIEF...

CANADA

Pinnacle Renewable Energy has obtained PEFC Chain of Custody certification for its wood pellet production and handling operations. The certification covers the company's six pellet mills (combined capacity 1.2Mt/y) as well as its operations at the Fibreco (Port of Vancouver) and Westview (Port of Prince Rupert) export terminals.

A new 160kt/y pellet mill is being planned for Mission, British Columbia. **SMG Wood Pellet** says it has fibre sourcing agreements in place and is working to finalise the necessary air quality and planning permits. The facility will feature a somewhat unusual design, with no external conveyers and all fibre being stored under cover. This will be achieved through a near just-in-time wood delivery system, with the site itself only storing approximately 3 days' worth of raw fibre. The company intends to finalise offtake agreements soon, with a view to beginning construction in Q1 2015.

FRANCE

German Pellets has been contracted to supply woodchips to a coal power station in France that is being converted to biomass. The recipient has not yet been officially confirmed, but E.ON's 150MW Provence 4 facility in Gardanne seems a likely candidate.

UK

A new biomass CHP plant (12.5MWe/10MWth) will be built alongside the Macallan whiskey distillery in Speyside, Scotland. The plant will be fuelled by locally sourced forest residues and will generate over 90% of the process steam required at the distillery.

The project has been developed by **Estover Energy** and has secured equity investment from **John Laing** and the UK's **Green Investment Bank**, with remaining funds expected to be raised from a £48M bond, backed by the government's Infrastructure UK guarantee scheme. The total project cost will be ~£74M and it is expected to be commissioned in 2016.

Port Clarence Energy (a collaboration of **Eco2** and **Temporis Capital**) has secured planning permission for its 49MW biomass plant at Clarence Works, Stockton. Construction of the £160M plant, which will use 325kt/y of waste wood, could begin by the end of the year, but is dependent upon the company successfully raising the remaining finance needed for the plant. However, all being well the plant could begin operation by 2017.

AUSTRALIA

Altus Renewables is preparing to export the first shipload of heating pellets

from its new mill in Tuan, Queensland. The 125kt facility uses residual wood from the adjacent Hyne sawmill, which processes FSC and AFS (Australian Forestry Standard) certified timber. The pellets will be sold into the domestic heating market as well as exported to the residential market in Europe.

JAPAN

Japan Pulp and Paper is developing a 14MW biomass plant in Noda, Iwate prefecture, Japan. The facility will utilise 140kt/y of forest residue woodchips, bark and PKS. The ¥6.5Bn (\$63.7M) investment in the project, which is being made in conjunction with **New Energy Development Co.**, will be partly subsidised through the country's feed-in tariff. Generation at the plant is expected to begin in April 2016.

USA

RockTenn is investing \$68M in a new biomass boiler for its Demopolis pulp mill in Alabama. The investment is said to have been driven by the EPA's boiler MACT rule which will enforce strict emission limits on industrial boilers from January 2016. The company has decided to invest in new boiler technology, rather than invest \$27M in MACT compliance for the site's existing boiler.

POLICY & LEGISLATION

THE CONSUMPTION OF RENEWABLE ENERGY IN FRANCE IS SET TO DOUBLE THANKS TO NEW ENERGY BILL

The French government has approved a new Energy Bill, which is designed to mobilise deployment of renewable energy, increase energy efficiency and reduce emissions (see FEM #39 p.15). The bill includes a target to cut greenhouse gas emissions by 40% by 2030 and by 75% by 2050. To achieve this, the government aims to increase the share of renewables in the energy mix from 13% in 2012 to 23% in 2020 and to 32% by 2030. The Bill also states the ambition to reduce the role of nuclear power in the electricity mix to 50% (from ~75% today). The strategy will be backed by €10 billion of funding over the next three years, to be allocated across sixty-four specific policy measures, which also include:

- Reducing final energy consumption by 50% by 2050, compared to 2012
- Accelerating the decline in final energy consumption intensity to 2.5% p.a. by 2030 from <1% currently. (Energy consumption intensity is a measure of the energy that is consumed per unit of economic output.)
- Reducing fossil fuel consumption by 30% by 2030, compared to 2012

Although the bill has been approved by the cabinet it also needs to be passed by parliament in order to become law. This is expected to take place in the autumn.

Bioenergy is a central part of France's decarbonisation strategy. At the start of August waste regulations applying to wood packaging were relaxed, opening the opportunity for waste wood pallets to be used as fuel.

DECC WILL SIMPLIFY SOME PARTS OF THE UK BIOMASS SUSTAINABILITY RULES

DECC has confirmed the outcome of a consultation into changes that will be made to the UK's biomass sustainability rules (see FEM #39 p.16). The decision document approves several amendments to the criteria which will apply from April 2015. These include:

- Changing the definition of 'saw logs' from the current definition (which is based on a tree's age) to instead allow the use of specifications provided by local sawmills.
- To simplify the requirement to report on specific 'tree species' and instead allow the proportion of 'hardwood' and 'softwood' to be used. Generators will also have to state whether any of the wood used was likely to have come from threatened or protected species.
- To exempt arboricultural residues (e.g. offcuts from tree surgery or land management activities) from the Timber Standard, meaning such wood is assumed ('deemed') to be sustainable.
- To also "deem sustainable" trees removed from non-forest land for ecological reasons.
- To add 'highly biodiverse grasslands' to the list of protected land types and prevent biomass from this category of land from being used.
- To implement the GHG annual averaging methodology as set out in the consultation document.

However DECC has decided not to move forward with three exemptions for residual fibre that had been under consideration. These relate to wood from diseased trees, sawmill residues and 'wind blow' wood (i.e. caused by extreme weather). DECC has stated that no exemptions from the Timber Standard will

be granted for these types of biomass at this stage, although DECC will keep the evidence under review regarding wind blow wood.

To implement the changes for generators supported by the Renewables Obligation, DECC intends to publish a consolidated Renewables Obligation Order, which will bring together several changes that need to be made to the legislation. This will be laid in Parliament in early 2015, with the aim of achieving parliamentary approval in time for the changes to come into force on 1 April 2015.

DECC also intends to implement these decisions in the RHI regulations by spring 2015. To achieve this DECC will need to follow a similar legislative timetable to that for the ROO (i.e. publish amended RHI regulations by early 2015) if they are to come into force as intended.

The changes will also apply to generators who are supported by an Investment Contract or other Contract for Difference. DECC's decision document can be found here <http://bit.ly/1r8oPtS>.

THE EUROPEAN COMMISSION WILL NOT INTRODUCE MANDATORY SUSTAINABILITY STANDARDS FOR SOLID BIOMASS BEFORE 2020

The European Commission has outlined its current thinking regarding biomass sustainability regulations in a 'working document' published at the end of July. The report highlights the important role of bioenergy, while also reiterating the need to prevent any unintended consequences that may result from bioenergy deployment.

Some of the more detailed elements of the report suggest that the EC's opinion of appropriate sustainability standards has moved on from those expressed in earlier drafts that were leaked into the public domain (see *FEM* #29 p.15). For example, the working document refers to a suitable GHG saving threshold of 70%, which is higher than has been used in previous documentation. While not unrealistic, this level may be difficult for some feedstocks and supply chains to achieve.

However, despite the discussion of appropriate GHG savings, the document goes on to state that the EC does not believe it is necessary to introduce mandatory standards for solid biomass, at least not before 2020: *"...at this stage, it is considered that the risk of market distortion caused by national sustainability regulations can be effectively managed through the existing EU tools on technical standards."*

Nevertheless, the Commission has also said it will continue to monitor the origin and end use of biomass. This is likely to mean that further regulations covering bioenergy will be developed over the coming years, to be applied to the industry beyond 2020. So while the publication of this working document provides a stable European policy framework for the period prior to 2020, it will still be important to observe developments in this area that could affect the industry over the longer term.

Note that a new **Joint Research Council (JRC)** report was also published alongside the EC document. This 255 page tome is an in-depth research report into the GHG emissions associated with solid and gaseous bioenergy pathways. It can be downloaded from <http://bit.ly/1Aye5Gb>.

AN INCREASING NUMBER OF US STATES ARE OFFERING FINANCIAL SUPPORT TO ENCOURAGE THE USE OF BIOMASS HEAT

More and more US states are rolling out support schemes to promote biomass heating. As of August 2014 eight US states (including Alabama, Arizona, Idaho, Maine, Maryland, Montana, New York and Oregon) offer some form of financial/tax incentive to install wood or pellet stoves. Also, five states provide support for biomass boilers (Maine, Massachusetts, New Hampshire, New York and Vermont). These schemes often seek to achieve multiple objectives. For example, to:

- address fuel poverty
- reduce fossil fuel consumption
- improve air quality
- drive improved boiler/stove design (e.g. improve efficiency)
- increase skills and sector professionalism

The newest scheme to be launched is the **Renewable Heat New York** programme, which was announced at the end of July. The programme includes a variety of measures to promote the use of high-efficiency, low-emission biomass boilers and stoves. For residential scale systems, pellet boilers and stoves, as well as cordwood (log) boilers with thermal stores are supported. For small commercial installations, both pellet boilers and 'advanced' cordwood boilers are eligible for financial support. The subsidy level for each of the technology categories is shown in the table below.

Renewable Heat New York - Biomass Boiler Programme		
Customer	Technology type	Subsidy level
Residential	Wood pellet stove	\$1,000 (up to \$1,500 for income qualified homeowners).
	Advanced cordwood boiler with thermal storage	Up to \$8,000 based on 20% of installed cost up to \$4,000 with an additional \$4,000 for the recycling of old outdoor/indoor wood boiler.
Commercial - small	Advanced cordwood boiler with thermal storage	Up to \$8,000 based on 20% of installed cost up to \$4,000 with an additional \$4,000 for the recycling of old outdoor/indoor wood boiler.
	Small pellet boiler <300,000Btu (88kW) with thermal storage	25% of total cost, up to a maximum of \$20,000 based on system size.
Commercial - large	Large pellet boiler >300,000Btu (88kW) with thermal storage, or dual boiler systems	20-25% of total installed cost depending upon boiler system design (\$150,000 maximum incentive).

Source: New York State Energy Research and Development Authority (NYSERDA)

The state is taking a rigorous approach to safety and quality in the scheme, by restricting support to only high performance equipment and requiring that it is installed by adequately qualified engineers. Compliance with this will be managed through an approval scheme for installers and contractors. Companies which wish to take part will be evaluated based on their qualifications and past experience installing biomass boilers. Only companies which receive eligible installer status will be able to apply for financial support for boilers and stoves which they install.

The combustion equipment itself must also meet stringent performance standards. For example, to be eligible for the funding wood pellet stoves must be able to achieve particulate emissions of 2.0 grams per hour, or less, according to the EPA list of certified wood heaters. Biomass boilers must also meet minimum efficiency and emissions standards.

More information on the scheme is available at www.nyserda.ny.gov/renewableheat.

A NEW STRATEGY AIMS TO INCREASE BIOMASS EXPLOITATION AND PELLET DEMAND IN SPAIN

The Galician regional government in Spain has published a new biomass strategy, which outlines plans to mobilize investment in the sector of €450 million (~\$600 million) by 2020. Approximately 50% of Spain's forest cover is found in the Galicia region, and the strategy focuses on making better use of this resource in order to reduce the country's dependence on fossil fuels. It also includes measures to develop the biomass supply chain and promote biomass heating.

The strategy highlights wood pellets as a key area for growth, stating the aim of tripling pellet consumption from 223,000m³ (145kt) currently to 692,000m³ (450kt) by 2020. By doing so, the government is hoping to create 1,000 jobs while reducing fossil fuel consumption by 13.8%.

The importance of ensuring biomass quality and sustainability is highlighted in the strategy. The existing regional brand known as '*Galicia Calidade*' (Galicia Quality) will be applied to the biomass sector, offering fuel suppliers the opportunity to prove the origin, quality, production system and sustainability of their biomass.

€89 million will be provided to the industry through direct subsidies, which is hoped will leverage savings of €500 million over the seven years of the programme thanks to reduced fossil fuel use.

More information is available from the *Xunta de Galicia* website here <http://bit.ly/1q4nkcB>.

ELECTRABEL'S ENTITLEMENT TO GREEN CERTIFICATES IS RESTORED, ALLOWING THE RODENHUIZE POWER STATION TO BE RESTARTED

Electrabel has restarted its 180MW 'MaxGreen' wood-pellet fired power station at Rodenhuize, Belgium. In Q1 this year the power station was shut down following a dispute about Electrabel's entitlement to Green Certificates. (See FEM #37, p.17).

The dispute concerned the types of biomass that were eligible for certificates. It appears that the original regulations were drafted in such a way that biomass could only be used for energy if it was of no use to traditional forest products industries, principally the pulp and paper and furniture manufacturing industries. To verify that this was the case, Belgium's paper and furniture industry trade associations were asked regularly to declare that the wood pellets used by Electrabel – all of which are imported from North America – do not compete for fibre with traditional industries.

The precise sequence of events is still somewhat cloudy, but the end-result was that the trade associations declined to make the necessary declaration. As a result, Electrabel's entitlement to certificates was withdrawn, the Max-Green power station was shut and pellet imports stopped. (Rodenhuize usually imports around 750kt/y of wood pellets.)

It now seems that the dispute that has rumbled on through the summer has been resolved. Electrabel has confirmed that Rodenhuize power station has been restarted. According to Flemish media reports, the "solution is first and foremost due to the change in the legislative role of the two federations [Fedustria and Cobelpa], who can now only provide advice [to the government] and no longer have a right of veto".

What this means precisely, and whether it represents a permanent solution to the dispute, is something that we will endeavour to find out.

POLICY & LEGISLATION IN BRIEF...

USA

The first internal standards for solid biomass fuels have been published. ISO 17225 solid biofuels — fuel specifications and classes” currently incorporates seven parts covering wood pellets, briquettes, wood chips, firewood, non-woody pellets and non-wood briquettes.

An eighth section is still under development but will cover thermally treated and densified biomass.

The standards have been published by the American Society of Agricultural and Biological Engineers and can be

downloaded (for a fee) from <http://webstore.ansi.org/>.

UNITED KINGDOM

Support for small biomass boilers (<200kW) in the UK’s commercial RHI will be reduced by 10% from 1st October.

The technology has achieved deployment levels much greater than DECC expected and the budget management system (known as tariff degression) has therefore been triggered. As a result, the tariff will be reduced from 8.4-7.6p/kWh (the tier 2 tariff will also be reduced, from 2.2-2.0p/kWh).

Drax’s legal challenge against DECC, regarding the award of an Investment Contract for its second converted coal unit, has been quashed. Although it initially seemed to be moving in Drax’s favour (see FEM #40 p.4), the Court of Appeal has since allowed DECC’s appeal and dismissed Drax’s application for judicial review.

The second unit conversion will therefore definitely not receive an Investment Contract. Despite this, Drax seems likely to continue with the conversion under the Renewables Obligation.

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	2.78x10 ⁻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	1.06x10 ⁻⁶	2.93x10 ⁻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	1.16x10 ⁻⁶	1	0.00
BTU/second		1.06	1.06x10 ⁻³	907.18	1

HAWKINS WRIGHT LIMITED

2A Blake Mews, Kew,
Richmond,
Surrey TW9 3GA,
United Kingdom

Tel: +44 20 8747 5840
Fax: +44 20 8181 6199
Email: post@hawkinswright.com
Web: www.hawkinswright.com
