

## Woodfuel potential and progress in South East England March 2011

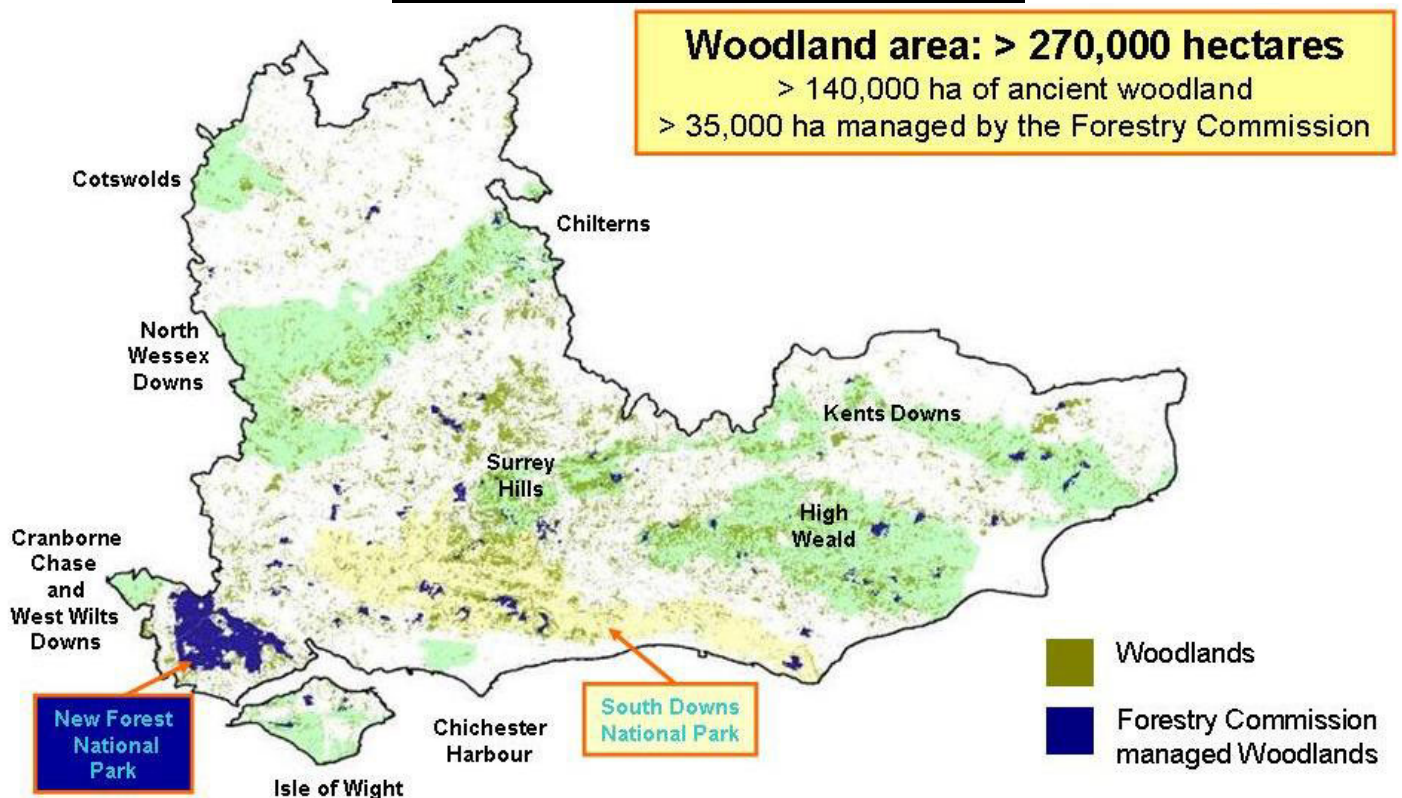
### Woodland cover in south east England:

Total land area: 1,909,600 ha  
**Total woodland area: > 270,000 ha** 14% of SE land area  
**Total ancient woodland: 130,885 ha**  
*>48% of SE woodland and 36% of England's ancient woodland*  
*Includes > 87,000 ha of ASNW and < 44,000 ha of PAWS*  
**Forest Commission managed woodland: > 35,000 ha**  
*(13% of SE woodland & 16% of FC managed woodland in England)*

### Comparison to rest of England:

Region	Woodland Area	% Woodland Cover	% of England's total woodland
<b>South East</b>	<b>270,000</b>	<b>14.1</b>	<b>24.6</b>
South West	212,000	8.9	19.3
East England	139,000	7.3	12.7
North East	103,000	12.0	9.4
West Midlands	99,000	7.6	9.0
North West	96,000	6.8	8.8
Yorkshire & the Humber	92,000	6.0	8.4
East Midlands	80,000	5.1	7.3
London	6,000	3.9	0.5
<b>TOTAL</b>	<b>1,097,000</b>	<b>8.4</b>	<b>100</b>

### Woodland cover and protected landscapes (National Parks and Areas of Outstanding Natural Beauty) in South East England



### **Major species in South East England:**

Oak	> 44,000 ha (16%)	Scots pine	> 23,000 ha (8%)
Ash	> 26,000 ha (10%)	Corsican pine	> 6,000 ha (2%)
Birch	> 25,000 ha (9%)	Norway spruce	> 5,000 ha (1.8%)
Beech	> 23,000 ha (8%)	Larch	> 4,500 ha (1.7%)
Sycamore	> 5,900 ha (2%)	Douglas fir	> 3,800 ha (1.4%)
Sweet chestnut	> 18,000 ha (2%)	<b>Note:</b> this adds to just > 50% so lots of mixed woods!	
Poplar	> 1,900 ha (>1%)	Total conifer	> 51,000 ha (<19%)
Total broadleaf	> 219,000 ha (81%)		

**Note:** all figures drawn from NIWT (National Inventory of Woodland and Trees published in 2002. NIWT '2' will shortly be available to update these figures.

Sweet chestnut coppice figures drawn from FC Bulletin 64 (published 1987)

### **Existing wood/timber production:**

From 35,000 ha (growing 40% conifer/60% broadleaves by area) the Forestry Commission is harvesting about 160,000m<sup>3</sup> per year (approx 80% of this is conifer)

We estimate that a similar amount is harvested from the other 235,000 ha of woodland (15% conifer/85% broadleaves). Of these woods less than a third (by area) are subject to a grant scheme or felling licence – though as licences are only needed for those parts of the wood being thinned or felled this represents a low estimate of active management.

### **Potential for production:**

- 235,000 ha of woodland not managed by the Forestry Commission;
- Of this around 39,000 ha are coniferous and 196,000 ha are broadleaved;
- If we assume this has the potential to grow at at least 4 m<sup>3</sup> per ha per year this equates to nearly **1,000,000m<sup>3</sup>** of increment per year. **Note:** this is a conservative estimate for managed woods as Scots pine will achieve YC8 (even allowing for open space in the wood) and sweet chestnut or ash coppice will yield > 100m<sup>3</sup> per ha at the end of a 15 year rotation equating to YC6 (and up to 12m<sup>3</sup> per ha per year if the rotation is extended to 20 – 25 years), however, most woods have not been actively managed for some time and are currently not achieving their optimal growth rates.
- If half of this increment were harvested for woodfuel each year this equates to 500,000m<sup>3</sup> per year. This reflects the target outlined under the England Woodfuel Strategy of 2,000,000m<sup>3</sup> per year by 2020 and can be broken down further to a possible target for each county:

<b>South East England - Woodfuel Strategy suggested targets by County</b>							
County	Woodland Area (hectares)	% woodland cover	FC holding (Hectares)	% of woodland cover	Non FC holding (hectares)	Woodfuel Strategy target by % non FC woodland area (m <sup>3</sup> /yr)	Woodfuel Strategy Suggested County Target (m <sup>3</sup> /yr)
<b>Berkshire</b>	<b>18,308</b>	<b>14.5</b>	444	2.4	17,864	38,103	<b>35,000</b>
<b>Buckinghamshire</b>	<b>17,573</b>	<b>9.4</b>	1,753	10.0	15,820	33,743	<b>33,000</b>
<b>Oxfordshire</b>	<b>18,235</b>	<b>7</b>	629	3.4	17,606	37,553	<b>35,000</b>
<b>Surrey</b>	<b>37,564</b>	<b>22.4</b>	1,588	4.2	35,976	76,735	<b>70,000</b>
<b>Hampshire</b>	<b>66,939</b>	<b>17.7</b>	20,136	30.1	46,803	99,828	<b>105,000</b>
<b>Isle of Wight</b>	<b>4,549</b>	<b>12</b>	1,146	25.2	3,403	7,258	<b>7,000</b>
<b>West Sussex</b>	<b>37,507</b>	<b>18.9</b>	3,789	10.1	33,718	71,919	<b>70,000</b>
<b>East Sussex</b>	<b>29,924</b>	<b>16.7</b>	2,643	8.8	27,281	58,189	<b>55,000</b>
<b>Kent</b>	<b>39,487</b>	<b>10.6</b>	3,540	9.0	35,947	76,673	<b>90,000</b>
	<b>270,086</b>	<b>14.4</b>	<b>35,668</b>		<b>234,418</b>	<b>500,000</b>	<b>500,000</b>

## Current woodfuel use and likely developments in south east England:

The woodfuel market seems to be developing at three complementary levels:

1. **Firewood:** The growing market for conventional logs is resulting in good prices for good quality broadleaves (particularly straight stemmed species which can be converted easily in a firewood processor), around £20m<sup>3</sup> standing and £35+ at rideside – mainly going to local firewood producers. Some firewood producers are finding it difficult to locate suitable wood to meet demand and this is stimulating interest in restoring management to smaller woods which owners haven't been able to actively manage for many years.
2. **Large scale:** Key developments:
  - a. **Slough Heat and Power:** have been using up to 350,000m<sup>3</sup> of wood per year from a multitude of sources including woodchips from sawmill slabwood, arboriculture, heathland re-creation, and some from existing woods but prices delivered have been in the low £20's per tonne. We understand that prices have increased slightly as they appreciate the benefits of higher quality fuel. UPM Tilhill have a major woodchip depot at South Warnborough which provides a degree of 'buffer' fuel storage for the plant.
  - b. **Giddings sawmill:** take up to 100,000m<sup>3</sup> of softwood from across southern England. Up to 50% of the volume (slabwood and sawdust) is converted into woodchips and sold to major buyers which may include Slough and/or the new Verdo pellet production plant at Andover –see below.
  - c. **Verdo Renewables:** have recently commissioned a pellet production plant at Andover. They will produce 55,000 tonnes of top quality pellets and 15,000 tonnes of wood briquettes per year. This will provide a reliable supply of high quality (A1) pellets providing security for those considering wood pellet heating systems. Their raw material is sourced about 50/50 from chipped sawmill slabwood and virgin conifer small roundwood (1,200 – 1,500 tonnes per week).
  - d. **British Airports Authority (Heathrow):** Have recently tendered for a supplier of 40,000m<sup>3</sup> of woodchips per year.
  - e. **Estover Energy:** Are looking for suitable site in Kent to site a medium scale (5MWe & 10MWth) CHP (Combined Heat and Power) plant (conventional steam turbine requiring about 60,000m<sup>3</sup> of wood per year). They are seeking a site where they can utilise the heat effectively. It is encouraging to note that they are following the example of our colleagues in continental Europe and seeking a site where they can utilise the heat effectively, thereby providing a more robust financial investment and making optimal use of the woodfuel resource. They have also been building their fuel supply chain by approaching wooded estates across the south east and exploring long term relationships.
  - f. **BkyB:** are rumoured to be looking for around 16,000m<sup>3</sup> per year for their new HQ near Heathrow.
  - g. **Waitrose:** are installing a CCHP (Combined Cooling, Heat & Power) plant at one of their stores on the Isle of Wight. This system is based on Stirling DK engines and will require about 2,000m<sup>3</sup> of wood per year. This has the potential to establish a useful market for some of the products from the Islands 4,500 ha of woodland
  - h. **Port of Southampton Biomass Plant:** Helius are considering building a CHP plant, however, the fuel resources seem likely to be mainly imported.
3. **Local Woodheat:** There are a growing number of estates (e.g. West Dean, Stansted Park, Torry Hill), schools (e.g. Beacon Community College – Crowborough, Bognor Regis Community College, Valley Park – Maidstone, Bexhill Community College), farms (e.g. Brockwood Park, Hillfields Farm, Manor Farm) and other establishments (e.g. Birtley House – retirement home, Surrey University Sports Centre – Guildford and Maidstone District Council offices) which are now heated with woodchips supplied from

local woods. The general price for delivered quality woodchips is currently £80 per tonne (equivalent to about 2.6 pence per kWhr).

Overall we feel the greatest opportunity for woodland owners and managers lies with local supply of quality woodfuel or woodheat (where as demonstrated in the Woodheat Solutions study tours to Austria and Finland individuals or groups of owners/managers install the woodfuelled boiler and infrastructure and sell heat – what is called an ESCo - Energy Services Company approach). While direct woodheat supply is not for everyone it can be particularly attractive in supplying a woodland owners own heat requirements. In several cases entrepreneurs have installed systems to supply their own heat needs, learnt the ropes and are now exploring opportunities to supply heat to nearby 'blue chip' customers such as schools.

While the full ESCo approach may only be attractive to the more entrepreneurial owners/managers local woodchip supply is less complex and offers the benefits of using farm machinery to deliver (rather than costly lorries). This approach may be v attractive to buyers like local authorities etc where security of supply is crucial.

### **Forestry Commission support for woodfuel development in SEE:**

#### **1. General support:**

- a. Advice about potential woodfuel resources;
- b. Linking potential buyers to suppliers;
- c. Promoting good practice – for instance Stansted Park as an exemplar installation;
- d. Supporting and/or working in partnership with local initiatives including:
  - i. **Surrey Hills Woodfuel Group** – have convinced Surrey CC to implement a policy under which all boiler replacements on Council properties will be woodfuelled (unless there is a good reason why not);
  - ii. **West Sussex CC** – Andrew Tolfts has just been recruited as the Woodfuel Development Officer – this post is jointly funded by WSCC and FC;
  - iii. **Bordon/Whitehill ecotown** – where we have obtained resources to assess the potential woodfuel supply close to the town (via a more detailed assessment of the potential from local woods);
  - iv. **TIMBER Project** – helping develop the woodfuel industry in the Chilterns.

## 2. Leading the Woodheat Solutions Project:



For those less familiar with the project: WhS is supported by Intelligent Energy Europe and involves working with Thames Valley Energy and a range of EU partners to transfer experience from Finland and Austria where woodfuel is well established as an industry to 'developing' Regions: South East England, Slovenia and Croatia.

Project included study tours to Finland (30 English delegates) and Austria (40 English delegates), technical advice to sites in SEE from Austrian and Finnish specialists and a series of technical training seminars highlighting the lessons learnt, which we have just completed. For further information please see: <http://www.woodheatsolutions.eu/> Project includes a series of documents summarising and highlighting the key elements of woodfuel quality and the new international CEN woodfuel Quality Standards:

- **WhS Newsletter 3: Introduction to woodfuel standards;**
- **WhS: Summary of woodfuel standards;**
- **WhS: Roadmap for implementing Standards;** and
- **WhS: Guide to moisture testing.**

Each has been designed to provide a little more detail than the last about the standards. In particular recommend the 'Roadmap' written by our Austrian partners.

**3. Kent Downs Woodfuel Pathfinder:** As part of the Forestry Commission's Woodland Carbon Task Force this national pathfinder is focusing significant FC and partner resources to work with a range of stakeholders to identify and test a range of temporary support measures to establish the woodfuel industry in the Kent Downs AONB.

**Kent Downs AONB**

- > 15,000 ha of woodland
- > 600 woodland owners
- > 80,000 tonnes annual growth
- Half of this could heat > 5,000 homes

Map labels: BROMLEY, NORTHFLEET, CHATHAM, MAIDSTONE, CANTERBURY, EDENBRIDGE, TONBRIDGE, ASHFORD, FOLKSTONE, DOVER.

Inset photos: Shoreham Woods, Otterden Woods, Knowle Park post 1987 restocking, Pennypot Woods.

Our objective is to establish:

- A robust woodland industry supported by local markets for woodland products
- Sensitive woodland management of our cherished biodiversity and landscapes
- Secure local jobs (including opportunities for farm diversification)
- An 'environment' requiring minimal state regulation and support

To help achieve this we have brought together a team with a diverse range of experience to help woodland owners and heat users consider and grasp the opportunities. The pathfinder builds on the experience gained through the Woodheat Solutions project and is supported by DECC's (Department of Energy and Climate Change) Renewable Heat Incentive launched on the 10<sup>th</sup> March 2011, the English Woodland Grant Scheme's Woodfuel WIG (Woodland Improvement Grant) and the wider grants available for rural business development under the Rural Development Plan England (for instance via LEADER and SEEDA – see [www.forestry.gov.uk/forestry/inf-d-7bbkmw](http://www.forestry.gov.uk/forestry/inf-d-7bbkmw)).

Ultimately, when we have tested what temporary support mechanisms help establish a robust wood fuel industry in Kent, we can identify the most effective support which could then be considered in other parts of England.

*Matthew Woodcock  
29 April 2011*

## Useful facts and figures:

1m<sup>3</sup> of wood (standing or recently felled) *comprises about 50% water (by total weight)*  
 = approximately 1 tonne of unseasoned/fresh/wet wood  
 = approx. 0.72 tonnes of seasoned wood *comprising about 30% water (by total weight)*  
 = about 3m<sup>3</sup> of loose woodchips (by volume)  
 = about 2,500kWhs (or 9.0GJ) of usable heat energy for broadleaf wood  
 or about 1,800kWhs (or 6.5GJ) of usable heat energy for conifer wood

**NOTE:** A m<sup>3</sup> of unseasoned wood will have a much lower energy value as some of the energy would be used to evaporate the water in the wood. Similarly wood which has been seasoned to less than 30% will have a higher energy value as less water has to be evaporated when the wood is burnt!

1kWh = 0.0036GJ or GigaJoules (1GJ = 278kWh)  
 One GigaJoule is 1,000,000,000 joules.  
 One joule refers to the 'work' required to produce one watt of power for one second.

### **Net carbon costs of woodfuel:**

All traditional fuel (i.e. excluding nuclear) releases carbon dioxide (CO<sub>2</sub>) when it is burnt. However, the net CO<sub>2</sub> released by burning sustainably produced wood is considerably less than the CO<sub>2</sub> released when fossil fuels are burnt:

<b>Net CO<sub>2</sub> emissions by fuel type</b>	
<b>Fuel type:</b>	<b>Life cycle CO<sub>2</sub> emission:</b>
Wood	7 kg/MWh
Natural Gas	270 kg/MWh
Oil	350 kg/MWh
Coal	480 kg/MWh
Electricity	530 kg/MWh

In essence you don't save any CO<sub>2</sub> by burning woodfuel - only be displacing fossil fuel, and the savings will depend on what fuel you are displacing.

<b>CO<sub>2</sub> savings when wood is substituted for fossil fuels</b>			
		Net CO <sub>2</sub> released	CO <sub>2</sub> Saved by substituting 1m <sup>3</sup> of wood for fossil fuel
1 m <sup>3</sup> of wood provides 2,500kWhrs of energy (when seasoned)		17.5kg	
Fossil fuels delivering the same amount of energy	Natural Gas	675kg	657kg
	Oil	875kg	857kg
	Coal	1,200kg	1,182kg
	Electric	1,325kg	1,307kg

To convert from CO<sub>2</sub> saved to carbon you divide by 44 (the molecular weight of CO<sub>2</sub>) then multiply by 12 (the atomic weight of carbon). So 1kg of CO<sub>2</sub> would equate to 0.27 kg of carbon.

All wood has about the same calorific value by weight (for the same moisture content) BUT different species have different densities and growth rates in volume terms

### **Comparison with fuel prices:**

Using a domestic home requiring about 15,000kWhrs of heat per year.

Current energy prices for usable heat.

- Electricity = 12.7 p/kWhr = £1,900/yr
- Oil = 5.9 p/kWhr = £885/yr  
(based on 59pence per litre and 10kWhrs per litre)
- Coal = 6.0 p/kWhr = £900/yr
- Mains gas = 4.0 p/kWhr = £600/yr
- Woodpellets = 5.8 p/kWhr = £870/yr  
(based on £281 per tonne (bagged) and 4,800 kWhrs per tonne)
- Woodchips = 3.5 p/kWhr = £530/yr

7

3.5 pence per kWhr would mean delivered seasoned woodchips costing about £110 per tonne

## Estimated energy yield by tree species

Species	kWh/kg at 10% mc	Est kWhr/kg at 30% mc	kg/m <sup>3</sup> at 30% mc	Est kWh/m <sup>3</sup> at 30% mc	Av Yield m <sup>3</sup> per ha per year	kWh per ha per year
Beech	4.13	3.5	780	2,730	4.00	10,920
Oak	4.33	3.5	800	2,800	4.00	11,200
Ash	4.21	3.5	750	2,625	6.00	15,050
Sweet Chestnut	4.20	3.5	750	2,625	8.00	21,000*
Spruce	4.67	3.5	620	2,170	16.00	34,720
Pine	4.50	3.5	580	2,030	12.00	24,360
Fir	4.62	3.5	520	1,820	14.00	25,480

### Notes:

Figures for kWh/kg at 10% mc derived from Euroheat Brochure 2010. Remaining figures re energy value and wood density from Biomass Energy Centre

Figures for SC estimated \* Sweet chestnut coppice in SE England on a 20-25 year rotation will attain YC12, thus producing 31,500kWh per ha per year

Yield in m<sup>3</sup> per ha estimated

<b>Conservative average</b>	<b>4.20</b>	<b>3.5</b>	<b>650</b>	<b>2,275</b>	<b>4.00</b>	<b>9,100</b>
-----------------------------	-------------	------------	------------	--------------	-------------	--------------

## Sweet Chestnut coppice – provisional yield tables

from FC Bulletin 64 (published 1987 by Tim Rollinson and Julian Evans)

Age (Years)	Volume – m <sup>3</sup> per ha (to 4 cm tdob) (tdob = Top Diameter Over Bark)	Volume – m <sup>3</sup> per ha (to 7 cm tdob)	Nominal Yield Class m <sup>3</sup> /ha/yr (to 4 cm tdob)	Heat value per ha when cut at rotation (to 4 cm tdob) Based on wood seasoned to 30% moisture content delivering approx 2,625kWhrs per solid m <sup>3</sup>	Average heat yield kWhrs/ha/yr (to 4 cm tdob) Based on wood seasoned to 30% moisture content delivering approx 2,625kWhrs per solid m <sup>3</sup> Figures rounded down to the 000
5	15	-	2	39,000kWhrs	7,000
10	65	25	6	170,000kWhrs	17,000
15	130	80	8	341,000kWhrs	22,000
20	205	160	10	530,000kWhrs	26,000
25	300	270	12	780,000kWhrs	31,000
30	405	405	12+	1,060,000kWhrs	35,000

This is crucial data as we have an estimated 12,500 ha of sweet chestnut coppice in Kent alone. If we're focusing on heat rather than traditional sc products then it looks like a longer rotation would be beneficial, however, we need to balance this with avoiding degradation of the coppice stools, utilising other markets and maintaining biodiversity and landscape benefits. Hence I suggest 20-25 years may be worth considering?

### Indicative costs of woodchip production:

1. Payment to woodland owner - £10+ per wet tonne/m<sup>3</sup>
2. cost of felling and extraction - £20 per wet tonne/m<sup>3</sup>
3. cost of drying - £5 per wet tonne/m<sup>3</sup>
4. conversion from wet tonnes to dry (30% moisture) tonnes  
- Divide by 0.7 (or multiply by 1.43) - £15 per seasoned tonne
5. cost of chipping - £10 per seasoned tonne
6. cost of delivery - £15 per seasoned tonne = about 3 m<sup>3</sup> of 'loose' woodchips
7. overheads 25% - £19 per seasoned tonne

**TOTAL = £94 per seasoned tonne** (equivalent to 3 pence per kW hr)

Note: Every woodland is different and so costs of production will vary considerably.

## The Renewable Heat Incentive:

The following summary has been produced by Nigel Blandford whom many people will remember as Surrey County Councils Woodland Officer, he's now Senior Business Development Manager Biomass with Envirolink Northwest (Note: this is his personal interpretation rather than that of Envirolink).

### **Tariffs bands and amounts**

<200kW	7.6p/kWh then 1.9p/kWh*
200kW-1MW	4.7p/kWh then 1.9p/kWh*
>1MW	2.6p/kWh

\*This second tier rate cuts in at above the installed thermal capacity multiplied by 1314 kWh or roughly equivalent to running the boiler at full tilt for 55 days.

The payment period is guaranteed (grandfathered) for 20 years from installation with an annual adjustment at the RPI rate to take into account inflation. Installations commissioned after 15<sup>th</sup> July 2009 could be eligible. A review of tariffs is scheduled for 2014.

Tariffs have been calculated on the basis of a required return on additional capital invested of 12 per cent. The scheme commences following Parliamentary approval and successful accreditation.

### **Air Quality**

Limits on flue gas emissions to come in during 2012 but no details are currently available

### **Heat Metering**

All installations will have to be metered with a Class 2 meter. Capital costs for metering appear to be around £500-£1000 for sub 200kW, £1000-£2000 for 200kW- 1MW and £2000+ for over 1MW. There is mention of periodic calibration but no details. Back-up heating systems are allowed, but must not feed heat in via the heat meter. *Meters probably won't be able to be calibrated in situ so what happens when they are sent away but you are still producing heat? Was deeming for small installations such a bad idea?*

### **Administration**

OFGEM will be responsible for administration & payments. Payments are made quarterly on receipt of heat meter data.

### **Fuel Sustainability**

The RHI will look to consult on mandatory sustainability criteria for biomass as part of the any scheme changes from 2012, with the criteria taking effect from 2013 onwards.

### **Domestic installations**

This is delayed. For single domestic dwellings RHI will start in a second phase in 2012 to coincide with the introduction of the Green Deal for Homes. Before that a one off Renewable Heat Premium Payment of around £950 will be given. Installations under 45kW must be an MCS accredited product from an MCS accredited installers. District Heating Schemes are classed as non-domestic.

*For district heating to take off there still needs to be an additional incentive to cover the high infrastructure costs.*

### **Interaction with other grants and schemes**

You cannot accept another grant from any public source and get RHI unless you pay the non RHI grant back. If you have received public support between 15th July 2009 and the point at which the RHI regulations come into force "provision" has been made. *What does "provision" mean?*

**Renewable Obligation (RO)** - No decision as yet as whether an option of RO uplift for CHP will be available after the RO banding review.

**Feed In Tariffs (FITs)** – RHI can be claimed for CHP installations claiming FITs.

**Carbon Reduction Commitment (CRC)** – Installations claiming RHI can be counted as reducing carbon consumption in compliance with the CRC.

### **The “owner” gets paid the RHI**

However, where a hire purchase agreement, conditional sale agreement or other similar arrangement has been entered into to cover the cost of purchasing and installation, the legislation provides that the individual in possession of the plant under that agreement is the ‘owner’ and the payment would therefore be made to the recipient of the loan, despite the fact that the terms of the loan agreement may provide that they are not legal owner.

### **Cooling**

The RHI now allows for heat generated to drive absorption chillers for cooling. *This is an excellent addition from previous proposals.*

### **Heat from plants fuelled by wastes**

Utilised heat is eligible for RHI, but only for the organic fraction. This will mirror the existing procedures applied under the Renewables Obligation (RO). *Standardising with RO regulations is simple and sensible.*

*It is good to see the proposals out as it gives the industry confidence. However a lot of issues like air quality, fuel sustainability and CHP and ROCs have yet to be resolved.*

Reference documents at;

[http://www.decc.gov.uk/en/content/cms/what\\_we\\_do/uk\\_supply/energy\\_mix/renewable/policy/incentive/incentive.aspx](http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/incentive/incentive.aspx)