



Forestry Commission
Scotland

Woodfuel

Demand and Usage in Scotland
Report 2011

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www.forestry.gov.uk/pdf/Woodfuelusagestudy2011.pdf

Contents:

1. The brief
2. Methodology
3. Results
 - 3.1. Operational projects
 - 3.1.1. Major Industry/Commercial (using >10,001 odt/yr)
 - 3.1.2. Industry/Commercial (using >1,001 to 10,000 odt/yr)
 - 3.1.3. Other Industry/Commercial Heat Only (using up to 1,000 odt/yr)
 - 3.1.4. Total Wood Fuel Use
 - 3.2. Wood fuel usage by fuel category
 - 3.3. Pellet plants
 - 3.4. Greenhouse gas emissions
 - 3.5. Projects in planning
4. Discussion

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Executive summary

1. This report on existing and potential woodfuel usage in the commercial, industrial heat and electrical generation sectors of the Scottish market details data for the calendar year 2010, forecasts usage for 2011 and 2012 and compares the data back on an annual basis to the initial report in 2005.
2. The number of industrial/commercial plants in operation during 2010 in Scotland using wood fuel has increased by 46 to 249.
3. Total wood fuel usage during 2010 has risen by 118k odt to 618k odt/yr. Within that figure the use of recycled fibre used as wood fuel rose to 31%.
4. Some 96% of existing woodfuel use took place in the major and large scale plant sectors (using >1,001 odt/yr).
5. Wood fuel projects currently operating in Scotland are estimated to save some 902k tonnes of CO₂e annually, a substantial rise on the 2009 figure of 509k tonnes CO₂e.
6. Of projects in the planning stage, five are electrical generation projects with a further eight CHP schemes of which three are currently under construction. The three plants currently under construction will have an annual demand for 245k odt of wood fuel by 2012.
7. Existing plant demand is set to increase by 30k odt in 2011, projects in planning that are currently in the build phase are projected to raise total wood fuel demand to 668k odt in 2011 and 895k odt by 2012 and beyond. The use of recycled fibre is forecast to increase to 40% in 2012.
8. Four wood pellet manufacturing plants in Scotland used in total some 83k odt of wood in 2010. There is a major increase in forecast demand for wood to be used for pellet production of 140k odt/yr in 2011.
9. The total of wood going directly or indirectly into wood fuel is forecast at some 800k odt in 2011 rising to in excess of one million odt in 2012.
10. If all the longer term projects currently at the planning stage, with a probability of 50% or greater, came to fruition after 2012, this would increase demand for wood for fuel by a further 500k odt/yr annually by 2015.
11. It should be noted that these anticipated demand figures take no account of the predicted uptake in demand for wood fuel as a result of the forthcoming introduction to Scotland of the Renewable Heat Initiative.

1 The brief

To update information reported in "Final Report – May 2005" (unpublished report on existing and potential woodfuel usage in the commercial, industrial and electrical energy sectors of the Scottish market) to 30 December 2010. The information gained from the study is used for planning purposes; firstly, in the short term, to establish the extent of the continuing growth of the wood fuel sector and to inform the Scottish Government on the progress towards its targets for woodfuel use and renewable energy generation; secondly, in the longer term, to assess the effects of projects in the planning stage on long term supply and demand in the sector, and the likely effects on long term markets for timber from the national forest and other potential sources of wood fuel.

The report is part of the work of the Scottish Wood Fuel Task Force Report to the Minister for the Environment, specifically recommendation 3:

"Undertaking an annual update of woodfuel usage in Scotland. In the longer term, a full review of woodfuel market development is needed in 2010 to assess progress and determine if mechanisms and policies need to be changed".

2 Methodology

The information has been gathered through emails, telephone calls and interviews with respondents to the initial study. For this report, for the first time, information was received from the Statistics Branch of the Forestry Commission on wood fuel use reported by respondents to surveys and data requests to the UK forest industry. Figures have been given by the industrial users on strict conditions of commercial confidentiality.

The source of the wood fuel was sought from all respondents during the update phase. Four source categories are used:

- Virgin wood fibre (chip and sawmill co-product)
- UK Pellet
- Recycled fibre
- Energy crops, forest residues and tree stumps

The first reports on wood fuel usage data had been collected and reported on an historical basis for periods encompassing financial years. The data for the 2009 report and this current report has been gathered for calendar years. In addition, for the major users of wood fuel in the categories of >10,001 odt/yr and 1,001 to 10,000 odt/yr, forecast demand has been estimated in the first category for the calendar years of 2011 and 2012 and for the latter category for 2011 only.

For projects that are likely to come to fruition in the medium to longer term the section on projects in planning has been retained, as has been the case in earlier reports, with the respondents asked to provide a probability factor in percentage

terms, of the project going through to build phase. Data on all projects was recorded, but only those projects with a probability factor equal to or in excess of 50% have been included in the forward planning figures.

Calculation of greenhouse gas (GHG) emissions from substituted fuels, effectively greenhouse gas emissions savings from the use of wood fuel, in all the operational wood fired heat and electricity generation plants identified in this and earlier reports has been carried out using new guidelines produced for Defra/DECC.

3 Results

3.1. Operational projects

There has been a net increase of 46 in the numbers of operational projects rising from 203 projects across all three size categories in the preceding period to 249 in the calendar year 2010.

3.1.1. MAJOR INDUSTRY/COMMERCIAL (using >10,000 odt/yr)

Total wood fuel usage in this category for the calendar year of 2010 has been recorded at 559k odt. This figure has increased by some 105k odt since the preceding recording period.

The wood fuel demand in 2011 for the existing plants is set to stabilise in the region of 589k odt, but the forecast start up of new plants will increase demand in 2012. Historic usage data and forecast demand for 2011 and 2012 are shown graphically in Figure 1.

3.1.2. INDUSTRY/COMMERCIAL (using >1,001 to 10,000 odt/yr)

Total wood fuel usage in this category for the calendar year of 2010 has been recorded at 31k odt (Figure 2), an increase of some 8k odt from the previous period.

Wood fuel demand for 2011 is forecast at 34k odt an increase of 9%.

Figure 1.

Wood Fuel Usage - Major Industry/Commercial (using >10,001 odt/yr)

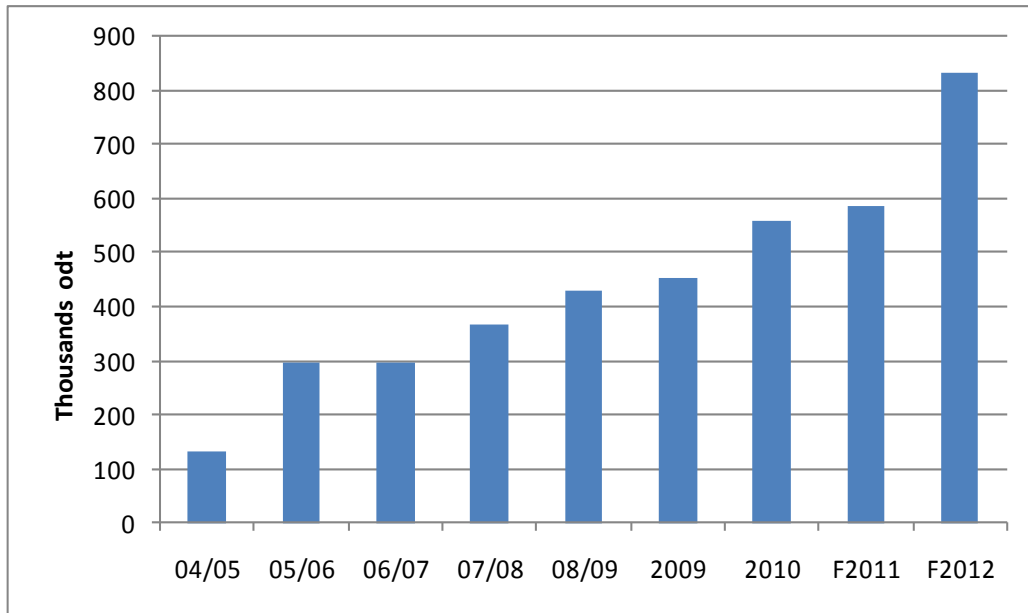
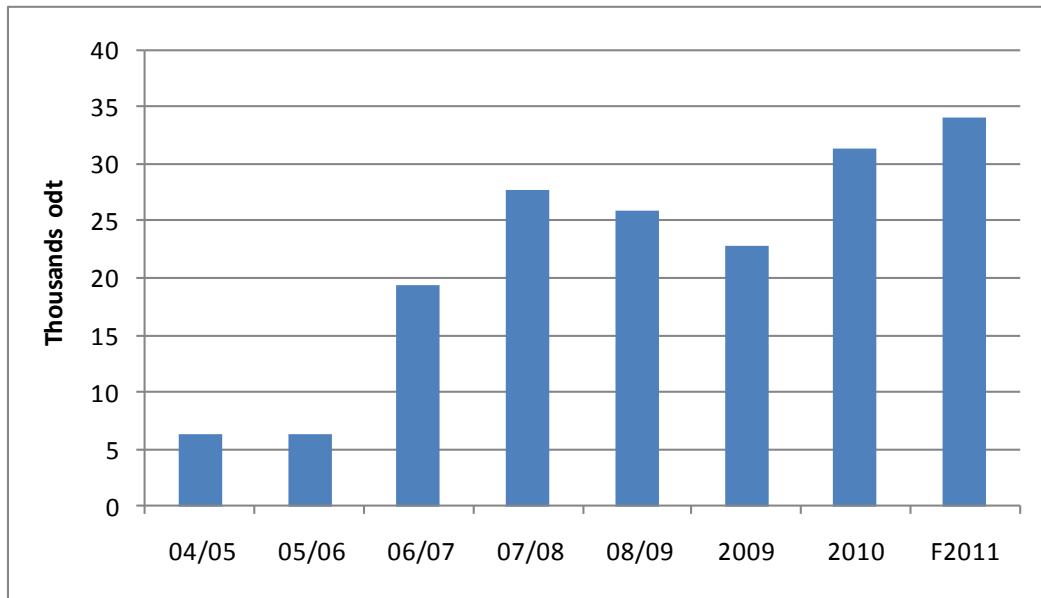


Figure 2.

Wood Fuel Use - Industry/Commercial (using >1,001 to 10,000 odt/yr)

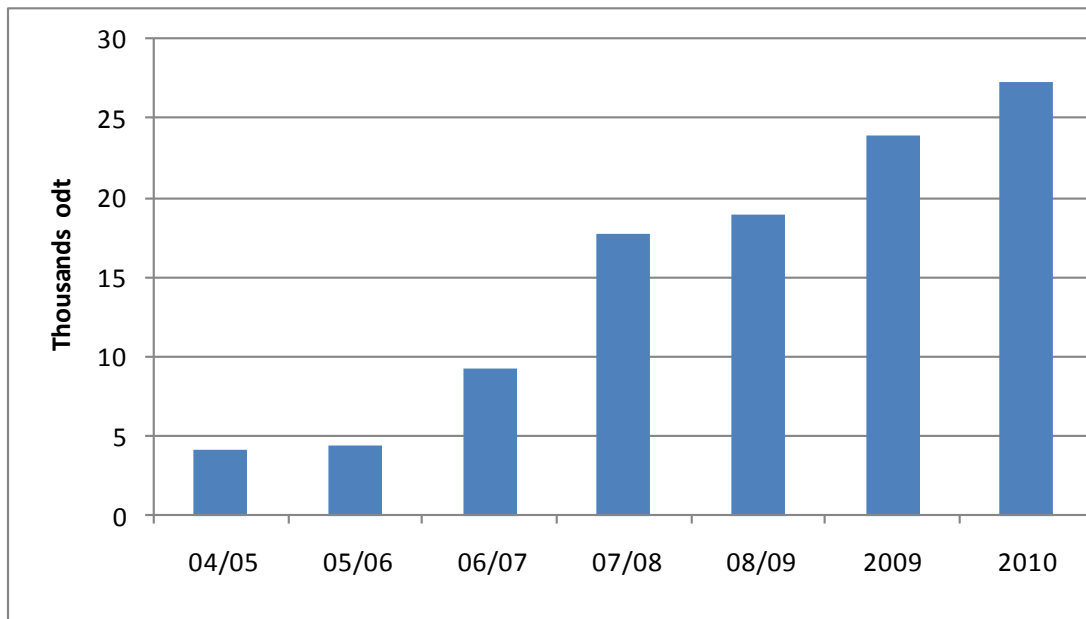


3.1.3. OTHER INDUSTRIAL AND COMMERCIAL HEAT ONLY up to 1,000 ODT/YR

Total wood fuel usage in the category Other Industrial and Commercial using less than 1,000 odt/yr was recorded at some 27k odt/yr (Figure 3) indicating an increase over the previous year of some 4k odt. No attempt has been made at forecasting demand in 2011 in this category.

Figure 3.

Wood Fuel Use - Industry/Commercial (using up to 1,000 odt/yr)



The total number of installations using up to 1,000 odt/yr has increased by a net 46 units to 230 units in 2010 (Figure 4).

Installed capacity in this category stands at 39.5 mw across some 230 individual plants with a mean plant size of 173 kw using an average of 120 odt/yr of wood fuel (Figure 5).

Figure 4.

Number of Wood Fuel Installations - Industry/Commercial (using up to 1,000 odt/yr)

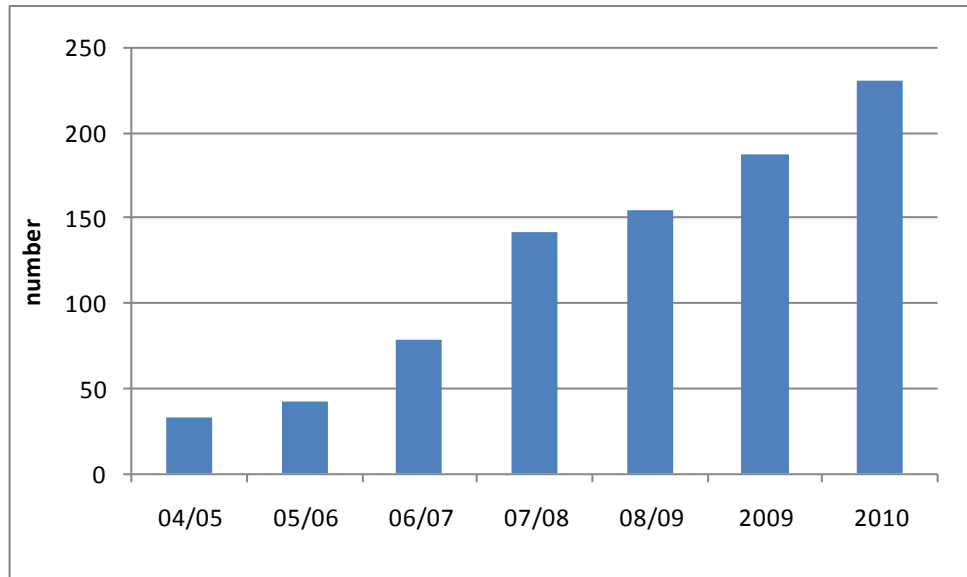
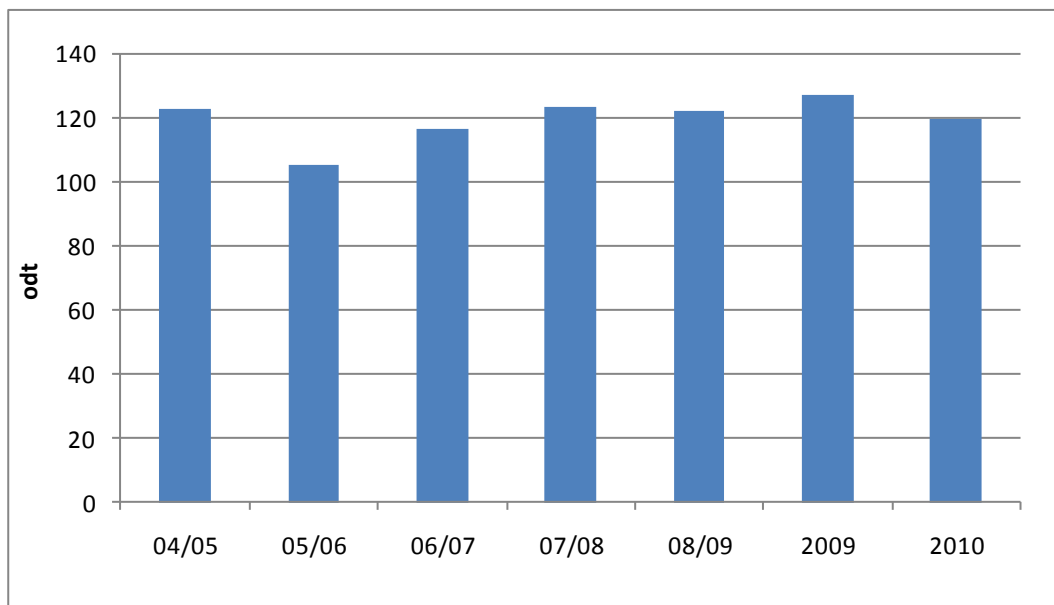


Figure 5.

Average Plant Consumption - Industry/Commercial (using up to 1,000 odt/yr)



Obtaining the finer details of all the small scale heat only installations up to 1,000 odt/yr is problematical as a result of the large number of individual contacts. Figures collected, especially on the quantities of wood fuel being used, give rise to some concern on the accuracy of the figures obtained in the survey on actual wood usage. However, the inaccuracy applies to only some 4.4% of total wood fuel use and therefore has little impact on the overall figures.

3.1.4. TOTAL WOOD FUEL USE - ALL INDUSTRIAL AND COMMERCIAL PROJECTS

The total wood fuel use over the three categories of projects in the calendar year 2010 has been recorded at 618k odt (Table 1), an increase of some 118k odt since the previous reporting period. The significant of the growth of use of recycled fibre is shown clearly in the graph (Figure 6).

Some 96% of woodfuel use took place in the major and large scale plant sectors (using >1,001 odt/yr). This dominance of the major scale users in the form of the wood processing sector is paramount.

Table 1.
 Total Wood Fuel Use by category 2010

| | odt | % |
|---|---------|-------|
| MAJOR INDUSTRY/COMMERCIAL (using >10,001odt/yr) | 559,346 | 90.5% |
| INDUSTRY/COMMERCIAL (using 1,001 to 10,000 odt/yr) | 31,332 | 5.1% |
| OTHER INDUSTRIAL AND COMMERCIAL HEAT ONLY <1,000 odt/yr | 27,329 | 4.4% |
| | 618,006 | 100% |

Given that existing plants retain their intake usage with a small forecast increase by some specific plants, demand is likely to rise 30k odt in 2011. However, one project currently in the build phase is projected to come on stream in 2011 and will increase demand in 2011 by 17,500odt. This additional demand to 668k odt in 2011 is shown in both Table 2 and in Figure 6.

Table 2.
 Total Wood Fuel Forecast Demand by category 2011

| | odt | % |
|--|---------|-------|
| EXISTING MAJOR INDUSTRY/COMMERCIAL (using >10,001 odt/yr) | 589,058 | 88.2% |
| NEW BUILD MAJOR INDUSTRY/COMMERCIAL (using >10,001 odt/yr) | 17,500 | 2.6% |
| INDUSTRY/COMMERCIAL (using 1,001 to 10,000 odt/yr) | 34,035 | 5.1% |
| OTHER INDUSTRIAL AND COMMERCIAL HEAT ONLY <1,000 odt/yr | 27,329 | 4.1% |
| | 667,922 | 100% |

Again assuming that the existing plants retain their intake usage, forecast demand in 2012 (due to current build phase projects coming on stream) is anticipated to increase by an additional annual 228k odt (165k odt recycled fibre and 63k odt virgin fibre) raising total forecast demand in 2012 to 895k odt (Table 3 and Figure 6).

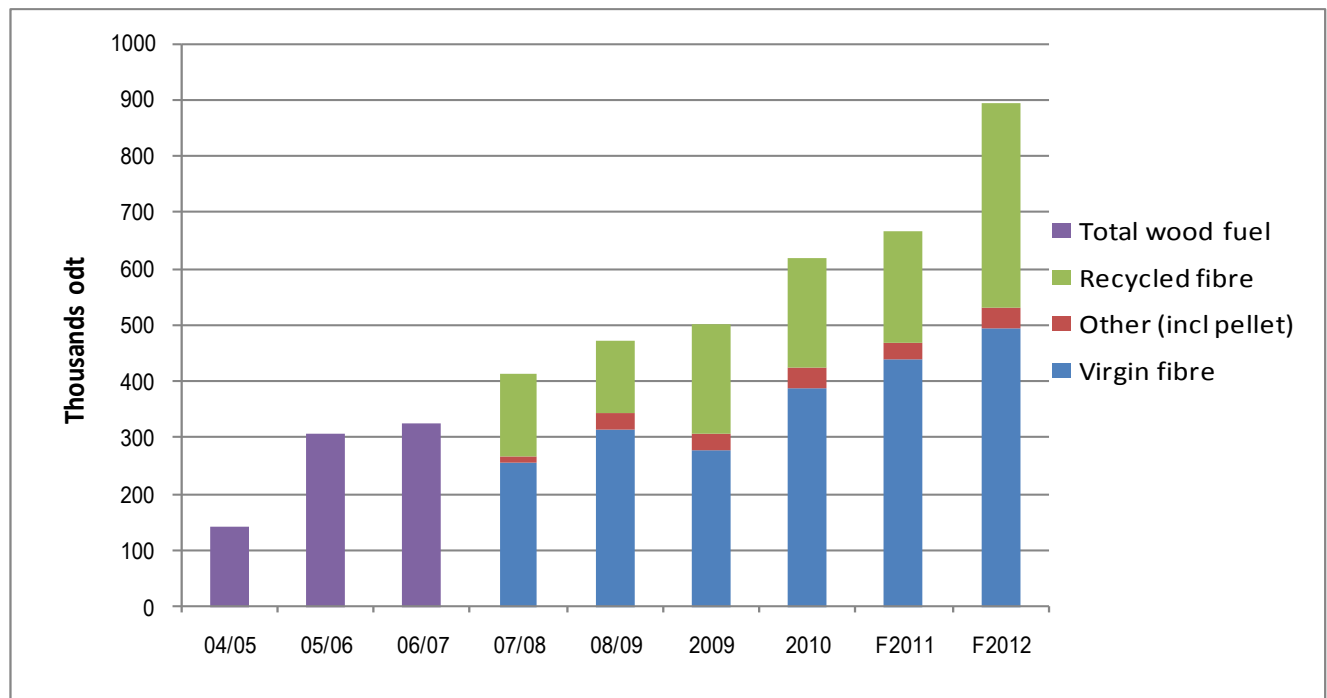
Table 3.

Total Wood Fuel Forecast Demand by category 2012

| | odt | % |
|--|---------|-------|
| EXISTING MAJOR INDUSTRY/COMMERCIAL (using >10,001 odt/yr) | 589,058 | 65.8% |
| NEW BUILD MAJOR INDUSTRY/COMMERCIAL (using >10,001 odt/yr) | 245,000 | 27.4% |
| INDUSTRY/COMMERCIAL (using 1,001 to 10,000 odt/yr) | 34,035 | 3.8% |
| OTHER INDUSTRIAL AND COMMERCIAL HEAT ONLY <1,000 odt/yr | 27,329 | 3.1% |
| | 895,422 | 100% |

Figure 6.

Total Wood Fuel Use – All Industry/Commercial – 2004/05 to 2010 and forecast for 2011 and 2012

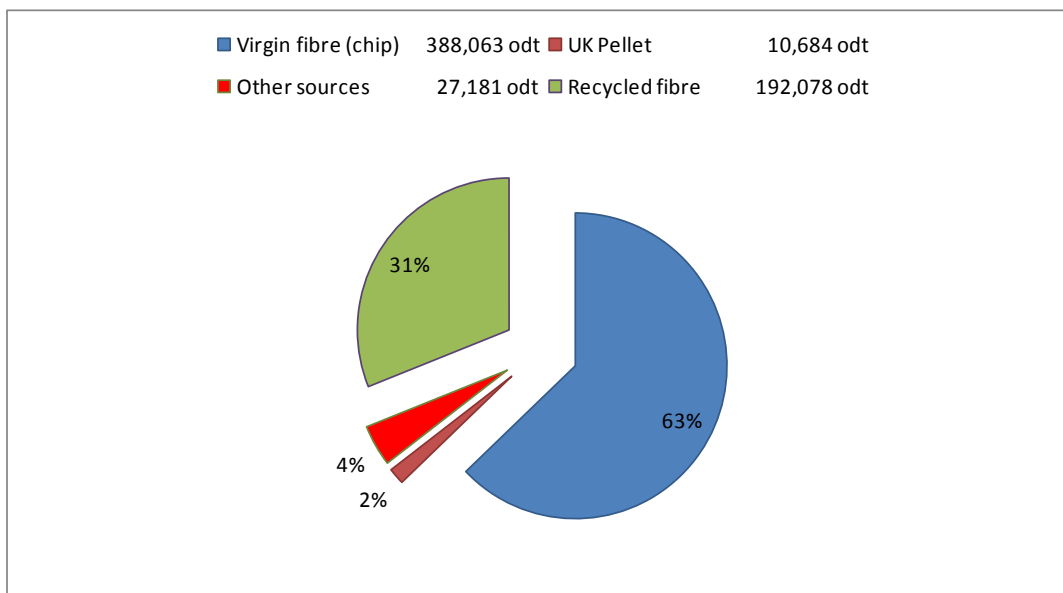


3.2 Wood fuel usage by fuel category

Of the total wood fuel use of 618k odt in 2010, some 63% (388k odt) was derived from virgin wood fibre in the form of chip from roundwood and sawmill co-products; 31% (192k odt) from recycled fibre; 2% (11k odt) from UK produced pellet and a further 4% (27k odt) from "other" sources (short rotation coppice, forest residues and stumps) (Figure 7).

Figure 7.

Total wood fuel usage by major fuel category 2010.



3.3 Pellet plants

There are currently four pellet plants operating in Scotland (a decrease of one since the previous reporting period). It is estimated that the four plants used in total some 83k odt of wood in 2010 (an increase of some 50k odt from the 33k odt used in 2009) and the forecast is to increase this to 140k odt in 2011.

3.4. Greenhouse gas emissions

October 2010 saw the introduction of revised Guidelines for calculation of greenhouse gas (GHG) emissions: *2010 Guidelines to Defra/DECC's GHG Conversion Factors for Company Reporting, (2010, AEA)*. This publication introduced conversion factors allowing organisations and individuals to calculate GHG emissions from a range of activities including energy use. The conversion factors, which include both Scope 1 (Total Direct GHG) and Scope 3 (Total Indirect GHG), give a grand total GHG for a range of fuel types. The new conversion factors for total GHG are used in

this report and are shown in Table 4 against the conversion factors previously used in earlier years of this report.

Table 4.
Conversion factors for Total Greenhouse Gas emissions.

| | Conversion factor used to 2009 | | Conversion factor used 2010 | | |
|------------------------|-----------------------------------|--|--------------------------------|-------------------------------------|--------------------|
| Substituted fuel | net CV kg CO ₂ e | Using revised DEFRA 2010 guidelines | net CV kg CO ₂ e | % increase from previous figures | |
| Electricity | 0.43 | Annex 3c | 0.61707 | 44% | |
| Compressed natural gas | 0.19 | Annex 1d | 0.23566 | 24% | |
| Burning oil (kerosene) | 0.25 | Annex 1d | 0.30786 | 23% | predominantly used |
| Coal (industrial) | 0.30 | Annex 1d | 0.39465 | 32% | |
| LPG | 0.21 | Annex 1d | 0.25907 | 23% | |

Where it has been feasible (and it has been feasible in the majority of the plants using in excess of 1,000odt/yr of wood fuel) to record the substituted fuel then the conversion factor for that particular fuel has been used. In the majority of the plants in the range of less than 1,000odt/yr then an assumption has been made that the substitute fuel was Burning oil (kerosene).

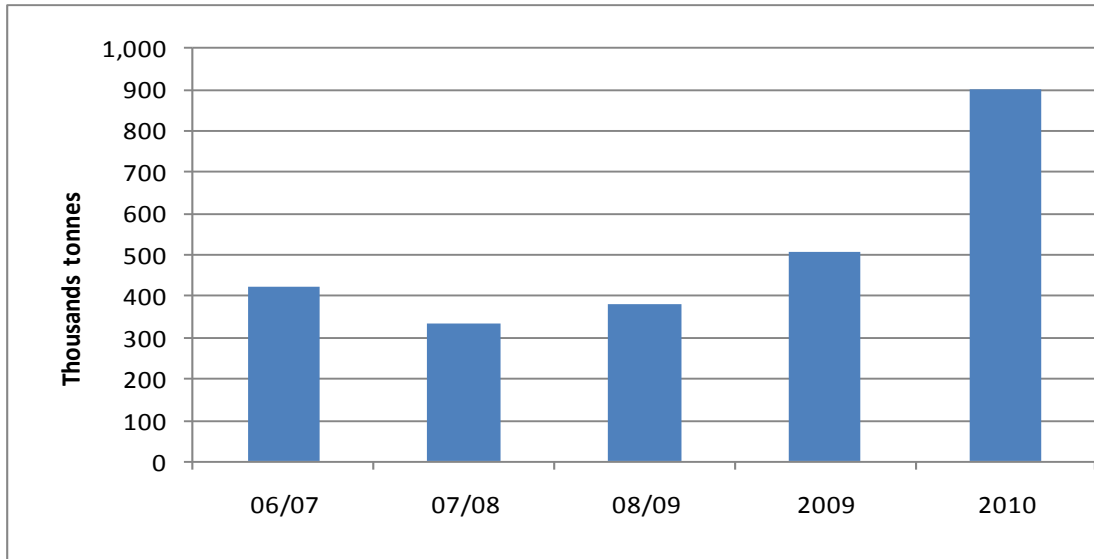
Wood fuel projects currently operating in Scotland are estimated to save some 902k tonnes of CO₂e annually, a substantial rise of 370k tonnes on the 2009 figure of 509k tonnes CO₂e (Figure 8, page 13). A proportion of that increase is due to the revised conversion factors that are in the range of 23 to 44% higher (Table 4 above) than those previously used, and the formulae recommended by the revised guidelines in CHP plants which have been effectively doubled using the new formulae. The remainder of the increase is due to an increase of some 100k odt of wood fuel used in the larger plant category of >10,001odt/yr.

3.5. Projects in planning

Of twenty one projects in the planning stage:

- five electrical generation projects all having a probability factor of 50% or >50% would utilise some 300k odt/yr of woodfuel. However, these plants have now been "in planning" for some considerable period and the successful outcome of actually coming to fruition must be diminishing with time.
- CHP schemes in planning has reduced from eleven projects, with a probability factor of 50% or >50%, in 2010 to eight plants of which three are currently under construction. The three plants under construction will have a demand for 245k odt in 2012, the remaining five plants, should they go ahead, a further 194k odt by 2015.

Figure 8. Greenhouse Gas emissions.



4 Discussion

The number of operational plants rose from forty three recorded in the initial study in 2005 to two hundred and forty nine currently. The dominance of the large scale users, in the form of the wood processing sector, and the increasing importance of electrical energy generation, shown by their use of some 96% of all wood fuel referred to in this report, was paramount in the initial survey and remains so.

Total woodfuel usage in 2010 in the category of major Industrial/Commercial (using >10,001odt/yr) was recorded at 559k odt/yr, an increase of some 105k odt on the previous year. Of the seven plants in this category, one is solely for electricity generation, co-firing with coal. Three are CHP plants, generating jointly 75 mw electricity and 124 mw thermal. A further three plants produce a combined total of 81 mw thermal as process heat. The wood fuel demand in 2011 for the existing plants is set to grow to 589k odt. However, projects in planning that are currently in the building phase and are projected to come on stream in 2011 are forecast to increase demand in 2011 by a further 17.5k odt to 606k odt and in 2012 to 834k odt.

Total woodfuel usage in the category of Industrial/Commercial (using 1,001 to 10,000odt/yr) was recorded at 31k odt/yr. a rise of 8k odt on an annual basis since the previous survey. The forecast demand is predicted to rise to 34k odt in 2011.

Total woodfuel usage in the category Industry/Commercial (using <1,000 odt/yr) was recorded at 27k odt/yr. This has risen by some 4k odt on an annual basis since the last survey.

Total wood fuel usage for the year 2010 over all categories has risen by 118k odt to 618k odt/yr from 500k odt/yr in 2009. The growth of recycled fibre to 31% of the total wood fuel usage in 2010, and forecast to increase to 40% in 2012 is significant.

Some 96% of woodfuel use took place in the major and large scale plant sectors (using >1,001 odt/yr). This dominance of the major scale users in the form of the wood processing sector is paramount.

There are currently four pellet manufacturing plants operating in Scotland a decrease of one from 2009. It is estimated that the four plants used in total some 83k odt of wood in 2010 and the forecast is to increase this by some 57k odt to 140k odt in 2011. Some 10k tonnes of wood pellets were burnt in the industrial and commercial sectors in Scotland in 2010, (9k tonnes in co-firing with coal). This tonnage is contained within the wood fuel usage figures in this report.

Wood fuel projects currently operating in Scotland are estimated to save some 902k tonnes of CO₂e annually, a substantial rise on the 2009 figure of 509k tonnes CO₂e. A proportion of that increase is due to the revised conversion factors that are in the range of 23 to 44% higher than those previously used, and the formulae recommended by the revised guidelines in CHP plants which have been effectively doubled using the new formulae. The remainder of the increase is due an increase of 100,000odt of wood fuel used in the larger plant category of >10,001odt/yr.

Of twenty one projects in the planning stage, five are electrical generation projects all having a probability factor of 50% or >50% which would utilise some 300k odt/yr of woodfuel. However, these plants have now been "in planning" for some considerable period and the successful outcome of actually coming to fruition must be diminishing with time. There are a further eight CHP schemes having a probability factor of 50% or >50% of which three are currently under construction. The three plants under construction will have a demand for 245k odt in 2012, the remaining five plants, should they go ahead, a further 194k odt by 2015.

Total wood fuel usage over all categories has risen by 118k odt from 500k odt/yr in 2009 to 618k odt/yr in 2010. Whilst existing plant demand is set to stabilise in 2011, projects in planning that are currently in the building phase are projected to raise total wood fuel demand to 668k odt in 2011 and 895k odt by 2012 and beyond.

In addition there is a major increase in forecast demand for wood to be used for pellet production of 140k odt/yr in 2011 bringing the total of wood going directly or indirectly into wood fuel to some 800k odt in 2011 and 1 million odt in 2012.

If all the longer term projects currently at the planning stage, with a probability of 50% or greater, came to fruition after 2012, this would increase demand for wood for fuel a further 500k odt/yr annually by 2015. It should be noted that these anticipated demand figures take no account of the predicted uptake in demand for wood fuel as a result of the forthcoming introduction to Scotland of the Renewable Heat Initiative.