# Review of the Scottish Wood Fuel Industry
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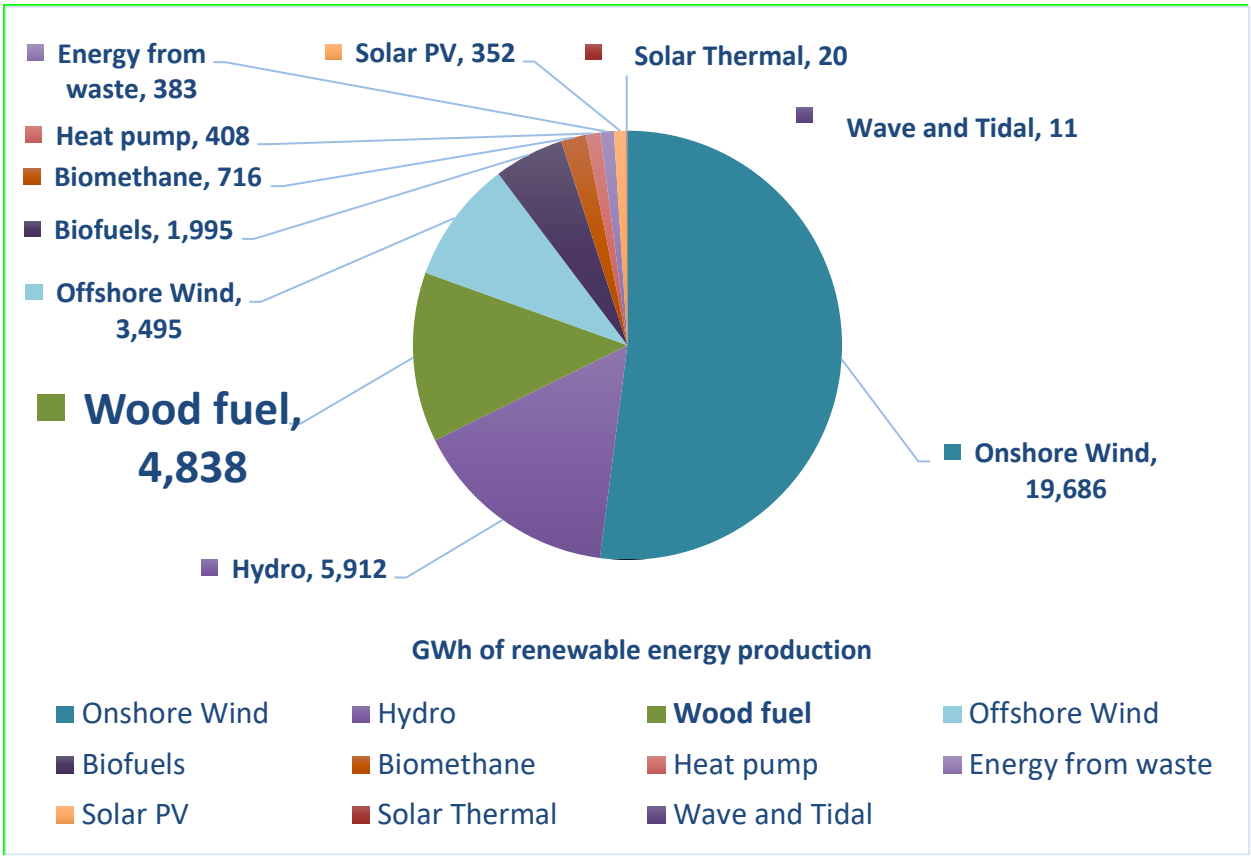
## Key findings

1. Wood fuel meets 3% of Scotland's total energy demand and provides 11%[1] of Scotland's renewable energy.
2. 1.67 million oven dried tonnes (ODT) of wood fuel (3.34 million fresh felled tonnes) is being used annually to generate 4.84 million MWh/y of renewable energy, of which 0.5 million ODT of wood fuel is used to generate renewable electricity and 1.17 million ODT of wood fuel is used to generate renewable heat.
3. Wood fuel use can be broken down into four distinct categories:

| Category of use | No. of installations | MWh/y generated | Wood fuel used ODT/y |
|---|---|---|---|
| Domestic wood heating | 120,974 | 549,766 | 230,069 |
| Heat under 1,000kW | 3,216 | 1,284,905 | 324,606 |
| Heat over 1,000kW | 30 | 1,904,812 | 619,756 |
| Electricity | 10 | 1,098,821 | 495,821 |
| **Totals** | **124,230 No.** | **4,838,304 MWh/y** | **1,670,252 ODT/y** |

4. The pie-chart below illustrates the contributions of the different renewable energy technologies in Scotland:




[1] The comparable figure for UK as a whole is that wood fuel supplies 40% of all renewable energy, largely due to the electricity output of Drax power station in North Yorkshire, using imported wood fuel.

5. The businesses involved in wood fuel include forestry, arboriculture, sawmilling, timber processing, farming, road haulage, waste recycling and specialist wood fuel suppliers or installers.
6. This review estimates that were about 861 jobs and 482 businesses operating in Scotland in the wood fuel industry in Scotland in 2019, although there will be many other companies that supply parts and services that we cannot quantify. Those businesses we can identify are broken down into the following categories:

| Category | Estimated number of businesses | Estimated number of jobs in wood fuel |
|---|---|---|
| Self suppliers of wood fuel | 35 | 24 |
| Firewood suppliers | 262 | 262 |
| Pellet agents and wood fuel haulage | 14 | 21 |
| Sawmills | 83 | 45 |
| Recycling companies | 3 | 6 |
| Wood chip suppliers | 23 | 83 |
| Pellet mills | 3 | 85 |
| Jenkinson's and Stobart's | 2 | 125 |
| Installers: design, installation & operation/maintenance | 57 | 210 |
| **Total numbers** | **482** | **861** |

# 1.0 Purpose and key terms

**Purpose**

Scottish Forestry, as the Scottish Government agency responsible for forestry policy, is contributing to the Scottish Government's Bioenergy Policy Working Group. To support this work re:heat ltd has been commissioned, as part of an ongoing contract delivering support services to Scottish Forestry, to present a clear picture of the current state of the wood fuel industry in Scotland. This report is based on survey work completed by reheat and does not represent Scottish Government policy.

The terms bioenergy and biomass are associated with wood fuel, but are also often taken to include other low carbon technologies like liquid biofuels or energy from waste. This review examines only the wood fuel used to generate renewable heat and renewable electricity, the installations required to convert that wood fuel into renewable energy, the number and type of businesses involved, and the contribution that wood fuel makes to Scotland's renewable energy targets.

This review excludes all other sources and uses of bioenergy as the fuel supply chain and conversion technologies associated with non-woody bioenergy are entirely separate from wood fuel[2].

This review is based upon a detailed evaluation of existing published data, bringing together for the first time, all the available information. All data presented applies to the year 2019, and unless otherwise stated relates only to Scotland.

There is very little published data specifically about the Scottish wood fuel industry in terms of the number of jobs it supports or how many businesses it includes. In addition existing data on how much wood fuel is used to produce renewable heat and how much wood fuel used to produce renewable electricity is hard to disentangle. This is important, as the process of producing and using wood fuel for electricity generation is significantly different from wood fuel produced and used for heat generation.

**Key terms and acronyms**

Megawatt and Kilowatt (MW and kW)

Megawatt and Kilowatt are units of energy measurement and delineate the maximum output or capacity of generation plant. A 1,000 kW generation plant is equal to 1 MW generation plant.

In Scotland the largest wood fuel generation plant is the Eon operated installation at Lockerbie that has a capacity of 50 MW (= 50,000 kW). A typical large high school might have generation plant with a capacity of around 1 MW (= 1,000 kW). A primary school might have generation plant with a capacity of around 200 kW. A large home might have generation plant rated at 10 – 15 kW.

Megawatt-hours and Kilowatt-hours (MWh and kWh)

MWh and KWh are measures of the amount of energy produced by generation plant in one hour. A single MWh is equal to a 1,000 kWh. A 500 kW installation running at full output for one hour will produce 500 kWh of energy (0.5 MWh of energy). A 200 kW installation that might heat a primary school will produce 200 kWh of energy in one hour.

Combined Heat and Power (CHP)

A CHP installation produces both useful heat and electricity from a single system. The main output of all wood fuel combustion is of course heat. That heat is then used to generate electricity or provide heating. In electricity-only installations much of the fuel used is wasted as discharged heat via large cooling

[2] The fuel used by these sectors is defined in Scottish Government's March 2021 Bioenergy Update as Municipal Solid Waste, Draff, food wastes, sewage waste, farm slurries and used cooking oils.

chimneys. In CHP systems that heat is diverted to useful purposes. Usually a CHP system generates electricity on a 24/7 basis, and that can make it challenging to use all the heat, which is not likely to be required at all times of the day or year, even though it must be produced to make the electricity.

Oven Dried Tonnes (ODT)

For ease of comparison, the term Oven Dried Tonne is typically used when referring to wood fuel. ODT is a theoretical value, and provides a baseline value for the energy available from wood once all the moisture has been removed.

The table below shows how much energy is contained in a tonne of wood fuel at differing moisture contents (MC). This shows that a tonne of wood fuel with a 10% MC contains over 4.6 MWh of energy, whereas a tonne of wood fuel at 65% MC only contains 1.4 MWh of energy.

| Moisture Content (MC) - % | Energy Content - kWh/t | Energy Content - MWh/t |
|---|---|---|
| 0% | 5,277 | 5.277 |
| 5% | 4,979 | 4.979 |
| 10% | 4,682 | 4.682 |
| 15% | 4,384 | 4.384 |
| 20% | 4,086 | 4.086 |
| 25% | 3,788 | 3.788 |
| 30% | 3,490 | 3.490 |
| 35% | 3,192 | 3.192 |
| 40% | 2,895 | 2.895 |
| 45% | 2,597 | 2.597 |
| 50% | 2,299 | 2.299 |
| 55% | 2,001 | 2.001 |
| 60% | 1,703 | 1.703 |
| 65% | 1,405 | 1.405 |

**Figure 1: Energy content of wood fuel at different moisture contents**

ODT refers to wood fuel at 0% MC; bone dry and only possible in an oven. One ODT contains about 5.3 MWh of energy, and all reporting of wood fuel use presented in this review is expressed in ODT. In approximate terms one ODT of wood fuel can be doubled to determine a real world (green) tonnage of fresh felled timber.

When a generation plant uses wood fuel not all the energy contained in the fuel can be converted into useful heat or electricity. For example a 500 kW installation heating a school might use 1,000,000 kWh of fuel a year (which is equal to 264 tonnes of wood fuel at 25% MC), however 15% of the energy contained in the fuel would be lost in the combustion process[3] and so 850,000 kWh of useful energy would be supplied by the 264 tonnes of fuel.

[3] Similar losses occur when using oil and gas to generate energy, and losses when generating electricity rather than heat can be up to 65%.

## 2.0 Wood fuel in context

**Why wood fuel is a sustainable**

Cutting down woodlands and transporting the wood to burn it in boilers may appear unsustainable to some. However such perceptions are wide of the mark.

The UK is good place to grow trees thanks to mild winters, plentiful rainfall, fertile soil and hill-sheltered topography. Growth rates for trees usually exceed those of mainland Europe.

The Domesday Book of 1086 indicated forests covered 15% of the UK's land, but the forested area bottomed out at 5% in 1919. That year, the Forestry Commission was established and today about 13% of Britain's land surface is wooded, of which 40% remains publicly owned and managed. In Scotland 19% of our land is forest and there is a target to achieve 25% cover.

The UK Forestry Standard is the reference standard for sustainable forest management across the UK, and applies to all woodland, regardless of who owns or manages it. The standard ensures that international agreements and conventions on areas such as sustainable forest management, climate change, biodiversity and the protection of water resources are applied in the UK.

The 'increment' is the volume of timber added to our forests by growth each year. The volume of wood extracted from our forests each year is less than or equal to the annual increment when measured over time. When forests are harvested, a proportion of the tree stems are suitable for sawn timber, the remainder is used to manufacture board materials for construction, pulp and paper and for wood fuel.

Demand for forest products in Scotland helps drive sustainable forest management and woodland creation.

**Carbon emissions of wood fuel**

Wood fuel-fired installations can achieve significant reductions in emissions of carbon dioxide ($CO_2$) compared with other fuels. All energy generation emits some $CO_2$. This includes renewable and non-renewable energy sources.

Conventional heating systems which consume heating oil or gas, emit $CO_2$ directly as a consequence of the combustion of the fossil fuel. Additionally, indirect $CO_2$ emissions arise from all other aspects of the life cycle of any fossil fuel heating system, mainly as a result of fossil fuels being used in fuel extraction, processing and transportation, as well as the manufacture, installation and eventual decommissioning of equipment, plant and machinery required to supply and combust those fuels.

These considerations equally apply to wood fuel installations. However, as long as the harvested volume is less than the annual increment of the forest resource, whilst $CO_2$ emissions occur at the point of combustion, an equal amount of the $CO_2$ emissions will have been absorbed by the growth of the forest resource. Hence, in this regard, wood fuel heating systems are often referred to as being 'carbon neutral', although, as there are emissions from the supply chain, technically this should really be 'low carbon'.

There are numerous studies[4] on the levels of carbon savings that can be achieved in practice by different means of heating. The graph featured below illustrates the grammes of $CO_2$ emitted per kWh of energy supplied from a variety of sources.

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48193/3153-final-report-carbon-factor.pdf and https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/carbon-emissions-of-different-fuels/

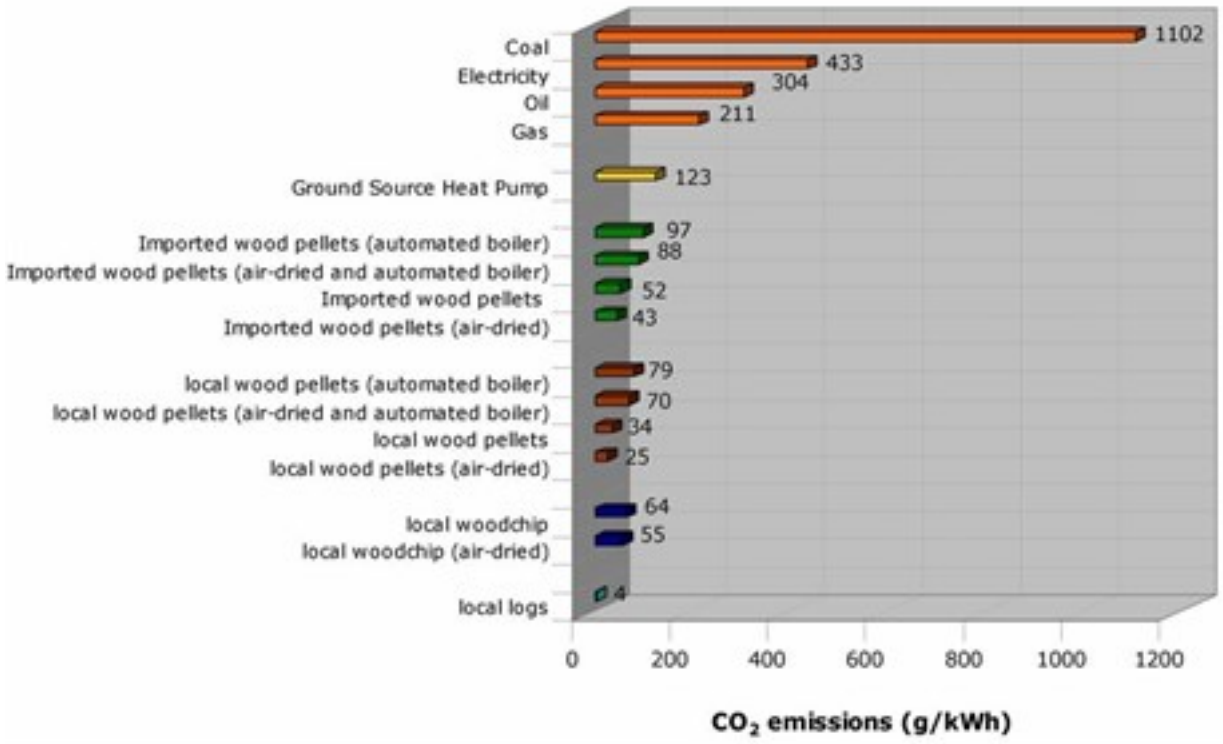



**Figure 2: Carbon emissions for differing technologies**

Whilst wood fuels deliver carbon savings compared to fossil fuels it is equally important to note they deliver higher carbon savings compared to most other forms of renewable energy as well. Here are some figures for $CO_2$ emissions from commonly used renewable energy technologies:

- Wind – 48g/kWh
- Solar PV – 105g/kWh to 190g/kWh
- Ground Source Heat Pumps – 123g/kWh

This compares to $CO_2$ emissions from wood fuels – 25g/kWh to 97g/kWh

**Employment effects of using wood fuel**

A defining characteristic of the wood fuel industry is that each individual installation requires the permanent supply of wood fuel and the on-going provision of specialist maintenance services. For these reasons and when compared to wind, hydro, solar and heat pumps, it is a job intensive form of renewable energy.

Employment effects relate to construction, fitting and maintenance of boilers and to the fuel supply and processing chains. There are a number of studies on wood fuel employment impacts. Taking the findings of these studies in aggregate, on average for each MW of installed capacity two jobs are created[5]. This calculation takes into account the displacement impacts of not using fossils fuels and the new activity created in the supply of wood fuel and the installation and maintenance of wood fuel installations.

[5] The Economic Impact of a Regional Wood Energy Strategy, prepared by ADAS UK Ltd of the Western Development Commission (November 2007) shows data on this basis.

## 3.0 Wood fuel use in Scotland

**Types of wood fuel users**

We have organised wood fuel use into three heat generation categories and one electricity generation category:

**Heat:**

- Domestic wood heating: using mostly firewood in systems up to 45 kW
- Commercial wood heating in systems under 1,000 kW: using mostly virgin wood chips and pellets
- Commercial wood heating and combined heat and power (CHP) in systems over 1,000 kW: using mostly sawmill co-products and forestry residue

**Electricity:**

- Electricity and CHP systems producing renewable electricity: using mostly sawmill co-products, recycled wood and forestry residue

These categories have been established as the wood fuel supply chain associated with each category is reasonably distinct. We also believe it is important for reporting of renewable energy statistics to show renewable heat and renewable electricity generation separately.

Below we present an evaluation of the amounts of wood fuel and numbers of users in each of the categories identified above.

**Domestic wood fuel heating**

The domestic wood fuel heating market has traditionally been hard to evaluate as it contains a large number of users who are not required to provide any information about the wood fuel they use – while each using relatively small amounts of wood fuel. To estimate the use of domestic wood fuel we have used data from the Domestic Renewable Heat Incentive (RHI) scheme, added to a UK wide firewood use study published by the Department for Business, Energy and Industrial Strategy (BEIS).

The BEIS firewood use study was published in 2016[6] and is now used for reporting UK renewable energy statistics via the Digest of UK Energy Statistics (DUKES)[7]. This study found there are an estimated 117,218 Scottish domestic users that burn wood in appliances that are not registered under the RHI. It shows that over 90% of domestic wood fuel users used logs either solely or in conjunction with other fuels (most likely coal, coke and manufactured solid fuels), while the use of other wood fuels (pellets, briquettes, waste wood, gathered, and wood chips) was noted as 'relatively small'. The study established that the key use (some 80%) of firewood was for '*some heating*'. Only 10% of households are thought to use wood fuel for '*all heating*'.

50% of the appliances thought to be used were closed stoves (wood burners), while 44% were open fires. Unfortunately the study does not directly report how much wood fuel was being used by households in Scotland. However it is possible to infer an annual average quantity by using the following methodology:

[6] This data on firewood use was published by the Department for Business, Energy and Industrial Strategy in '*Summary Results of the Domestic Wood Use Survey*' in December 2016. That survey focussed on firewood consumption during 2014 and was updated last in 2016 and the results were incorporated into the Digest of UK Energy Statistics (DUKES). It showed that the UK had previously been underestimating its domestic wood fuel consumption by a factor of three.

[7] https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

- Measured UK wide, the survey found that 18,077,098 MWh/y of wood fuel energy was consumed by 2,054,629 households. This means that each household using wood fuel is consuming an average of 8,798 kWh/y of energy in the form of wood fuel.
- Therefore, in Scotland with 117,218 households using wood fuel, 1,031,311 MWh/y of energy is being consumed on average.
- Based on data in the BEIS study we can assume appliances are operating at 40% efficiency.
- This means 412,524 MWh/y of useful heat is being produced.
- As one ODT of wood fuel contains 5.278 MWh of energy, this means 195,398 ODT of wood fuel is used domestically in Scotland to provide an assumed ~18 million MWh/y of heat energy.

As a sense check, this means about 400,000 green tonnes of wood fuel is used by about 117,000 homes – so 3.4 green tonnes per home per year on average. This appears high but reasonable.

Based on the BEIS published data, we are able to state with a reasonable degree of confidence that domestic wood fuel use in Scotland is *in the region of* 200,000 ODT/y, that there are an estimated 117,000 households using this wood fuel, and that 90% of it is supplied as logs used in open fires or closed stoves to supply 'some heating'.

It is not possible to state the output of these appliances with a great deal of confidence, but it is likely that they are heating individual rooms, and are therefore in the range of 2.5-5 kW.

The Domestic RHI scheme was introduced in 2014, and in the last seven years 3,756[8] Scottish homes have secured accreditation on this scheme for a wood-fired system. This means there is data on these particular 3,756 users, although it only reports the average capacity of these appliances at a GB level, and that is stated as 26.1 kW. This suggests that total installed capacity of the Scottish cohort under the domestic RHI is in the region of 98 MW.

The published RHI data does not report how much wood fuel is used or how much heat was produced by this cohort. Clearly the amount of fuel and heat will vary each year based on how the owners operate the appliances and how cold the winter have been. We have assumed that on average the appliances were operated for 1,400 full load hours per year[9]. We also assume the average efficiency of these appliances is 75%. Using these assumptions, the 3,756 appliances would produce 137,242 MWh/y of heat and use 34,671 ODT/y of wood fuel.

These RHI figures are very close to figures that have been published in the '*Woodfuel Demand and Useage in Scotland'* (2019) report by the Energy Savings Trust[10].

The table below provides a summary of estimated Scottish domestic wood fuel use using both sources outlined above:

[8] RHI monthly official statistics tables (January 2021) – published by the Department for Business, Energy and Industrial Strategy.

[9] Full load hours are a measure of output relative to capacity. We use this figure as we believe it represents a reasonable average for appliances of this size and application.

[10] EST report there are 3,721 appliances, using 35,000 ODT/y of wood fuel and producing 137,000 MWh/y of heat – we understand they have access to other RHI data, not published by BEIS.

| Type | Number of appliances | Heat produced - MWh | Capacity of appliances - MW | ODT of wood fuel per year |
|---|---|---|---|---|
| Firewood | 117,218 | 412,524 MWh/y | unknown | 195,398 ODT/y |
| RHI | 3,756 | 137,242 MWh/y | 98.032 MW | 34,671 ODT/y |
| **Total domestic** | **120,974** | **549,766 MWh/y** | | **230,069 ODT/y** |

**Figure 3: Total domestic wood fuel use**

**Commercial wood heat under 1,000 kW**

This part of the industry is well-defined and the data available on its use of wood fuel is reasonably robust. The reason for this is that virtually all the appliances, "installations" under the non-domestic RHI, will be accredited with the non-domestic RHI scheme.

The non-domestic RHI was introduced in July 2011 and enabled wood fuel boilers installed from 2009 to be accredited for RHI payments. It is extremely unlikely that any installation between 45 kW and 1,000 kW will not be accredited under the ND RHI scheme[11]. The published data provides the number and capacity of all installations that are accredited at a GB level - as shown below:

| GB Data : Technology Type | Number | % of total | Capacity - MW | % of total |
|---|---|---|---|---|
| Small Solid Biomass Boiler (< 200kW) | 13,030 | 63% | 1,525.0 | 29% |
| Medium Solid Biomass Boiler (200-1000kW) | 3,894 | 19% | 2,134.9 | 40% |
| Large Solid Biomass Boiler (> 1000kW) | 146 | 1% | 725.9 | 14% |
| Solar Thermal (< 200kW) | 328 | 2% | 6.1 | 0% |
| Small Water or Ground Source Heat Pumps | 1,325 | 6% | 38.2 | 1% |
| Large Water or Ground Source Heat Pumps | 398 | 2% | 202.4 | 4% |
| Biomethane | 95 | 0% | N/A | N/A |
| Biogas | 758 | 4% | 316.3 | 6% |
| Air Source Heat Pumps | 680 | 3% | 28.4 | 1% |
| CHP | 87 | 0% | 312.8 | 6% |
| Deep Geothermal | 0 | 0% | 0.0 | 0% |
| **Total** | **20,741** | **100%** | **5,290.0** | **100%** |

**Figure 4: GB ND RHI deployment data by January 2021**

This data relates to GB as a whole and such data is not published for Scotland alone. However, other published data about the GB ND RHI data shows 19% of the total number of installations and 20% of the total capacity of installations are located in Scotland.

Therefore, we have applied these percentages to small and medium biomass categories to infer the number of installations of these sizes located in Scotland. We have then assumed the likely number of full load hours and efficiency of these installations to calculate the amount of heat that is estimated to be produced and the amount of wood fuel being used to generate that heat. Footnotes show these assumptions.

[11] As there was a financial incentive for owners to secure the RHI payments. At some points between 2011 and 2015 payments were nearly 3 times higher per kWh than the cost of fuel that was required to make that heat.

| RHI categories (Scotland) | No. of installations | Capacity - MW | Heat produced – MWh/y | Wood fuel use - ODT/y |
|---|---|---|---|---|
| Small Biomass Boiler | 2,476 | 305 | 430,959 MWh/y[12] | 108,873 ODT/y |
| Medium Biomass Boiler | 740 | 426.97 | 853,946 MWh/y[13] | 215,733 ODT/y |
| **Totals** | **3,216** | **731.97** | **1,284,905 MWh/y** | **324,606 ODT/y** |

**Figure 5: Scottish ND RHI – small and medium boilers (2019)**

These figures are also reasonably close to figures that have been published in the '*Woodfuel Demand and Useage in Scotland*' (2019) report by the Energy Savings Trust (EST).[14] Given that the amount of fuel and heat will vary each year based on how the owners the operate the installations and the average annual temperature, we consider our estimates - and those published by EST - are sufficiently close to make both data sets reliable in a general sense.

**Commercial wood heating and CHP over 1,000kW**

Using the same methodology as described for the small and medium installations, the ND RHI can also be used to estimate the heat produced and wood fuel used by boilers in the large category (any boiler above 1,000 kW producing heat).

| RHI categories (Scotland) | No. of installations | Capacity - MW | Heat produced – MWh/y | Wood fuel use- ODT/y |
|---|---|---|---|---|
| Large Biomass Boiler | 28 | 145.18 | 435 MWh/y[15] | 110,030 ODT/y |

**Figure 6: Scottish ND RHI – large boilers (2019)**

In the case of these large boilers, we cannot cross check this data with '*Woodfuel Demand and Usage in Scotland*' (2019) report by the EST, as that survey does not report heat produced in RHI accredited boilers in this size category. It does have a category of large boilers, but this encompasses all biomass systems above 1,000 kW that produce heat and power, irrespective of whether they are accredited for RHI payments. There are 30 of these systems reported by EST.

The EST reported category will therefore include systems that are, for example, just over 1,000 kW and heating a school or similar building using circa 200 ODT/y of wood fuel, alongside a handful of very large systems rated at many MWs using up to or over circa 200,000 ODT/y.

During the preparation of this report we sought further information from EST, and they kindly supplied additional data beyond that published in the '*Woodfuel Demand and Usage in Scotland*' (2019) report.

The table below shows that data, and how much wood fuel is estimated by EST to be used by the 30 installations that produce heat and power that are above 1,000 kW in capacity. EST believe that this is full extent of wood fuel installations over 1,000 kW in Scotland.

[12] At 75% efficiency and 1,413 full load hours

[13] At 75% efficiency and 2,000 full load hours

[14] EST reports there are 2,531 small installations (288.5 MW capacity) , producing 421,000 kWh/y of heat and using 107,000 ODT/y of wood fuel. There are 912 medium installations (480.6 MW capacity) producing 847,000 kWh/y of heat and using 215,000 ODT/y. We understand that EST has access to some unpublished data that would explain the differences between our calculations and those published by EST.

[15] At 75% efficiency and 3,000 full load hours

| Installations | Capacity heat – MW | Capacity power - MW | No | ODT/y | MWh/y - heat | MWh/y- power |
|---|---|---|---|---|---|---|
| Heat | 218.66 | 0 | 20 | 245,282 | 1,216,988 | 0 |
| CHP | 194.62 | 49.31 | 7 | 374,474 | 677,926 | 358,153 |
| Power | 184.3 | 119.3 | 3 | 495,603 | 9,896 | 740,667 |
| **Totals** | **597.58** | **168.6** | **30** | **1,115,359** | **1,904,812** | **1,098,820** |

**Figure 7: EST data on all wood fuel installations above 1,000 kW (2019)**

The data presented in Figure 7 is based upon a direct survey of those installations undertaken by EST. The data presented in Figure 6 is almost certainly included within the data in Figure 7 derived from the RHI statistics.

The amount of wood fuel estimated to be used in the 30 installations above 1,000 kW is 1,115,359 ODT/y. This contrasts with the estimated 124,190 installations below 1,000kW that use 554,675 ODT/y.

In relation only to installations that produce heat, the ODT/y of wood fuel, installed capacity and MWh/y of heat produced are shown in Figure 8 below :

| Installations | Capacity of heat - MW | No | ODT/y | MWh/y - heat |
|---|---|---|---|---|
| Heat | 218.66 | 20 | 245,282 | 1,216,988 MWh/y |
| CHP | 194.62 | 7 | 374,474 | 677,926 MWh/y |
| Power | 184.3 | 3 | 0 | 9,896 MWh/y |
| **Totals** | **597.58** | **30** | **619,756** | **1,904,812 MWh/y** |

**Figure 8: Commercial heat and CHP above 1,000kW**

**Electricity and CHP systems producing renewable electricity**

Based on the EST data, there are 10 installations in Scotland that produce renewable electricity only (i.e. are not a CHP system). These installations are using an estimated 495,603 ODT/y to produce 1,098,821 MWh of electricity, and have a combined power output of 169 MW.

**Summary and evaluation of the use of wood fuel for renewable heat**

This review finds that in 2019 an estimated 1,174,431 ODT of wood fuel was used to produce renewable heat. However, the three sectors that use wood fuel are quite different, as illustrated by the data in Figure 9 below :

| Category - heat | Number | Heat produced MWh/y | Capacity - MW | ODT/y | Average size - kW | Efficiency |
|---|---|---|---|---|---|---|
| Domestic | 120,974 | 549,766 | NA | 230,069 | NA | 45% |
| Under 1000 kW | 3,216 | 1,284,905 | 732 | 324,606 | 228 | 75% |
| Over 1000 kW | 30 | 1,904,812 | 598 | 619,756 | 19,919 | 58% |
| **Totals** | **124,220** | **3,739,483** | **1,330** | **1,174,431** | | |

**Figure 9: Wood fuel use for renewable heat in 2019**

Hitherto, there has been no published data on the amount of wood fuel used to produce renewable heat which includes domestic heat, therefore the data presented here represents the first complete estimate of total wood fuel use for Scottish heat production.

The currently reported official data in the *Renewable Heat in Scotland - 2019* report by the EST indicates that 'biomass heat and biomass CHP' generation amounted to 3,678,000 MWh/y. This figure did not include domestic use of wood fuel, and therefore, on a like-for-like basis, our survey indicates around 488,000 MWh/y less renewable heat was being produced in 2019 than has been reported.

The inclusion of the domestic sector adds back 549,766 MWh/y of heat, and we believe this figure should be included in future reporting of wood fuel use and renewable heat production. The total use of wood fuel in the three *heat* categories splits as follows:

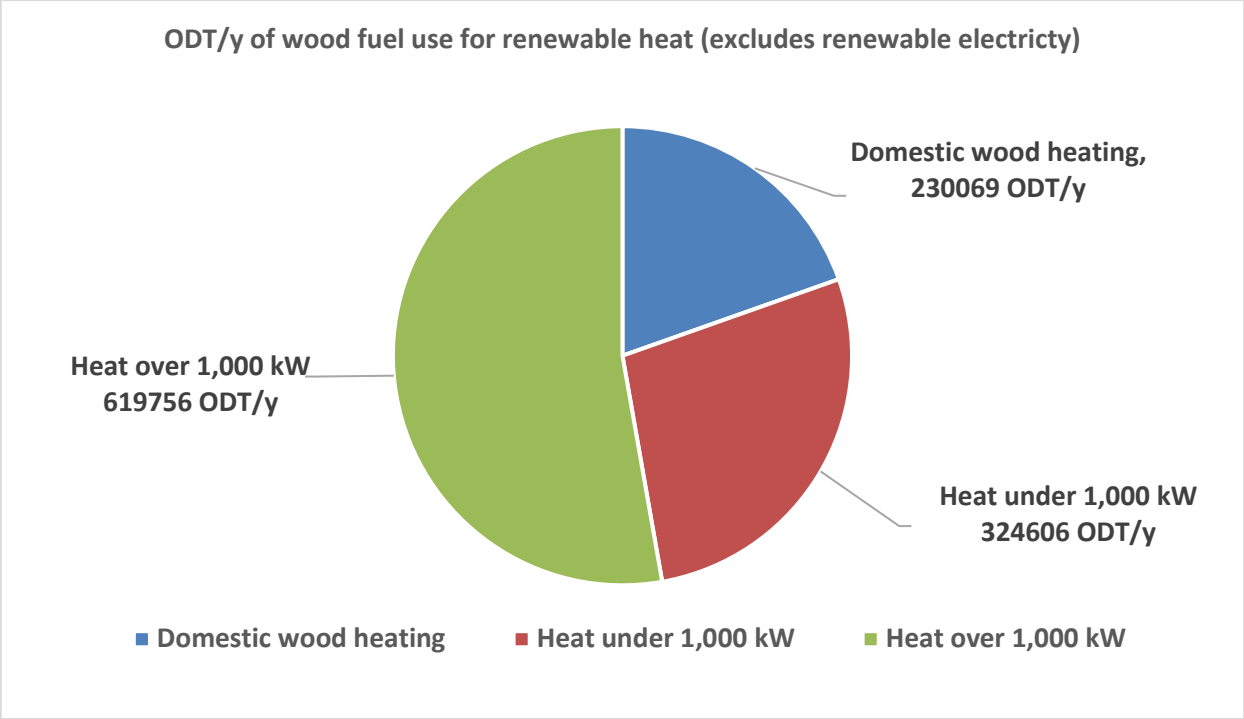



**Figure 10: Split in wood fuel use for heat only: ODT/year of wood fuel use**

Some wider observations can be made :

- The domestic sector has over 120,000 users, but only uses 230,000 ODT/y of wood fuel. It is the least efficient use of wood fuel due to the preponderance of wood burners and open fires. Most of the fuel used in this sector is chopped firewood logs;
- The under 1,000 kW commercial heat sector has 3,216 users, using wood fuel in boilers with an average size of 228kW. It appears to represent the most efficient use of wood fuel, with 324,606 ODT/y of fuel producing 1,284,905 MWh/y of useful heat. Most of the fuel used in this sector is virgin wood chip or wood pellets.
- The over 1,000 kW commercial heat sector is very different, with only 30 users using wood fuel in boilers with an average size of almost 20,000 kW. Ten of these also produce electricity. It appears to represent a relatively inefficient use of wood fuel, with 619,756 ODT/y of fuel producing 1,904,812 kWh/y of heat. This is likely to be explained by some larger CHP systems that 'waste' the heat produced, as there is no useful application for it at the scale it is being generated. Most of the fuel used in this sector is sawmill co-product, residues and recycled wood.

**Use of wood fuel for renewable electricity**

Based on the EST data there are 10 installations in Scotland that produce only renewable electricity from wood fuel. These installations are using an estimated 495,603 ODT/y to produce 1,098,821 MWh/y of electricity, and have a total power capacity of 169 MW.

The data suggests this wood fuel is being converted to renewable electricity at 42% efficiency. Whilst this is worse than the efficiencies being seen in the heat sector, it is actually somewhat higher than the European Environment Agency reports as an average. Electricity production efficiency is shown to be in the range 35% to 38% in a report by the European Environment Agency[16]. One possible explanation of this is that some of the wood fuel reported by EST as being used to generate renewable heat in the 'commercial wood heating and CHP over 1,000 kW' category is in fact being used to generate renewable electricity (in sites that are CHP it is presumed such splits are hard to accurately collect).

**Total wood fuel use**

Figure 11 and 12 below shows total wood fuel use in the four categories:

| Category | Number | Heat/electricity - MWh/y | Capacity MW | ODT/y |
|---|---|---|---|---|
| Domestic wood heating | 120,974 | 549,766 | 98[17] | 230,069 |
| Heat under 1,000kW | 3,216 | 1,284,905 | 732 | 324,606 |
| Heat over 1,000kW | 30 | 1,904,812 | 598 | 619,756 |
| Electricity | 10 | 1,098,821 | 169 | 495,821 |
| **Totals** | **124,230** | **4,838,304** | **1,597** | **1,670,252** |

**Figure 11: Total wood fuel use 2019**

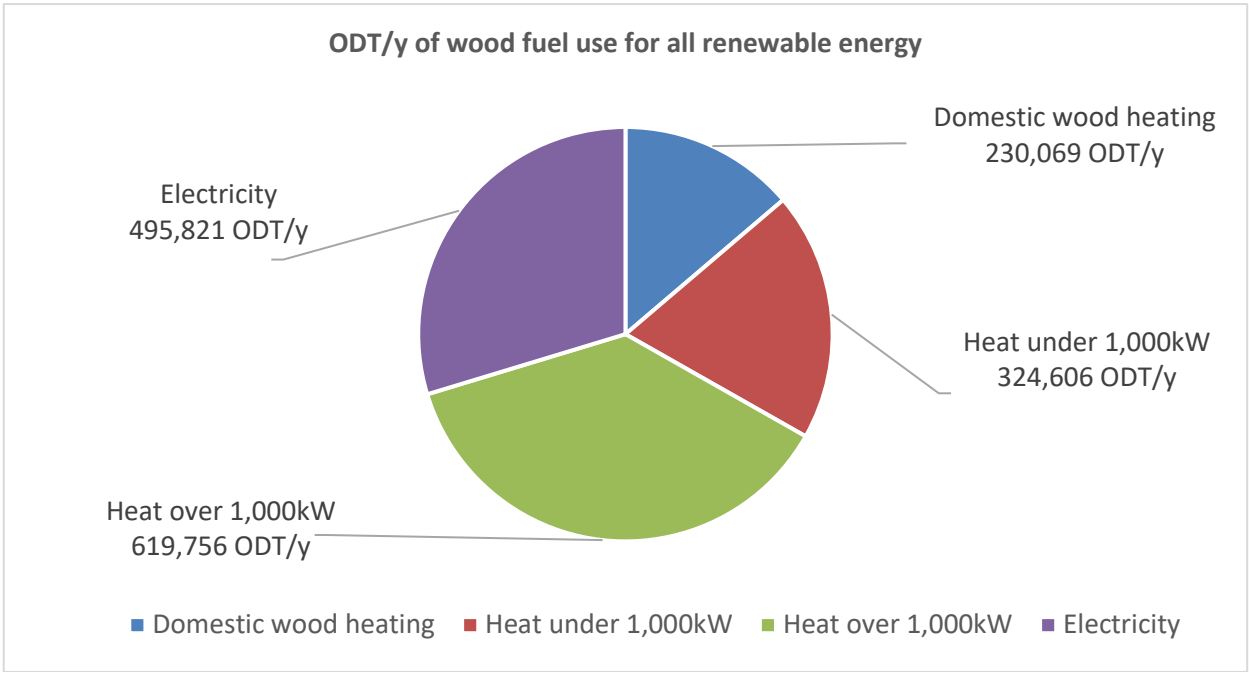



**Figure 12: ODT a year of wood fuel in all four use categories**

[16] https://www.eea.europa.eu/data-and-maps/indicators/en19-efficiency-of-conventional-thermal/en19-efficiency-of-conventional-thermal

[17] Excluding domestic stoves and fires

In total therefore 1.67 million ODT of wood fuel is being used to generate 4.84 million MWh/y of renewable energy, which as we show in the next part of this review, provides 3% of Scotland's total energy requirements and 11% of Scotland's renewable energy.

On a like-for-like basis our survey indicates around 488,000 MWh/y less renewable heat is being produced from wood fuel than is being reported in the Scottish Energy Statistics. However domestic use of wood fuel has not been included in the existing estimates of wood fuel use, and the inclusion of the domestic sector adds 550,000 MWh/y of heat output.

1.67 million ODT is equivalent to 3.34 million fresh felled tonnes of wood. Forest Research[18] reports that in 2019 total UK wood removals (the amount of wood being harvested) was 10.7 million green tonnes.

[18] https://www.forestresearch.gov.uk/tools-and-resources/statistics/data-downloads/

## 4.0 Wood fuel contributions to renewable energy

**Wood fuel is hidden in the published data**

Wood fuel is not a defined category in terms of renewable energy; it always sits inside headings of either 'bioenergy & wastes' and 'other'. This means wood fuels contribution to Scottish renewable energy generation has remained hidden in the published statistical data[19].

A key reason to highlight this and present data on wood fuel is that it provides 11% of Scotland's total renewable energy, with only hydro and onshore wind making a greater contribution. In contrast, data is collected and presented about heat pumps, energy form waste, solar PV, solar thermal and wave and tidal – each of which contributes 1% of or less to our total renewable energy generation. In that context, it is a clear anomaly that data on wood fuel is not collected and presented separately.

**The role of wood fuel in renewable energy**

The pie chart shown in figure 13 below illustrates the importance of wood fuel relative to the other major sources of renewable energy.

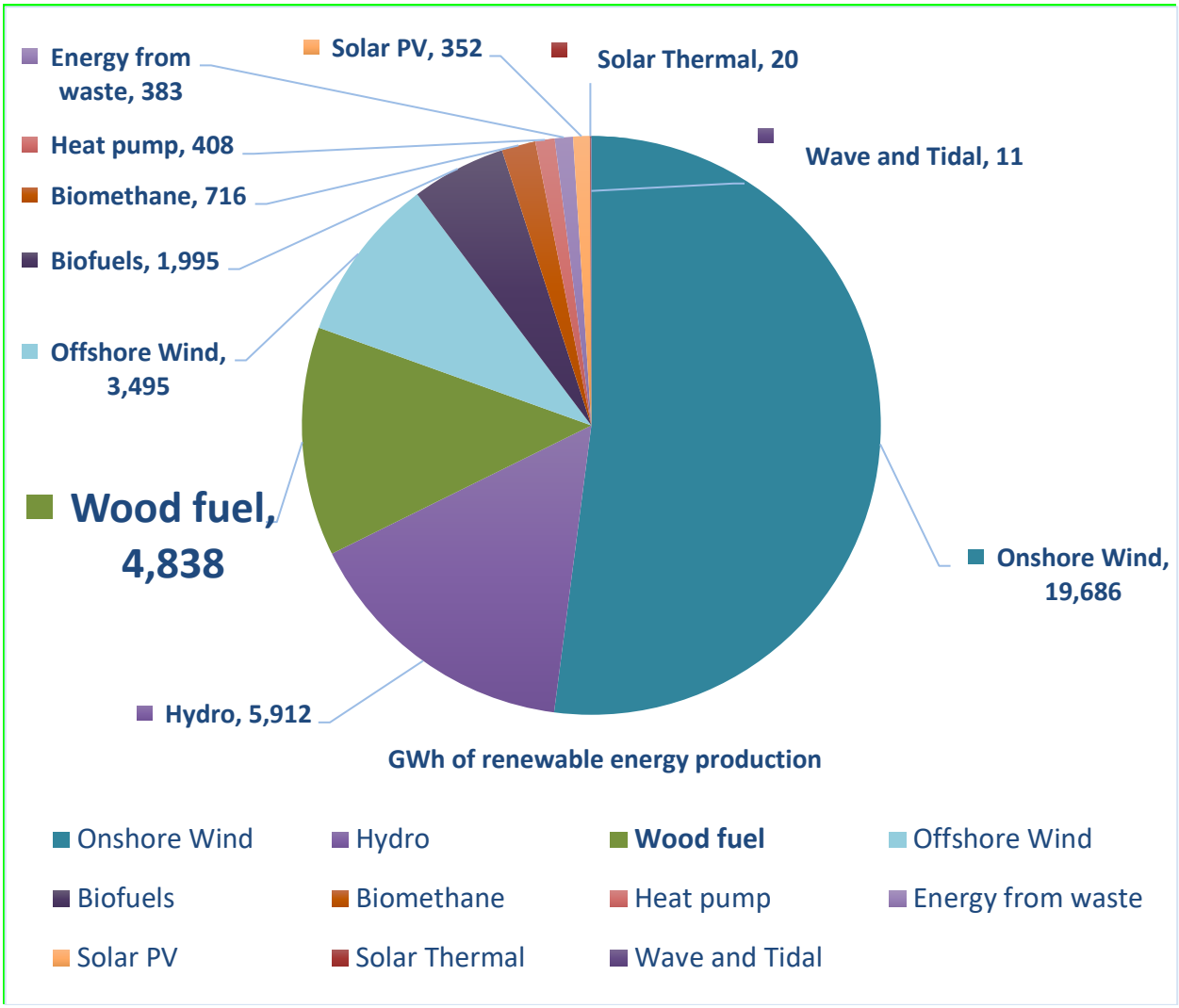



**Figure 13: Role of wood fuel in renewable energy in Scotland – GWh of energy generated by each technology**

[19] The source of the other renewable energy data is: Scottish Energy Statistics Hub

The MWh/y and percentage contributions are shown below in figure 14:

| Renewable energy sources | MWh of production/y | % of renewable energy |
|---|---|---|
| Onshore Wind | 19,686,000 | 34% |
| Hydro | 5,912,000 | 14% |
| ***Wood fuel*** | ***4,838,000*** | ***11%*** |
| Offshore Wind | 3,495,000 | 8% |
| Biofuels | 1,995,000 | 5% |
| Biomethane | 716,000 | 2% |
| Heat pump | 408,000 | 1% |
| Energy from waste | 383,000 | 1% |
| Solar PV | 352,000 | >1% |
| Solar Thermal | 20,000 | >1% |
| Wave and Tidal | 11,000 | >1% |

**Figure 14: Sources of renewable energy in Scotland – MWh and %**

**Wood fuel's contribution to heat and power**

One of the reasons that wood fuel makes such a significant contribution to Scotland's renewable energy is that it provides meaningful contributions to both renewable heat and renewable electricity.

The table in figure 15 below shows the total amounts of use in the heat, electricity and transport sectors. This is expressed in GWh (= 1,000 x MWh) of generation (in 2019) for all fossil fuel, other renewables (all non-wood fuel sources) and wood fuel as highlighted in green.

| GWh/y - 2019 | Fossil fuel use | Other renewables | Wood fuel | Totals |
|---|---|---|---|---|
| Heat | 74,429 | 1,466 | 3,739 | 79,634 |
| Electricity | 3,363 | 29,422 | 1,099 | 33,884 |
| Transport | 36,798 | 1,995 | 0 | 38,793 |
| Other | 4,705 | 0 | 0 | 4,705 |
| **Total** | **119,295 GWh** | **32,883 GWh** | **4,838 GWh** | **157,016 GWh** |

**Figure 15: Wood fuel's contribution to heat and power**

This shows that total Scottish energy use is 157,016 GWh/y, of which wood fuel contributes 3% and other renewables 17%.

**UK context for wood fuel**

UK data on the use of wood fuel exhibits similar issues to the Scottish data in that it only appears within the broad heading of bioenergy. The Digest of UK Energy Statistics 2020[20] provides a useful analysis of UK use of bioenergy to generate heat and electricity. This is shown in the bar chart below:

[20] https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

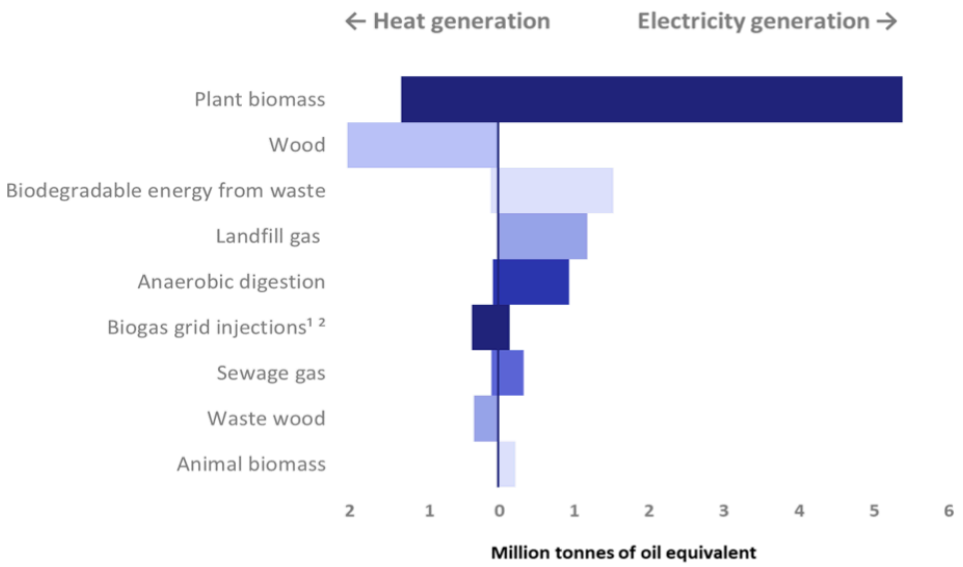



**Figure 16: Bioenergy in the UK (2020 DUKES): generation of heat and electricity**

It is notable how much renewable electricity is generated by bioenergy UK-wide. This contrasts with Scotland, which has nowhere near this proportion of renewable electricity generated by bioenergy.

Plant biomass shown in Figure 16 is predominantly wood pellets, the single largest user of which is the Drax power station in Yorkshire[21]. When wood pellets are added to the 'Wood 'and 'Waste Wood' categories, it can be seen that in the UK, ~60% of the output of the bioenergy sector is derived from wood fuels. To place that in context, DUKES also report how bioenergy use compares to other sources of renewable energy, which is shown in the pie chart below :

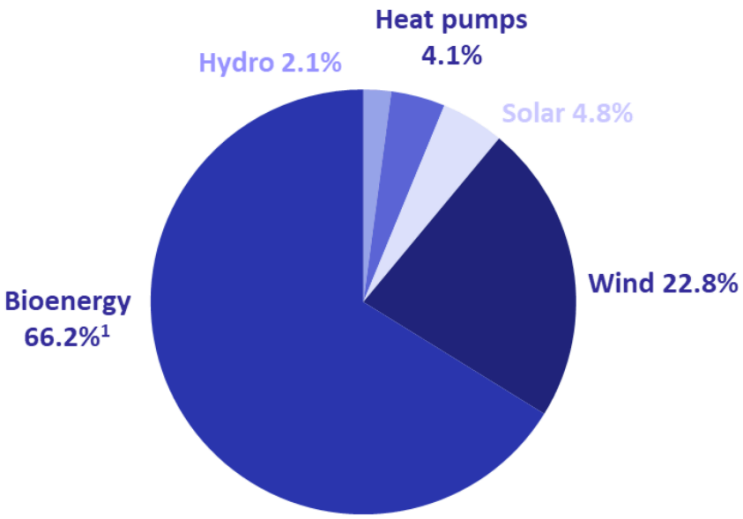



**Figure 17: UK renewable energy sources (DUKES 2020)**

[21] Drax Power Station supplies 6% of the country's electricity needs, including 15% of its renewable power. Drax is the largest single user of wood pellets in the world, with a consumption of circa 8 ODT million tonnes/y. Some wood pellets will be used by other installations, but in statistical terms these users hardly registered when compared to Drax.

As this data illustrates, at a UK level some 66.2% of renewable energy comes from bioenergy and ~60% of bioenergy is wood fuel. To express this more directly, 40% of the UK's renewable energy comes from wood fuel, and Drax power station is the key reason for this.

In summary, wood fuel provides 40% of the UK's total renewable energy, a large proportion of which is deployed for electricity generation at Drax power station. Scotland has pursued a different policy course from the UK in terms of wood fuel, and in the last decade or so, has not encouraged its use to produce renewable electricity alone. Put simply, England has Drax (the world's largest single user of wood pellets) and Scotland has seen its wood fuel more often deployed for heat.

## 5.0 Published information on jobs and turn-over in wood fuel

**Sources of information**

Published data about employment and turn-over in the Scottish wood fuel industry is not available. Nor is such data available at a UK level.

The Office for National Statistics (ONS) issues an annual statistical bulletin called *'Low carbon and renewable energy economy UK: 2019'* (LCREE). In addition, the Fraser of Allender Institute (FAI) published '*The Economic Impact of Scotland's Renewable Energy Sector'* in 2021. This FAI study uses the 2019 ONS data along with the FAI's own economic model of Scotland.

Both these publications are reviewed to help provide information about employment and turnover in the Scottish wood fuel industry.

**Survey by the ONS Low carbon and renewable energy economy UK: 2019**

This survey shows that turnover in the UK 'low carbon and renewable energy economy' (LCREE) was estimated to be £42.6 billion, and employment was estimated to be 202,100 full-time equivalent (FTE) posts in 2019. *The LCREE has seen no significant change in size since the survey began in 2014.*

It reports the following percentage splits in the ten sectors that make up the LCREE :

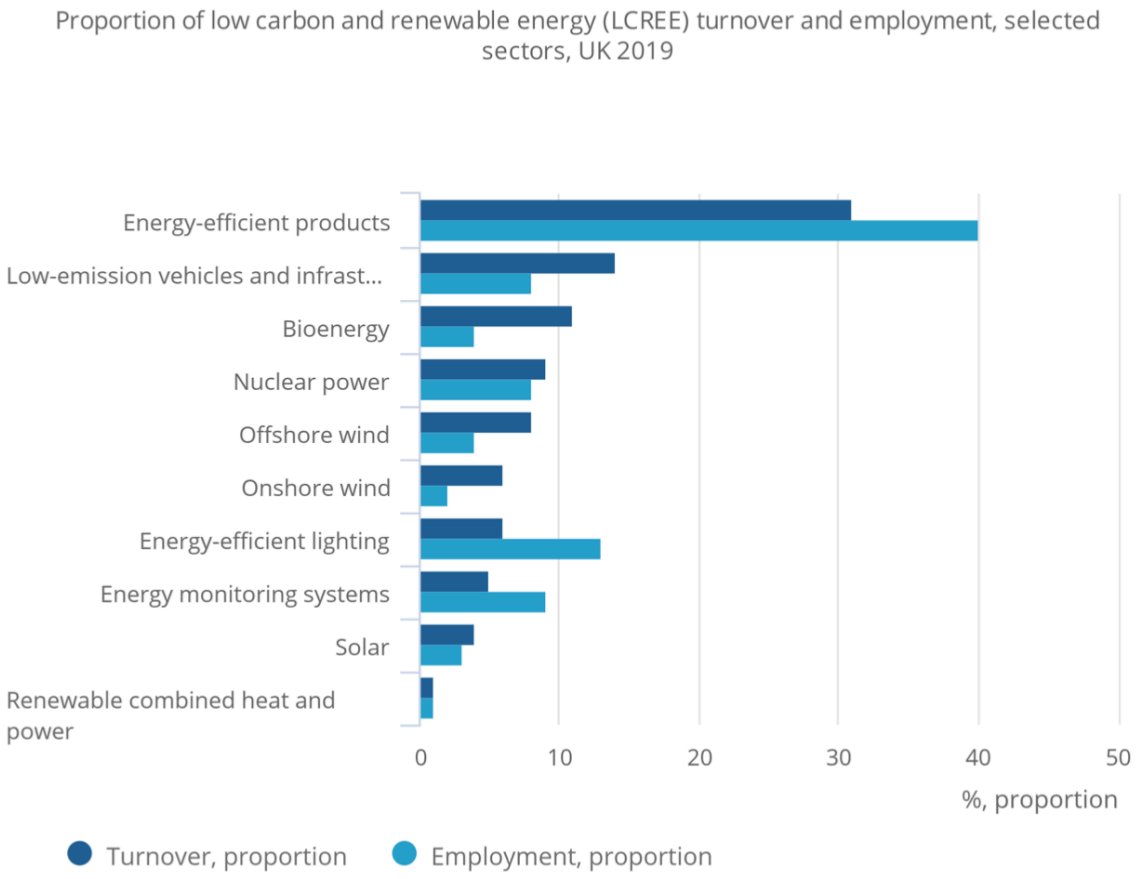



**Figure 18: % of jobs in each renewable sector out of 202,100 jobs/% of turnover out of £42.6 billion**

The ONS categories do not include wood fuel, however the ONS has a category called 'bioenergy' and another one called 'renewable combined heat and power'. It is very likely that wood fuel is a key part of both these categories, and very unlikely that wood fuel is a part of the remaining eight categories.

The ONS report does not provide a breakdown of the position in Scotland. It does however report the following 'overall estimates' for Scotland in 2019 :

- LCREE employment FTE: 21,400 FTE;
- LCREE turnover: £5.7 billion.

By assuming the percentage split (shown in Figure 18 above) between bioenergy/renewable CHP and other sectors which applies to the UK also applies to Scotland, it can be inferred that ~5% of the employment and ~12% of the turnover for the 'overall estimates' are associated with bioenergy/renewable CHP. This means :

- Scottish bioenergy/renewable CHP employment FTE : 5% of 21,400 = 1,070 FTE jobs
- Scottish bioenergy/renewable CHP turnover : 12% of £5.7 billion = £0.684 billion turnover

Such calculations are obviously tenuous and illustrate an important gap in the knowledge about the details of the UK's and Scotland's renewable energy sector; namely that there is no direct evaluation of the jobs that have been created by 40% of the UKs renewable energy, whilst many other significantly smaller renewable sectors – that will be less job intensive - appear to have been measured.

**Fraser of Allander Institute: the Economic Impact of Scotland's Renewable Energy Sector**

The Fraser of Allander Institute (FAI) at the University of Strathclyde published '*The Economic Impact of Scotland's Renewable Energy Sector'.* FAI uses a different set of categories than the ONS, but they do use the above mentioned ONS survey of businesses, hence it also fails to report the contribution of wood fuel.

This is broken down in the following table for FTE jobs in Scotland in 2019 :

| | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Offshore wind | 1,400 | 1,540 | 2,020 | **4,700** |
| Onshore wind | 1,900 | 3,380 | 3,490 | **8,780** |
| Solar photovoltaic | 600 | 230 | 240 | **1,070** |
| Hydropower | 700 | 1,300 | 1,290 | **3,290** |
| Other renewable electricity | 90 | 10 | 20 | **120** |
| Renewable heat | 900 | 730 | 760 | **2,390** |
| Renewable combined heat & power | 50 | 80 | 90 | **230** |
| Bioenergy | 800 | 820 | 1,000 | **2,630** |

**Figure 19: FAI jobs estimates**

It is unclear how the 1,070 bioenergy/renewable CHP jobs in Scotland inferred from the ONS data relate to the jobs in 'bioenergy', 'renewable CHP' and 'renewable heat' reported by FAI. To aid understanding this, it is useful to know how the FIA define direct, indirect and induced jobs :

- Direct : the direct impact relates to the output and employment of renewable activities;
- Indirect: firms undertaking renewable activities purchase goods and services from other firms in order to produce these activities. These suppliers, in turn, have their own suppliers and so on. The activity generated throughout the supply chain is called the indirect impact;
- Induced: the activity generated in the direct and indirect impacts supports employment in the Scottish economy. These employees earn wages and spend these on goods and services. This activity generated by wage spending is called the induced impact.

We suspect (but are unable to verify) that jobs recorded by the ONS survey are direct jobs only.

The FIA categories of 'other renewable electricity, bioenergy, renewable heat and renewable CHP' will include a proportion of wood fuel. The direct jobs in these categories total 1,840.

**Conclusions on jobs (from published data)**

ONS report that UK wide employment in renewable energy has seen no significant change in size since 2014. Our own industry experience suggests that employment in the wood fuel industry is at a low point and that the number of jobs was probably higher back in 2015 when the RHI scheme was driving market growth, but there is no baseline from which to track changes.

From the published data it is only possible to infer a range in terms of possible current employment for the wood fuel industry in Scotland.

The FAI report shows there are 1,840 direct jobs in sectors that must include wood fuel. The ONS report infers there are 1,070 jobs in sectors that must include wood fuel.

All we can reasonably conclude from these reports is that some unknown proportion of jobs in the range 1,070 to 1,840 must be associated with wood fuel production and use in Scotland.

As mentioned above, wood fuel is Scotland's third largest renewable energy sector, so it is also reasonable to conclude that a significant proportion of jobs in these categories must be associated with the wood fuel industry. It is also worth observing that the wood fuel industry is more job intensive than other renewable sectors due to the fuel supply chain that does not exist in wind or hydro.

We can therefore surmise that :

- An upper estimate of employment could be that ~75% of 1,840 jobs are associated with wood fuel, thus 1,340 jobs;
- A lower estimate employment could be that 40% of 1,070 jobs are associated with wood fuel, thus 428 jobs.

Quite clearly, both the assumptions used here, and the range provided, are not particularly useful in determining *exactly* how many jobs are associated with wood fuel in Scotland.

It is however interesting to observe that these levels of employment are significantly lower than those anticipated in early 2010's. For example, the '*UK jobs in the bioenergy sectors by 2020*' published for the Department of Energy and Climate Change (DECC) in 2012, reported a central estimate of 42,684 FTE for UK wide jobs in (only) bioenergy in 2020.

Applying a population proxy implies that in the early 2010's, it was assumed that circa 5,000 jobs would be associated bioenergy/wood fuel in Scotland by 2020.

## 6.0 Wood fuel suppliers and installers

**Introduction to the wood fuel supply chain**

The supply chain for wood fuel ranges from firewood suppliers for wood burners and open fires, to chip and pellets producers selling to biomass boilers up to ~1MW capacity and larger scale suppliers delivering recycled wood and sawmill co-products to the CHP and renewable electricity generation sectors.

Suppliers can operate across several of the sectors, many do other things beyond making or supplying wood fuel and some only act as agents, selling on or transporting wood fuel manufactured and processed by others. One cohort are self-suppliers who are making and using their own fuel.

The businesses involved in wood fuel supply are generally associated with forestry, arboriculture, sawmilling, timber processing, farming, road haulage and waste recycling. Only a minority of businesses are specialist wood fuel suppliers, where that activity is their only role.

**What is known about the supply chain?**

There is only one publicly available UK wide database of wood fuel suppliers: the Biomass Suppliers List (BSL). The BSL was established by the Department for Business, Energy and Industrial Strategy (BEIS), formerly the Department of Energy and Climate Change (DECC).

The BSL was introduced in April 2014 as a means of ensuring that wood fuel used in appliances supported through the RHI is legal and sustainable. Apart from some firewood suppliers, it can be assumed that virtually all UK based wood fuel suppliers are registered as BSL suppliers.

**Methodology for survey of wood fuel suppliers and the BSL**

Companies that wish to secure a BSL registration are required to submit an on-line application. Suppliers do this by submitting written evidence[22]. If successful, they are registered on the BSL and appear in the public database.

The UK wide BSL database contains 2,295 entries, however as businesses can register as suppliers of firewood, pellet or chip, there are sometimes several entries for the same business. In addition, the database is organised by postcode, so some businesses are listed in multiple regions as they offer coverage of supply in multiple post code areas. Finally, it would appear that some businesses are no longer trading but still appear on the database. We established this fact through our review of the internet and by applying our industry knowledge.

As part of this survey, we have not completed a detailed evaluation of 2,295 UK wide BSL entries, however based on a rapid review we believe the number of individual active businesses listed is likely to be around one third to a half of the total database. In other words, we can tentatively conclude there are no more than 1,200 wood fuel suppliers are registered on the UK wide BSL, and probably a quite a few less.

The methodology we adopted to identify the active individual businesses located in Scotland was to use the BSL as follows :

[22] In particular suppliers must demonstrate that the greenhouse gas emissions generated from the cultivation, processing and transport of their biomass fuel are at least 60% lower than the EU fossil fuel average for heat. To calculate their greenhouse gas emissions, suppliers use either the simple calculator within the BSL application process or the more comprehensive B2C2 calculator. What the BSL define as 'Producers', 'Traders' and 'Producer-Traders' of virgin or virgin/waste blend wood fuel are also required to demonstrate compliance with the 'land criteria' requirements. This confirms that the wood has been legally felled and that the woodland has been sustainably managed.

1. List all businesses located in Scotland via their postcode;
2. Remove instances where the same business has multiple entries;
3. Review their internet presence to determine their trading status, type of supply service and an estimate of the number of jobs that are likely to be associated with their wood fuel supply activities;
4. By the process of reviewing each website, we were also able to divide the businesses into nine categories.

This methodology has required that we use professional judgment and our existing understanding of the industry. In many instances, a business listed may have a principal role not directly associated with wood fuel supply. For example, they might be a forestry business, a road haulage business, or they might operate as waste recycling business, with wood fuel supply simply an add-on revenue stream. In these examples we used their website and our judgement and industry knowledge to consider what type of wood fuel supplier they were.

Using this process, we established the BSL contains only 156 businesses operating in Scotland. We added to this by undertaking internet research on other businesses that we consider will be operating in the wood fuel industry. That added an additional 325 businesses.

**Categories and numbers of wood fuel suppliers/installers**

To help evaluate the various types of wood fuel suppliers/installers, we have organised businesses into nine categories as listed below :

- Self suppliers of wood fuel
- Firewood suppliers
- Pellet agents and wood fuel haulage
- Sawmills
- Recycling companies
- Wood chip suppliers
- Pellet mills
- AW Jenkinson and Stobart Biomass
- Installers : design, installation and operation/maintenance

**Summary on jobs**

The process outlined above is imperfect, and requires that we use a number of assumptions and deploy our professional judgment. Some of the issues are:

- Many businesses involved in wood fuel supply or installation will be doing other things as well;
- Some businesses are not headquartered in Scotland but operate there;
- There will also be businesses that we have not listed who have a role in the industry. For example, there are companies that supply parts and equipment such as wood chippers, screeners, blowers, silos, thermal buffer tanks, pumps, valves, district heating pipes, controls, augers, heat meters and many types of other such equipment.

For these reasons it is not possible to provide a comprehensive list of businesses and there will be many other companies that supply parts and services that we cannot quantify. Those businesses we can identify are broken down into the following categories and summarised the totals in the table below:

| Category | Estimated number of businesses | Estimated number of FTE jobs |
|---|---|---|
| Self suppliers of firewood | 35 | 24 |
| Firewood suppliers | 262 | 262 |
| Pellet agents and wood fuel haulage | 14 | 21 |
| Sawmills | 83 | 45 |
| Recycling companies | 3 | 6 |
| Wood chip suppliers | 23 | 83 |
| Pellet mills | 3 | 85 |
| Jenkinson and Stobart | 2 | 125 |
| Installers: design, installation and operation/maintenance | 57 | 210 |
| Total numbers | 482 | 861 |

**Figure 20: Total number businesses and jobs**

The estimated number of jobs presented is our judgment based upon consideration of the scale and type of businesses in each category.

From the published data presented in section 5 of this review we surmised that :

- An upper estimate of employment could be that 1,340 jobs are associated with wood fuel;
- A lower estimate employment could be that 428 jobs are associated with wood fuel.

Our own survey estimates 861 jobs are associated with wood fuel in Scotland in 2019, and this correlates reasonably well with the existing published data. We also find that there are an estimated 482 businesses operating in Scotland in the wood fuel industry. These businesses will of course employ more than 861 staff, but they will be involved in non-wood fuel roles.

Appendix 1 offers detailed lists of the BSL registered suppliers and some other companies we have identified, with their website address.

ENDS (7th September 2021)

## Appendix 1: lists of wood fuel industry businesses

### Self-suppliers

This category are businesses listed in the BSL that do not appear to advertise that they make or sell wood fuel, which implies they are producing and using wood fuel for their own consumption. They will register with the BSL if they have a biomass boiler and were claiming RHI. Many of these are estates and farms. Thirty five business were placed in this category.

| Name of business | Post code | Website |
|---|---|---|
| Castleton Fruit Ltd | AB30 1JX | www.castletonfruit.co.uk |
| Alistair Ballantyne | AB31 4BW | www.timber-stone.com |
| East Coast Viners Grain (Drumlithie) LTD | AB39 3XA | |
| Ednie Farms Ltd Partnership | AB42 3BU | |
| Colaren Farms Ltd | AB43 7EJ | |
| JG Fairlie & Partners | DD11 2QW | |
| DM Fairlie & Partners (Fraserfield) | DD11 2QW | |
| Cononsyth Farms Limited | DD11 3SA | |
| Craignathro Farms Ltd | DD8 2LE | www.craignathrofarms.com |
| Barnyards Farm Ltd | DD8 3QA | |
| Lindertis Farms Ltd | DD8 5LY | |
| Northwest Timber Ltd | DG11 3LG | www.nwtt.co.uk |
| Kingan Farms | DG2 8DF | www.kinganfarms.co.uk |
| Loch Arthur farms | DG2 8EE | www.locharthur.org.uk |
| FRASER C ROBB | G63 0AA | www.frasercrobb.co.uk |
| Aberarder Estate | IV2 6UE | www.sportinglets.co.uk/locations/aberarder/ |
| Speyfruit Ltd | IV30 6NG | www.speyfruit.co.uk |
| Brahan Farms Ltd | IV7 8EE | www.brahan.com/ |
| Milton blairquhan estate | KA19 7LY | www.blairquhan.co.uk |
| J A McIntyre, Sorn Estate | KA5 6HR | www.sorncastle.com |
| Balcaskie Farms | KY10 2RF | www.balcaskie.com |
| Dunlossit Trustees Ltd | PA45 7QL | www.dunlossit.co.uk |
| Glendelvine Trust | PH1 4JN | |
| Bankhead Farms Ltd | PH12 8QY | www.gmclaren.com |
| Alvie Farm Partnership | PH21 1NE | www.alvie-estate.co.uk |
| Mountfair Farming Ltd | TD11 3NF | www.mountfairfarming.co.uk |
| N J McWilliam and Co | AB30 1DY | www.njmcwilliam.co.uk |
| Douglas Scott | EH41 4JS | www.howden.com/en-gb |
| Scott Pallets Ltd | AB30 1JR | www.palletlogistics.co.uk |
| Aithrie Estates | EH30 9SL | www.hopetoun.co.uk |
| Winton Trust Biomass | EH34 5AT | www.wintonhouse.co.uk |
| Champfleurie Estate | EH49 6NB | www.champfleurieestate.co.uk |
| P & R Ramsay | DD11 4RW | www.kinblethmont.com |
| Novar Estate | IV16 9XL | www.novarestate.co.uk |
| Meikleour Trust | PH2 6EA | www.meikleour.com |

**Figure 21: Self suppliers**

**Firewood Suppliers**

Fifty businesses are listed that are primarily producers and suppliers of firewood based in Scotland. These are the businesses that appear to focus on the supply of firewood into the domestic market. Many of them indicate they can also supply processed wood fuels like briquettes and bagged pellets, some appear to supply wood chips. It is most probable they are not producing mechanically dried chips.

| Name of business | Post code | Website |
|---|---|---|
| Duncan Wight | AB31 5EE | www.treesareus.co.uk |
| Speyside Tree Services Ltd | AB37 9BJ | www.speysidefirewood.co.uk |
| CT Harvesting Limited | AB51 7NL | |
| Northwest Timber Ltd | DG10 9SN | www.nwtt.co.uk |
| A & G King Timber Ltd | DG11 1LD | |
| Ian Anderson | IV32 7LG | www.iandkmilling.co.uk |
| Aigas Community Forest | IV4 7AD | www.aigasforest.org.uk |
| Corachie Clematis | PA35 1HY | www.corachieclematis.co.uk |
| James G Dick (Fuels) | IV30 8XE | www.jgdickfuels.com |
| T hunter+son | kw14 8hn | www.thunterandson.co.uk |
| Rosehill Timber | AB30 1QD | www.rosehilltimber.co.uk |
| John Roberts | AB30 1TD | www.johnhroberts.co.uk |
| South Logie Woodlands | AB51 5EE | www.southlogiewoodlands.co.uk |
| Galloway Biomass | DG9 0LA | |
| Colin Mark Garden & Tree Services | Eh26 9LT | www.colinmark.co.uk |
| Broadleaf Woodfuel Ltd | EH46 7BD | www.broadleafwoodfuel.co.uk |
| Treeline Woodlands Ltd | EH46 7HL | www.treelinescotland.com |
| The Highland Firewood Co | IV24 3AW | www.thehighlandfirewoodcompany.co.uk |
| ScotLog | ML11 7DX | www.scotlog.com |
| Biohot Woodfuel Ltd | ML5 2JP | www.biohot.co.uk |
| Baltic Firewood | PA10 2PL | www.balticfirewood.co.uk |
| Argyll Woodfuels | PA34 4SE | www.argyllwoodfuels.com |
| Duchray Castle | Fk8 3XL | www.duchraycastle.com |
| Little Mark Farm | DG9 8HX | www.ecoboilerfuels.com |
| Edinburgh Wood Fuel Ltd | EH14 4AJ | www.edinburgh-woodfuel.co.uk |
| Burnside Lodge,Fortrie, Turriff | AB53 4HX | www.burnsidelogs.co.uk/ |
| LFS Linnorie Firewood Services | AB54 4PT | www.firewoodbylfs.co.uk |
| Bridgend Logs | DD5 3RB | www.bridgendlogs.co.uk |
| Carberry Developments t/a Westwater Homes | DD9 7PY | www.anguslogs.co.uk |
| Wood Fuel Co-operative | DG1 3PH | www.woodfuel.coop |
| Tomatin Firewood | IV13 7YA | www.tomatinfirewood.co.uk |
| Drumnahaving Firewood | IV27 4DH | www.drumnahaving.co.uk |
| Highland Woodfuels | IV6 7UL | www.highlandwoodfuels.co.uk |
| NWMCW Trading Company Limited | PA75 6QR | www.islandwoodfuels.com |
| Logsnstuff | PH1 3EQ | www.logsnstuff.com |
| Gatehouse Firewood | PH15 2EL | www.gatehousenursery.co.uk |
| Mark Fergusson | PH16 5LG | www.baledmundestate.com |
| Alex Stielow | PH2 6FB | www.sawdustwoodfuels.co.uk |
| Scotch Logs | FK7 9PZ | www.scotchlogs.com |
| Maden Eco Ltd | TD15 1TQ | www.madenecofuels.co.uk |

| | | |
|---|---|---|
| HOTTLOGSUK LTD | DG8 6RB | www.holtslogs.co.uk |
| Nairn Fuels | IV12 5HX | www.nairnfuels.co.uk |
| Fairlie Woodfuels | KA29 0EQ | www.fairliewoodfuels.co.uk |
| LJX Ltd | PA14 6YL | www.ljxtreesurgeons.com |
| D K Logs | ph15 2el | www.dklogs.com |
| The Real Firewood Company Ltd | TD11 3LT | https://www.realfirewood.co.uk |
| Carnethy Wood Fuel | EH26 8QD | www.carnethywoodfuel.co.uk |
| Oscar Yerburgh | DG7 3NS | hwww.barwhillantyestate.co.uk/woodfuel/ |
| The Firm of South West Firewood | DG1 3NN | www.southwestfirewood.co.uk |
| Tayside Forestry Ltd | DD3 0PP | www.taysideforestry.co.uk |

**Figure 22: Firewood suppliers**

The fifty firewood suppliers listed on the BSL data base will represent only a small percentage of the total number of firewood suppliers. For example, the following website provides a list of 183 firewood suppliers :

https://woodfuelscotland.wordpress.com/list-of-firewood-suppliers/

Most of these are not listed in the BSL data base.

Amazon lists 162 suppliers of firewood, although it is not possible to determine where they are based.

A Google search of 'firewood suppliers in Scotland' offers 370,000 results. A quick check showed that up to page 16 of the search there were about 15 companies listed per search. This suggests 240 companies.

It is possible to conclude that the firewood suppliers listed in the BSL probably represent only a fifth to a third of the total number of Scottish firewood suppliers. There is also no doubt a large number of very informal arrangements associated with the supply of firewood, where no registered business operates but where firewood is being produced and supplied.

**Pellet agents and wood fuel haulage**

Fourteen businesses are listed that are primarily pellet agents and wood fuel haulage companies based in Scotland. These are businesses that appear to act mostly as pellet agents, and or provide a fuel haulage service. Some probably offer firewood in addition

| Name of business | Post code | Website |
|---|---|---|
| W & W Mackie | AB33 8DE | www.mackiewhiteside.co.uk |
| Mole Valley Farmers Ltd | FK3 9XB | www.molevalleyfarmers.com |
| Merkland Farm Feeds | KA19 8HP | www.thepetfoodco.co.uk |
| Benston Motor Engineers | Pa5 8by | www.benstonmotorengineers.co.uk |
| Engebret ltd | hs1 2sl | www.engebret.co.uk |
| Andrew Gray & Co (Fuels) Ltd | KA26 9PF | www.graysfuels.co.uk |
| Ailsa Renewable Energy | KA26 9PF | www.ailsa-renewable-energy.co.uk |
| Mac Woodfuels | EH20 9NU | www.macwoodfuels.co.uk |
| Alex Hastie & Co | EH33 1NH | www.woodpelletseastlothian.co.uk |
| Wood Pellets Ayrshire | KA26 9PF | WWW.wood-pellets-ayrshire.co.uk |
| B D Supplies Limited | PH1 3QY | biomasswoodpelletsscotland.co.uk |
| Flex Technologies Limited | EH48 2EY | www.bioglow.co.uk |

| | | |
|---|---|---|
| HALS | FK3 9UY | www.hbsring.co.uk |
| White Horse Energy | G68 9HW | www.whitehorseenergy.co.uk |

**Figure 23: Pellet agents and wood fuel haulage**

### Sawmills

Five sawmills are listed and could be supplying wood chips :

| Name of business | Post code | Website |
|---|---|---|
| Cordiners Sawmills Ltd | AB31 5PY | www.cordiners-sawmills.com |
| Carronbridge Sawmills Limited | DG3 5AY | www.carronbridgesawmill.co.uk/ |
| Raddery Sawmill Ltd | IV10 8SN | www.radderysawmill.com |
| Abbey Timber Limited | TD11 3TX | www.abbeytimber.co.uk |
| GM Forestry Ltd | IV2 7SU | www.gmforestry.com |

**Figure 24: Sawmills**

The five sawmill suppliers listed on the BSL database will represent only a small percentage of the total number of sawmills. Many sawmills are likely to have some formal or informal role in the supply of wood fuel because the main by-products of sawmilling are chips and sawdust. 79 companies are listed by Yell.com as being sawmills located in Scotland. Some of these are very large companies who own and operate their own biomass boilers (for kiln drying or other purposes).

### Recycling businesses

Three businesses are listed and could be supplying wood chips. There are probably more recycling companies than this with a role in wood fuel, but we have no reliable means of determining the numbers in this category.

| Name of business | Post code | Website |
|---|---|---|
| Hamilton Waste & Recycling Ltd | EH22 2NN | www.hamiltonwaste.com |
| Forth Resource Management Ltd | EH39 5AH | www.frmrecycling.co.uk |
| J&M Murdoch & Son Ltd | G53 7SP | www.jmmurdoch.com |

**Figure 25: Recycling businesses**

### Wood chip suppliers

Twenty two businesses are listed that are primarily producers and suppliers of wood chips based in Scotland. Some of these businesses are specialist chip producers, but some also are part of a wider business. Most of the business will offer to supply pellet or firewood alongside the supply of wood chip.

| Name of business | Post code | Website |
|---|---|---|
| Swallowfield Smallholding ltd. | IV4 7AA | www.blackislefirewood.co.uk |
| Blairgowrie Woodchip Company Ltd | PH13 9HN | www.blairgowriewoodchip.co.uk |
| Treelogic Wood Energy Ltd | AB51 5LA | www.treelogic.co.uk |
| Blair Biomass | DG9 9BE | www.blairbiomass.co.uk |
| Arran Energy Ltd | KA27 8JU | www.arranenergy.net |
| Caledonian Woodfuel Ltd | PA13 4SG | https://www.caledonianwoodfuels.com |
| Argyll Estates | PA32 8XE | www.inveraray-castle.com |
| NEWFuel Limited | AB53 4LH | www.new-fuel.co.uk |
| Callendar Estate Biomass Ltd | FK1 5LX | www.callendarestate.co.uk |
| Campbell Energy Limited | KA1 3LS | www.campbellfuels.co.uk |

| | | |
|---|---|---|
| PWR Bioheat Limited | KA26 9PZ | www.pwrbioheat.net |
| Miller Biofuels Limited | PA12 4LD | www.millerbiofuels.co.uk |
| The Wood Chip Shop | PA21 2DA | www.thewoodchipshop.co.uk |
| Our Power (Cairndow) CIC | PA26 8BL | www.ourpowercairndow.co.uk |
| Pentland Biomass | EH20 9QG | www.pentlandbiomass.com |
| woodforfuel.com | G63 0LL | www.woodforfuel.com |
| Central Woodchip Company Limited | KA11 4JU | www.centralwoodchip.co.uk |
| ANGUS BIOFUELS | DD8 1PX | www.angusbiofuels.co.uk |
| Glenskinno | DD10 9LG | www.glenskinnobiofuels.co.uk |
| Scot Heating Company Limited | EH52 5NT | www.scotheatandpower.co.uk |
| West Coast Woodfuels Ltd | PA16 0DJ | www.wcwoodfuels.co.uk |
| RTS Ltd | PH7 3QZ | www.rtsforestry.co.uk |

**Figure 26 : Wood chip suppliers**

**Pellet Mills**

Three pellet mills are listed. Given these are large fixed plants, we know there are no other pellets mills located in Scotland.

| Name of business | Post code | Website |
|---|---|---|
| Puffin Pellets | AB45 2LR | www.puffinpellets.com |
| Land Energy Girvan | KA26 9PF | www.land-energy.com |
| Balcas Timber Limited | IV18 0LT | www.balcasenergy.com |

**Figure 27: Pellet mills**

**AW Jenkinson and Stobart Energy**

These two companies are listed separately as they are by far the two single largest businesses registered in the BSL and have a role in supplying wood chips to the large process heat and renewable electricity users that make up over 50% of total wood fuel use.

| Name of business | Post code | Website |
|---|---|---|
| A.W. Jenkinson Forest Products | AB54 7XY | www.awjenkinson.co.uk |
| Stobart Biomass Products Limited | AB54 7XY | www.stobartwoodfuel.com |

**Figure 28: Jenkinson's and Stobart's**

**Installers : design, installation and operation/maintenance**

There are twenty three entries of businesses that appear to primarily design, install and maintain wood fuel systems. Many of the companies will operate across the UK and some are not headquartered in Scotland.

| Name of business | Post code | Website |
|---|---|---|
| Speyside Plumbing Services Ltd | AB38 9SB | https://speysideplumbing.wordpress.com/contact-us/ |
| Turblown Ltd | AB42 4QF | www.turblown.co.uk |
| AD Heating | AB53 8QB | |
| Energy Source (UK) Ltd | FK9 5QB | www.energysource.uk.com |
| AMP Clean Energy | IV16 9XL | https://www.ampcleanenergy.com |

| | | |
|---|---|---|
| Nuergy Ltd | KA26 9PF | www.woodpelletfuel.co.uk |
| William Mitchell & Sons Ltd | ML11 0RL | www.3renergy.co.uk |
| Alternative Heat | PA3 2RS | www.alternativeheat.co.uk |
| Myriad | | www.myriadproducts.co.uk |
| Vital Energy | ML4 3PR | www.vitalenergi.co.uk/products-services/our-services/ |
| Reheat Ltd | G77 5PW | www.reheat.uk.com |
| Ember ENERGY | KA4 8PB | www.emberenergyrenewables.co.uk/contact/ |
| Greenheart Renewables | | www.greenheart.co.uk |
| R&I Cruden | IV6 7UA | www.ricruden.net |
| Gibson and Gould | KA8 0JH | www.gibsonandgoold.co.uk/renewable-energy.html |
| Dunster Biomass (Scotland) | IV36 2AB | www.dunster.biz |
| Biomass boiler services | TD 15 1HU | www.biomassboilerservices.com |
| Perthshire Biofuels | PH2 8HQ | www.perthshirebiofuels.co.uk |
| Glendevon Energy | KY13 0UL | www.glendevonenergy.co.uk |
| Renew Green Energy | TD1 3TE | www.renewgreenenergy.co.uk |
| Dennis Lawson plumbing and heating | TD113ES | www.lawsonplumbingheating.co.uk |
| Greenflame Installations Ltd | PH26 3TA | www.greenflameinstallations.co.uk |
| Border Eco Systems Ltd | TD8 6DU | www.borderecosystems.co.uk |

**Figure 29: Installers**

The BSL excludes stove suppliers and the following website provides a list of 34 domestic stove suppliers and installers :

https://woodfuelscotland.wordpress.com/list-of-firewood-suppliers/

None of these are not listed in the BSL data base.