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# PELLETtime

## Pellet markets in Scotland



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## INTRODUCTION TO THE PELLET MARKET

In Scotland the pellet market is small in scale. Until recently the lack of pellet supply as well as low public awareness has been a major obstacle. However, in 2009, Scotland's first large-scale pellet plant will be operational, which will help secure the supply for the country together with two other pellet plants. Many public buildings have been changing to pellet heating systems which raises the interest of private households to follow suit. Pellets are mainly used in co-firing in the large heat plants, however, there are also a few households using pellets for heating. In addition, pellets are also used for horse litter (Arbuthnott 2009, Wood Energy Scotland 2009).

The Scottish Community and Householder Renewables Initiative (SCHRI) provides grants for communities and householders to change their heating or energy systems to renewable fuels. Supported technologies include automated wood fuel heating systems (boilers and stoves). For communities, grants of up to £100 000 are available, while for households up to 30% of the cost and a maximum of £4000 can be reimbursed (Energy Saving Trust 2009).

### Existing pellet producers (MAP)

In 2007, the first pellets made in Scotland were produced when two small scale demonstration pellet plants were established. One in James Jones and Sons Ltd's sawmill in Larbert, Stirlingshire which is producing pellets from the co-products of the mill, the second was the Norbuild Timber Fabrication

and Fine Carpentry in Rafford, Forres (Forestry Commission Scotland 2007). At the moment there are two medium-scale pellet plants and a third large-scale plant is going to be operational in spring, 2009 (Figure 1).

**Arbuthnott Wood Pellets (AWP)** is located on the Arbuthnott Estate in Kincardineshire in the North-East of Scotland and produces pellets under the Stovies brand. AWP was the first commercial pellet plant in Scotland with an annual capacity of 15 000 tonnes, however, in 2008 the actual production was around 4000 tonnes. The plant went online in December 2007 (Arbuthnott 2009).

**Puffin Pellets** is located in Auchterless in the North-East of Scotland, the plant has an annual capacity of 25 000 tonnes (Pellets@las 2008, Puffin Pellets 2009).

**Balcas** is an Irish pellet manufacturer. The company is currently building a new pellet plant with a capacity of 100 000 tonnes in Invergordon Scotland. The plant is expected to go online in April 2009 (Balcas 2009).

In the UK, as a whole, there are about 10 pellet producers, whose total production capacity was estimated to be 134 000 tonnes in 2008. Producers are mainly small scale, only two plants have a capacity of 50 000 tonnes or more. The new pellet plant in Invergordon is going to be the largest pellet plant in the UK (Pellets@las 2008).

# Pellet plants in Scotland in 2008

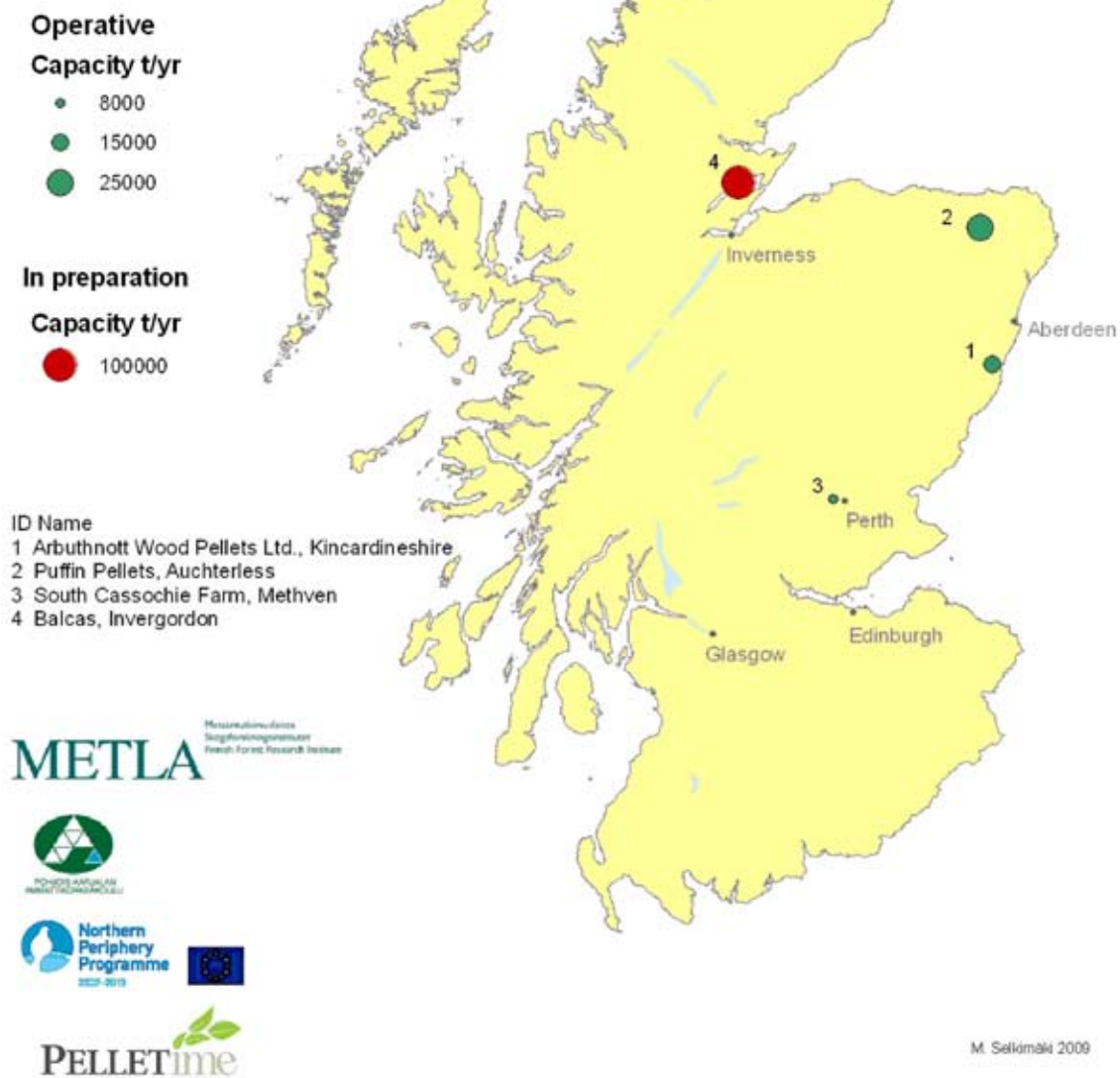


Figure 1. Pellet plants in Scotland.

## Raw materials used for pelletizing

Traditionally, the most commonly used raw material for pellets is sawdust, a by-product of the forest industries. In some areas in Scotland there is an oversupply of sawmilling residues and in these areas they will remain the most important raw material. However, in Scotland there are significant amounts of low grade timber in remote areas away from major markets and installations such as sawmills. Therefore, these forest resources represent a tremendous amount of raw material for pellet production.

New installations such as the pellet plant in Invergordon are going to harvest roundwood, which will then be debarked, chipped and hammered to sawdust. The main species found in the Scottish Highlands are lodgepole pine and sitka spruce. Arbuthnott Wood Pellets (AWP) is producing pellets from the sawdust of larch, spruce and pine (Arbuthnott 2009). Pellets are 6mm in diameter and the maximum length is 25mm.

## Quality of pellets produced (Standard)

In the United Kingdom there are no pellet standards, however, the European standard for solid biofuels will be implemented once it is official (Pellet@las 2008). Currently, pellets are produced under a voluntary Code of Good Practice (COGP) categorizes the pellets according to eight criteria (Table 1). In addition, it states that the only additives which can be used are lignin, as a binder, and a small amount of vegetable oil used for lubrication of the die. Pellets are divided into two groups; "premium biofuels pellets" and "recovered fuel pellets". According to the draft of the European Standards for solid biofuels, recovered fuel pellets may contain up to 15% of material other than biomass. According to the ash content, COGP pellets are labeled as: <1% ash (premium), <3% (standard) and <6% (high ash) (Remade Scotland 2003, Hahn 2004). Currently, Balcas and AWP are following the European standard CEN/TS 14961 (Balcas, AWP 2009).



**Figure 2.** Low quality timber available for pellet production. (D. Röser)

Specifications	Premium Biofuel Pellets	Recovered Fuel Pellets
Size	> 4mm - 20mm	> 10mm - < 20mm
Fines in % < 3mm	< 0.5%	< 0.5%
Ash	< 1%, 3% or 6%	< 1%, 3% or 6%
Moisture content	< 10%	< 10%
Calorific Value	> 4.7 kWh/kg	> 4.2 kWh/kg
Bulk density	> 600kg/m <sup>2</sup>	> 500kg/m <sup>2</sup>
Sulphur	< 300ppm	< 300ppm
Chlorine	< 800ppm	< 800ppm

**Table 1.** Wood pellets Code of Good Practice (Hahn 2004).

## Major customers

The main commercial customers in Scotland, at the moment, are schools, colleges and small scale district heating schemes. However, there are also a number of small scale customers such as family houses. Furthermore, Invergordon has a deep water port from which pellets will be exported to the rest of the UK. It is the idea that all the pellets should stay in the UK where a big market for pellets for power stations exists.

At the moment, there are about 40-50 pellet boilers, while room heaters are still fairly unpopular. However, with increasing production capacity and the resulting reliable supply structures it is expected that pellet customers are going to increase substantially in the future. The development in Ireland is very encouraging where Balcas is currently delivering directly to about 3000 customers.

## Delivery methods

Balcas has brought an older version of a tanker truck from Ireland. The truck is able to deliver 4 tonnes per customer. It has 4 chambers and each of them holds 4 tonnes. Nowadays, in Ireland, pellet delivery trucks are equipped with an onboard scaling system. As the market for pellets grows in Scotland similar trucks are going to be used there as well.

Balcas has developed an online tool in which the order is placed on the internet and delivery within 2 weeks is guaranteed. This online tool has been very successful in Ireland and a similar system is nowadays also used in Scotland.



Figure 5. Filling of big bag with Pellets. (R. Prinz)

Another option for customers is to order pellets in 10 kg sacks. Balcas carried out a survey among its customers and it was found out that they prefer 10 kg bags. In the case of AWP, 15 kg sacks and big bags ranging from 1 to 1.5 tonnes are offered.

Balcas developed a silo (3.5 tonnes) for the Irish market which the company has been selling to its customers. A bigger silo would be needed for the Scottish market since the minimum delivery of pellets in Scotland is 4 tonnes. As a result, the silo should also be at least 4 tonnes.



Figure 3. Packing of small sacks in Arbuthnott pellet plant. (R. Prinz)



## Existing pellets users

In Scotland only a few community buildings, such as schools and public buildings, have pellet heating systems. A few examples are: Glenkens Community and Arts Trust in New Galloway and John Wheatley College in Glasgow (Energy saving Trust 2009). During the recent years pellet use has been growing mainly in co-firing in large and medium-sized power and CHP plants. In England many community and public buildings have been equipped with pellet heating systems (Rosillo-Calle & Perry 2006).

## Structure of the customers

The customers using pellets on a small scale can be divided: one-third using them in stoves and two-thirds using pellets in boilers. In general, customers are very sensitive about their heating system. It is expected to work without major problems since heating is something that people do not want to be bothered with. Therefore, it is important to have a functioning support and maintenance system in place, which is currently missing in most of Scotland with regards to pellets.

## Transportation of pellets

Arbuthnott Wood Pellets (AWP) offers pellets in 15kg sacks bagged on pallets which carry 66 sacks. Furthermore, Arbuthnott is also delivering large sacks of 1000kg as well as bulk pellets.

Customer can either choose to collect sacks or bulk pellets from the pellet plant or they are delivered to the customer directly. Brites pellets (Balcas) are sold widely around the UK in small sacks (10kg). In Scotland alone, there are 17 retailers (Balcas 2009).

Exported pellets are coming to Scotland from Ireland, Norway, Sweden and Finland (Alakangas et al. 2007). Lantmännen Renewable Fuels is providing Swedish Agrol pellets in small sacks (15kg) on pallets, large sacks (650kg) as well as bulk deliveries by pneumatic truck upon request. Bulk deliveries are done from warehouse storages around the UK by the company's own pneumatic trucks and small sacks are sold via 30 retailers (Lantmännen Renewable Fuels 2009).

**Figure 4.** Small sacks on a pallet at AWP. (R. Prinz)



# TRENDS IN THE PELLET MARKET DEVELOPMENT

In order for the pellet market to develop in Scotland investments into boilers in the range of 100-200 kW are needed in the future. These are installations such as schools, swimming pools, distilleries or community centers. This would build a core market and support trust among society and would lead to more investments in the long run. Furthermore, it makes pellet distribution for pellet producers much easier if a solid customer base is available.

There are a number of large buildings for which biomass, and particularly pellets, would be feasible solutions. One of the challenges is the high investment costs compared to traditional heating

sources such as oil or gas. Therefore, installations should be supported with sufficient subsidies. There is a potential conflict of interest with wood chips. However, the use of pellets and wood chips complement each other and the right systems have to be chosen for the right place. It is very important to remember that both pellets and wood chips have advantages and disadvantages. If these are weighed properly, potential conflicts of interest can be minimized since each of the systems would fit in their niches. The trend should be towards using pellets in small scale systems ranging from 15 kw to 100 kw and wood chips should be used in larger installations where fuel quality is not a big issue.

## BOTTLENECKS

The Norrboard factory is located near Inverness and, currently, most of the raw material is transported there from the surrounding area. This will probably change in the future and could lead to more competition for raw material. Careful planning and mapping of available raw materials is therefore of utmost importance.

At the moment there are only two medium scale pellet producers, although a third large producer will start production during the spring of 2009. The main bottleneck is the lack of an efficient pellet supply and distribution network which is one of the reasons preventing people from switching to pellets systems.

## SWOT analysis of the pellet raw material and pellet supply systems

### Strength:

- Forest resource (wood fibre) is available in abundance
- Know-how and equipment to chip and deliver wood chips is available
- There is enthusiasm in the forest sector to develop this market further in the future

### Weaknesses:

- Not enough boilers/customers at the moment
- Not enough promotion of pellets as a reliable fuel
- Equipment for blown pellet deliveries is missing
- Inadequate government support in terms of policy and grant aid
- Lack of public awareness
- Lack of well designed and working pellet demonstration systems

### Opportunities:

- There is a huge potential market, particularly in the CHP and district heating market
- The entrance of Balcas into the market will serve to promote the use of pellets
- Raising awareness of biomass and its positive environmental effects

### Threats:

- Competing energy technologies on the market if they start to get ahead biomass will be unable to keep up
- Fluctuating price of oil and gas
- Lack of trained professionals for installing and maintaining the boilers



## CASE ARBUTHNOTT WOOD PELLETS LTD

### Raw material

Arbuthnott Wood Pellets (AWP) is buying good quality sawmill chips, with about 50% moisture content. It is mainly a mixture of Sitka spruce and Lodgepole pine. Wood chips with a size of 30mm are produced by a chipper in the sawmill. The chips are transported about 24 km from the sawmill to the pellet plant.

When using forest chips the moisture content is reduced from 50% to 30% through natural drying before the chipping. Moisture content is considered the most critical factor regarding overall costs. The raw material should also be debarked as earlier experiments demonstrated that bark caused problems in stove firing.

At the pellet plant there is a 2 MW diesel powered dryer. This system will be changed in the future in order to run the entire plant on biomass. The chips are dried to 10% moisture and then processed by a hammer mill. The diesel generator is also producing the electricity for the hammer mill and the dryer. The electricity companies are very big competitors on the market. The connection to the national grid is very costly and therefore a diesel generator had to be purchased. The best solution for the future would be the establishment of a small CHP plant that would serve the pellet plant and the farm with its grain dryer, buildings etc.

At present 15 kilo sacks and 1 ton sacks of pellets are produced. The company is also able to deliver in bulk, however, there is no demand at the moment.

### Handling of materials in plant

The handling of materials within the plant is done by front loaders and forklifts. The produced one-ton sacks and pallets filled with 15 kg sacks can be stored at the plant before they are transported to the customers. The daily production of 8 tonnes can be managed with a total of 1-2 operators working on site.

### Plant

The equipment of the existing pellet plant is a Kahl pelletizer, manufactured in Germany, with a capacity of 5000 tonnes annual production. The horizontal die produces pellets without any additives.

The investments costs of 1 million pounds, with a grant of £400 000, are expected to have quite a long payback period due to the limited available markets. The investment is seen as a promising future opportunity besides the existing farming business as it is mostly independent of weather influences.

### Stovies Pellets

The produced pellets are sold under the "Stovies" brand and meet the CEN standard regulations. All pellets are of high quality and the size is standard with 6 mm. At present there are approximately 20 customers. The largest share of customer sare family houses using about 3 tonnes a year. At the moment, everything is rather small scale. However, there are a number of bigger size projects that are currently being planned.



## Storage systems

The storage type depends on the pellet boiler type, whether it is a stove or boiler. In some cases it can just be a shed. There are some auger systems but most of the systems are hand fed using the 15 kilogram sacks. The sacks are only available from the distributor at the moment and since the market is not developed yet. The price for domestic use is 300 Euros (£200 per ton). The average transportation distance is about 50 miles. All Stovies pellets are sold in local markets and stay in the area at the moment.

One example of small scale heating systems can be found close to the production facilities on the Arbuthnot estate. A 26 kW boiler is heating four holiday cottages with heat produced from Stovies pellets. The fee for the used heat is included in rent of the cottages. The storage system of the boiler is a Geo plast system with a capacity of one ton, sacks are used as backup (see figure 6).

## Delivery

15 kg sacks are sold directly from the plant. The Wud Chips Company was founded and they are buying the pellets wholesale and then they are sold retail to the customers. The company has its own truck (3 tonnes) which is also used for delivering woodchips. The one ton sacks are either handled with a crane or a tractor. One problem in truck delivery are the complicated UK regulations in terms of driving license, management, towing etc.

## Experiences

One thing that was found out was that the amount of support and backup from the equipment suppliers was not adequate. Making pellets is more an art than science. The start-up phase was set by trial and error. In order to get a feeling for the situation it took month for the operator to make the equipment work properly. This is a serious failing in the pellet production chain - not only in Scotland.



**Figure 6.** Storage system of a 26 kW pellet boiler. (R. Prinz)





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