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THE PELLETS@LAS PROJECT – A COMPREHENSIVE EUROPEAN PELLET MARKET OVERVIEW

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ABSTRACT: The aim of the pellets@las project is to develop a transparent European pellets market through the collection and provision of detailed information on all pellet markets across Europe. Market data, such as produced and available quantities and regional sales prices are made available through a public web-based information platform. In order to cover heterogeneous markets across Europe, as well as all groups of stakeholders (pellet producers, traders and consumers) a consistent methodology for data collection was tailored to these particular needs. Since 2007, the European pellet market has been monitored using a set of specific questionnaires, which are sent to market participants, combined with the cooperation of national pellet associations in more developed pellet markets.
The pellets@las is the only database covering relevant market data on all fuel pellet markets across Europe (incl. Switzerland and Norway). This promotes transparency in the European fuel pellets market and thus removes one of the major barriers for permanent market growth. As a result of detailed data collections, the pellets@las database currently presents comprehensive information on production, consumption and trade volumes, as well as detailed insights in pellet prices for all European pellet markets. All results are available to the public on the project website www.pelletsatlas.info.
Pellets market data show that, after the crisis in the winter of 2006/2007 (caused by high pellet prices and supply shortages), the markets stabilised again during 2007 as indicated by fairly stable and moderate prices. Pellet prices increased again towards the end of 2008. This price increase, however, was modest and did not disrupt consumer confidence, as many consumers purchased their pellets earlier during the year. This promoted a stronger market growth in 2008, when production and consumption of fuel pellets reached growth rates comparable to the boom year 2006.
Keywords: pellets, bio-energy marketing, biomass trade

1 INTRODUCTION

The importance of wood pellets for small and medium scale heat production and large scale power generation is continuously increasing across Europe. Pellet use can contribute substantially to renewable heat and electricity targets set by the EU Renewable Energy Directive.

Besides the established national pellet markets (e.g. Sweden, Austria), which are still growing strongly, additional pellet markets are emerging across Europe. This diversity regarding market development stages is accompanied by the development of heterogeneous demand and trade structures.

In countries such as Germany, Austria and Italy, wood pellets are exclusively used in heat production for the residential sector while the industrial use for power generation prevails in the United Kingdom, the Netherlands and Belgium. In Sweden and Denmark, both sectors are well established (Figure 1). In terms of trade, many of the developed national pellet markets depend on imports from countries with surplus pellet production. These are, besides Germany and Austria, mainly the Eastern European countries and Canada.

This heterogeneity, together with the fast increase of pellet demand leads to inconsistencies mainly concerning supply security.

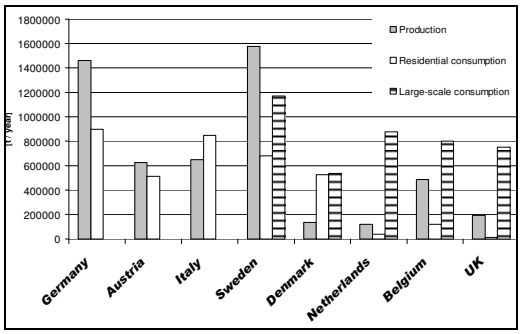

Figure 1: Major European pellet markets: Domestic pellet production and consumption in the large-scale and the residential sector (small and medium scale); 2008 data.

Already today, a shortage of raw materials for pellet production is reported from most of the European pellet markets and the broadening of the feedstock base, i.e. the use of residual wood, SRC (short rotation coppice) or agricultural biomass for pellet production, is becoming necessary.

However, it seems that an increased international pellet trade (i.e. pellet import from e.g. America to Europe) is, in the long run, essential for satisfying the growing demand in Europe.

2 THE PROJECT

The pellets@las project started in January 2007 and will continue until December 2009. Pellets@las is co-financed by the European Union under the Intelligent Energy Europe Programme.

2.1 Objectives

The general aim of pellets@las is to develop and promote transparency on the European fuel pellets market. This is done to facilitate pellets trade and to remove market barriers, mainly information gaps but also local supply bottlenecks, production surpluses and uncertainties in quality assurance management.

2.2 Methodology

The core of the action is a data and information collection in all EU 27+2 countries (plus Norway and Switzerland) from wood and mixed biomass pellet (MBP) producers, traders and consumers.

In order to cover heterogeneous markets across Europe, as well as all groups of stakeholders a consistent methodology for data collection was tailored to these particular needs. Since 2007, the European pellet market has been monitored quarterly using a set of specific questionnaires, which are sent to market participants, combined with the cooperation of national pellet associations in more developed pellet markets.

Market data, such as produced and available quantities and regional sales prices are made available through a public web-based information platform at www.pelletsatlas.info.

2.3 Outcomes

The public databases are the main result of the pellets@las project. Produced and consumed volumes, monthly end-consumer prices and information on market participants (e.g. pellet producers and traders; boiler and pelletizing equipment manufacturers) are publicly available.

In addition, the following information is available online:

- Country reports summarizing the collected information for all assessed countries;
- Analyses concerning market development, pellet quality issues, pellet spot markets, future developments and policy recommendations;
- Wood pellet handbooks in several European languages;
- Analyses on international pellet trade and logistics;
- Information on emerging mixed biomass pellet (MBP) markets, including exemplar feasibility studies for MBP production in several European countries;
- Presentations and publications produced by the pellets@las consortium.

3 OVERVIEW: EUROPE 2008

The annual pellet production in Europe amounted to more than 7 million tons in 2008. The data collected during the pellets@las project suggests that even more than 7.5 million tons were produced. However, this data is partly based on estimations and therefore, uncertainties must be considered. Around 60 % of the produced pellets were of high quality, suitable for usage in small-scale residential combustion. Main producing countries are Sweden, Germany, Austria and Italy. The other 40 % were "industrial" pellets of lower quality. Again, Germany and Sweden contribute large shares but also countries such as Belgium and the Eastern European countries (e.g. Poland and Estonia) are important industrial pellet producers.

Even more pellets were consumed in Europe in 2008. The pellets@las data suggests that the total demand in Europe amounted to more than 8.5 million tons. Again, uncertainties occur. Another independent (confidential) study estimates 8.2 million tons. However, it can be estimated that the consumption of high quality pellets in the heat sector (mainly Italy, Germany, Austria, Sweden and Denmark) roughly equals the consumption of industrial pellets by the power production sector (mainly Sweden, the Netherlands, Belgium, UK and Denmark).

In summary, the European demand for high quality pellets is currently covered by the domestic production while the use of industrial pellets partly depends on imports from countries such as Canada and Russia (Figure 2).

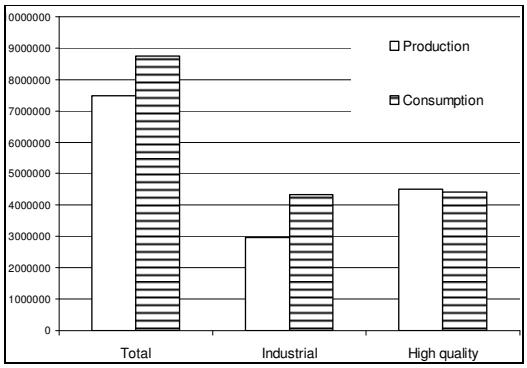

Figure 2: Estimations on total produced and consumed volumes in Europe; Total values are broken down to industrial and high quality pellets; High quality includes pellet consumption for heat production in the medium scale; Data from 2008.

Concerning the future development, the demand for high quality pellets in the residential sector and particularly in the medium scale sector (e.g. community solutions) is likely to continue growing strongly, not only in the traditional markets (Germany, Austria, Italy) but also in currently small markets such as France, Spain and also in Eastern Europe. On the other hand it is unclear how the demand for industrial use (e.g. in CHP applications) will develop. In this sector, growth is anticipated in countries such as Poland but plants using pellets for co-firing are usually very flexible concerning the fuel used. Changes in pellet prices or other factors such as changes in support policies could have large influence on the future demand in this sector.

The uncertain demand development in the large-scale sector is accompanied by an ongoing build-up of additional production capacities for industrial pellets (Canada, USA and Eastern Europe, incl. Russia) while the increasing demand for high quality pellets is challenged by a difficult raw material supply situation in Europe.

Currently, the international trade with high quality pellets is of minor importance. High quality pellets are often exchanged between neighboring countries within cross-boarder retail and logistics networks. Long-distance transports of high quality pellets are rarely reported. The logistics of pellet supply to the residential sector therefore still seems to be mainly based on national or even regional supply chains. Exceptions are the pellet trade from e.g. the Baltic States to Denmark or the pellet transport from various European countries to Italy.

In contrast, the international trade with industrial pellets has reached impressive volumes. One reason for this of course is the fact that large-scale pellet consumption mainly occurs in countries without significant domestic pellet production (e.g. the Netherlands, UK and Denmark).

This picture might change in the future and the long-distance trade with high quality pellets (e.g. from Canada or Russia to Europe) might become necessary.

In the following sections, summaries of selected pellets@las country reports are presented. The full reports and additional information are available at www.pelletsatlas.info.

4 RESIDENTIAL HEATING MARKETS IN CENTRAL EUROPE (AT, DE, CH, FR)

Austria is still the most developed market concerning residential pellet heating. Germany and Switzerland also have strong pellet industries and large consumer numbers but both countries considerably lag behind Austria when per capita values for e.g. consumption are compared. France is only at the beginning of market development.

These four countries have in common that wood pellets are currently exclusively used for heating purposes in the residential sector where central pellet heating appliances combined with loose pellet delivery and storage prevail (Ireland and Luxemburg would fit in here as well). However, in France pellet stoves might be equally important and might become the main pellet appliance in the next years as it is the case in other Southern European countries.

4.1 Austria

In 2008, pellets were produced at 24 sites in Austria. Pellet producers are mainly family-run sawmills whose by-products (Sawdust and wood shavings) are dried and pelletised on the spot. These pellet production plants are predominantly small and medium-sized but are often part of a large company structure. In most cases sawmills are the main business field [1].

In addition, some of the larger Austrian wood processing companies have subsidiaries in Eastern Europe (e.g. Romania and Slovakia) where they produce high quality pellets for the Austrian market.

The pellet production capacity increased from 410,000 tons in 2004 to 980,000 tons in 2008 which is nearly twice as high as the domestic demand in 2008 (510,000 tons). The real production amounted to 626,000 tons. For 2009 and 2010 the start-up of 7 more pellets plants is planned. Currently, the over-production is mainly bagged and exported to Italy.

The competition for raw materials intensifies due to a significant decline in timber sales. For that reason a number of producers are starting to use cutter chips for pellets production and some have made their production ready to convert wood logs into pellet feedstock.

This of course also affects end-consumer prices (Figure 3). While pellet prices were comparably low in 2007 and 2008, price levels are high in 2009. In an interview, an Austrian pellet producer stated that 70 % of the pellet production costs are spent on raw materials when pellets are produced from wood chips [2].

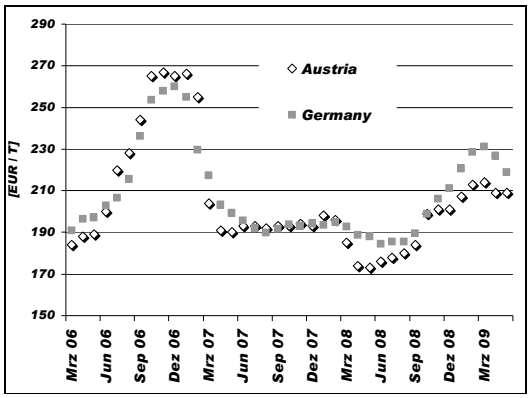

Figure 3: Pellet price development in Austria [3] and Germany [4]; Loose delivery of 5 tons; incl. transport of max 50 km; incl. VAT; ÖNORM M 7135 or DINplus.

In Austria the pellet consumption market is mainly confined to the residential sector. With the end of 2008 nearly 63,000 boilers (automatically stocked; heat output of up to 50 kW) were installed in total. Until now, pellet stoves are of minor importance. Consequently, wood pellets are mainly traded in bulk and delivered by blower lorries.

4.2 Germany

The German pellet market is in many respects similar to the market in Austria [5]. This is particularly so in relation to consumption, which displays the same structure with the exclusive use of pellets for heating, mainly delivered in bulk to households (In 2008, around 140,000 boilers, incl. central heating stoves were installed in total [6]).

With an annual pellet production of 1.46 million tons in 2008 and a production capacity of 2.4 million tons, Germany is considered to be one of the largest pellet markets [6]. However, with a pellet use of around 11 kg per person per year (50-60 kg in Austria), there seems to be potential for further market development.

After the boom years 2005 and 2006, when 17,000 and 26,000 pellet heating systems were sold in Germany per year, supply shortages and a rise of prices occurred in the winter of 2006/2007. The resulting loss of consumer confidence cooled down the market in 2007 so that only 13,000 pellet heating units were sold. The number of new installations increased again to 23,000 in 2008 [6].

In 2008, 50 wood pellet producers were registered by the pellets@las project. However, there are certainly a

number of non-registered small-scale producers. The total number of pellet producers might be around 70.

Around 70 % of the registered companies produce in a small scale with production capacities of less than 30,000 tons per year. On the other hand, the large-scale producers (capacity: > 70,000 tons per year) represent around 60 % of the total pellet production capacity installed in Germany.

Small and medium-scale producers can be agricultural drying collectives and wood processing companies that use residuals for pellet production. Another type are small or medium companies that buy their raw materials from wood processing industries in their vicinity. Both types often operate their own regional distribution system and in some cases a brand name is used. In the small and medium scale there is a tendency towards forming networks. Several independent sites produce for a distribution network that sells pellets under well-established brand names. These networks can operate on regional or national level. The network not only provides the brand name and corporate identity but also a fleet of blower lorries and a network of retailers. Sometimes also a network of storage facilities is provided.

In the large scale, only three sites are known that are operated by wood industry companies. The other large-scale producers are dedicated pellet companies.

At least 90 % of the total pellet production capacities are certified for the production of DINplus pellets and it can be assumed that most of the pellets consumed in Germany are DINplus certified (around 900,000 tonnes in 2008, [6]). At least another 600,000 tonnes were exported in 2008. This fraction probably was of lower qualities, certainly those exported to be burned in large co-firing plants in Scandinavia, Belgium and the Netherlands.

In 2008, saw dust and chippings were still the mainly used raw material for pellet production in Germany. It can be assumed that small and medium scale producers mainly use these side-products, especially when they are operated in combination with other wood processing sites. However, it can be observed that a number of larger pellet producers broadened their raw material base in 2008 and used chipped wood as a major raw material source. This was inevitable in order to avoid raw material shortages in some areas. Some companies are also actively preparing for the use of short rotation wood in the near future.

The effect on end-consumer prices is the same as in Austria and shown in Figure 3.

4.3 Switzerland

Switzerland is considered one of the smaller and less developed pellet markets [7]. This is true when only absolute numbers are taken into account: The Swiss association “Holzenergie Schweiz” [8] estimates the installed production capacities at 170,000 tons and the consumption in the winter of 2008/2009 at 90,000 tons [9]. However, considering the resulting per capita values of pellet consumption of almost 12 kg per person, Switzerland becomes comparable to Germany.

Similar to Germany and Austria, wood pellets are mostly used in small scale applications for heating purposes in the residential sector. This market has great potential due to good raw material availability and a professional wood energy image campaign organized by “Holzenergie Schweiz”. The pellet trading infrastructure is well developed and end-consumers are supplied reliably.

One difference to Germany is that there are no large pellet producers (> 100,000 tons per year). Pellet production takes place mainly at wood processing businesses that use their own by-products. Consequently, there are a number of small producers (< 10,000 tons per year) and two medium scale producers of which one buys raw materials for pellet production. Some of the producers will expand their capacities while all of them state that their current capacities are not fully used.

Nevertheless it is estimated that 10 – 20 % of the domestic demand is satisfied by imported pellets [9]. This can be explained by looking at the price development of pellets. The prices as evaluated by the organisation “Transan” [10] show relatively stable prices with reasonable fluctuations between summer and winter. The price in February 2008 was the same as it was in February 2009. Looking at the same prices converted to EUR shows that due to fluctuations of exchange rates the prices for wood pellets rose by € 20 per ton within one year and are extraordinary high compared to prices e.g. in Germany. Therefore pellets import to Switzerland becomes attractive.

4.4 France

The large potential for pellet production and consumption in France is not reflected by the comparably slow market development. On the other hand, the slow growth in France avoided inconsistencies concerning pellet supply [11].

The climate in France is variable depending on the region which offers opportunities for both pellet boiler and stove usage. Barriers to stronger growth in this sector are that the use of wood for energy purposes does not have a strong tradition in urban and sub-urban areas and that the prices for electricity and gas are regulated at a comparably low level. Furthermore, pellet appliances are produced only by a few companies in France and installers (who are a main driver in other countries) do not promote pellet heating systems. In 2008, the total pellet consumption in France was 193,000 tons. This is accounted for exclusively by the residential sector since pellet use for power generation is not reported.

This demand is satisfied by around 30 small and medium scale companies who produced around 210,000 tons in 2008. They can be saw millers or feed producers but more recently, also dedicated pellet producers are emerging who collect raw materials from a number of small saw mills.

The quality of French production was heterogeneous in the past and did not promote a good development of the market. An important evolution has occurred and most of the current producers are in the process of quality certification. Since early 2009, French standards are now also available, associated to the brand name "Norme Française" better known by the French consumers than the German DINplus. This development is also supported by the newly founded French pellet producer organisation (SNPGB: *Syndicat National des Producteurs de Granulés de Bois*).

France imported around 20,000 tons of wood pellets last year (from Germany, Spain, etc) and exported around 35,000 tons to Italy, UK and some other countries. French production is currently mostly dedicated to serve

the French market, imports and exports acting more as balancing tools between offer and demand.

5 SCANDINAVIA (SE, DK)

Scandinavia is characterised by heterogeneous market development. Currently, Sweden is the only country in Scandinavia with a significant domestic pellet production industry. Pellet production in Denmark is limited by the availability of raw materials and pellet production capacities in Finland are just about to be increased.

Denmark and Sweden belong to the largest pellet markets worldwide regarding per capita pellet consumption and in both countries, pellets are used for the whole spectrum of scale.

The pellet market in Norway is currently of minor importance while the market in Finland is rapidly developing towards a significant size (
Figure **4**).

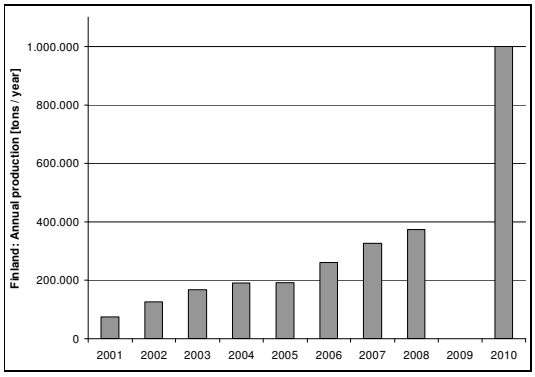

Figure 4: Development of pellet production in Finland (2001 – 2008: [12]; 2010 estimated based upon planned additional production capacities [13]).

5.1 Sweden

The Swedish wood pellet market is one of the worlds largest and especially in relation to the number of inhabitants the consumption of wood pellets is enormous [14], [15,] [16], [17]. In 2008 the total consumption was around 1.85 million tons [18].

Strong drivers provide for wood pellets being used in all sizes of combustion plants from small boilers in single family houses (680,000 tons, [18]) and small heating centrals for multi-unit dwellings, public service buildings and industry over medium sized district heating plants up to large power plants producing power and heat for large district heating systems.

In 2008 around 120,000 households had pellet boilers. Another 20,000 had pellet stoves. In addition, around 4,000 medium sized boilers were in operation in Sweden.

Large scale consumption of pellets takes place in large district heating plants and CHP plants. These plants have gradually reduced their consumption of fossil fuels during the 1970-90'es due to energy taxes on fossil fuels. Many district heating plants switched from combustion of oil to coal, and after the introduction of the CO_2 emission tax in 1991, they are now switching from coal to biofuels, such as pellets.

Currently around 94 companies/plants produce pellets in Sweden. The capacity is currently increasing as large market actors - energy companies and paper companies - are commissioning facilities each with capacities over 100,000 tons. In 2008, the total installed capacity was around 2.2 million tons and the actual production was around 1.5 million tons. Production is to a large extent based on residues from the numerous wood processing industries. Even though some producers are experiencing decreasing production due to changes in the feedstock availability the capacity is expected to increase in the years to come.

As mentioned above the Swedish wood pellet manufacturing companies vary in size and comprise small, locally based pelletising plants as well as large dedicated pellet plants.

Apart from being a large manufacturing country, Sweden also is a large wood pellet importing country. For the last five years, Sweden has imported between 300,000 and 400,000 tons per year. The pellets are mainly imported from Canada, Poland, Finland and the Baltic Countries.

Some Swedish manufacturers also export pellets. Up to 150,000 tons per year have been exported during the last years - the majority being shipped to Denmark and to the United Kingdom.

Pellet prices in Sweden have remained constant at a high level for a long period and have not been sensitive to the changing crude oil prices during 2008. From the end of 2008 the pellet industry has seen increasing prices of around 13 percent [18].

With an annual wood pellet consumption of 1,850,000 tonnes and a population of 8 million, the per capita wood pellet consumption in 2008 exceeded 230 kg per person. Although this figure provides evidence for the mature character of the Swedish pellet market, there is still a high potential for the market to grow.

The growth will take place in the residential sector and in medium sized industrial heating appliances, while in the utility sector wood pellets seems to be replaced by other solid biofuels.

The growth in the Swedish wood pellet market is expected to mainly be supplied via domestically produced pellets. The sector is furthermore expected to grow to export for the increasing pellet demand elsewhere in Europe.

5.2 Denmark

The Danish wood pellet market belongs to the largest worldwide. Similar to the situation in Sweden, wood pellets are being used in all sizes of combustion plants: Small boilers in single family houses, small block heating centrals, medium sized district heating plants and large power plants producing power and heat for large district heating systems [19].

More than half of the residential heat demand in Denmark is supplied via district heating. The utilisation of wood pellets started in the district heating sector in the late 1980's and the annual pellet consumption quickly reached around 100,000 tonnes and since the beginning of the 1990's this has been the consumption in the district heating sector.

The wood pellet consumption in individual boilers for space heating in private dwellings, public institutions and other large buildings also increased rapidly. The drivers would be biofuel tax exemption in combination

with high taxes on fossil fuels for heating purposes and from 1995 a subsidy scheme for wood fired combustion systems with a nominal capacity below 250 kW. Since spring 2007 the pellet prices in Denmark have remained constant at a level which is low enough to encourage consumers to change for pellets and high enough to be attractive for suppliers.

Based on a variety of drivers parts of the Danish utility sector started to show interest in co-firing wood pellets into coal fired dust burners in the beginning of the new century. This resulted in a significant amount of wood pellets being utilised mainly in the advanced Avedøre 2 power plant south of Copenhagen. In the near future other large plants will follow.

Wood pellet production in Denmark is to a large extent based on dry wood residues from the numerous wood processing industries. Only recently some manufacturers have invested in facilities for drying feedstock. A utility based large pellet production plant was commissioned in 2003. The capacity of the plant was 180,000 t/y wood pellets based on logs and wood chips from a nearby wooden floor manufacturer and 120,000 t/y straw pellets. Currently, the wood pellet part is closed down and the equipment is for sale.

In the beginning of the century the national production capacity and the actual production of around 200,000 t/y was able to cover half of the demand. Currently the production is decreasing due to changes in the feedstock availability and as the demand has increased rapidly, Denmark has become a large importing country.

6 INDUSTRIAL PELLET USE (NL, UK)

In addition to Sweden and Denmark, Governmental incentives and obligations have lead to the use of wood pellets in co-firing in countries such as the UK, the Netherlands, Belgium and others like Poland.

Apart from this, pellets are hardly used for other purposes (i.e. residential heating) in the UK and Netherlands and also the domestic production in these countries is rather marginal (as in Denmark) so that large quantities of pellets have to be imported.

In contrast, Belgium is developing a considerable residential pellet heating market (more than 100,000 tons consumed in 2008) besides the enormous pellet co-firing market (around 800,000 tons consumed in 2008) [20].

6.1 The Netherlands

The Dutch pellet market is characterised by minor domestic production at only a few production sites (production capacity: 130,000 tons in 2008), a negligible market for domestic pellet heating and a large demand for wood pellets for co-firing in coal fired power plants [21].

Production is mainly hampered by the lack of raw material, because most sawmill residues have a dedicated use in Belgian particle industry or in the extensive Dutch dairy sector while the development of a residential pellet heating market is hindered by lacking policy support for residential pellet boilers and the nation-wide availability of cheap and domestically produced natural gas and advanced gas boilers.

Wood pellet consumption has increased from less than 200,000 tons in 2002 to over 900,000 tons in 2008. The use of wood pellets for co-firing started in the late 1990s, when the utilities started to use larger amounts of biomass for permanent co-firing. After 2000, all production companies intensified their co-firing activities, the main reason being a covenant between the power producers and the Dutch Ministry of the Environment (2002) and beneficial policy support schemes for the production of renewable electricity from biomass. The MEP ("Environmental quality of the electricity production") feed-in premium, which was in place between 2003-2006 provided a subsidy of between 6 to 7 €ct per kWh electricity produced from clean woody biomass.

Co-firing capacity is still eligible for MEP support. The government, however, has limited its long term support to a maximum of 10 years. Because most contracts were made for the full period of ten years, it is likely that current wood imports and co-firing levels can be maintained up until 2012. After 2012, when first contracts from 2003 will be terminated, a starting decline in the consumption of wood pellets is expected, unless new subsidy schemes are put in place in the meantime.

Given the large contribution of wood pellet co-firing to the overall Dutch renewable electricity production, it is likely that a new instrument will be devised to continue the use of wood pellets.

However, as wood pellet co-firing requires very little investment costs, and depends largely on the costs of wood pellets and the cost of coal (the fuel to be substituted), it is questionable whether the currently applied SDE support system (*stimulering duurzame energie:* feed-in premium for renewable electricity, currently not promoting pellets) will be used to stimulate future wood pellet use.

Alternatively, this could also be achieved by obliging power companies to produce a minimum share of renewable electricity from biomass. It is expected, that during 2009, more clarity on this issue will be provided by the Ministry of Economic Affairs.

Until then, the main barrier for further increase in wood pellet consumption is the uncertain future policy support. Based on the current long term grants until the period 2012-2015 (inherited from 2003-2006 governmental obligations), it is expected that current wood pellet consumption may remain more or less stable until 2012.

Today, more than 95% of all wood pellets consumed in the Netherlands are co-fired in large coal power plants. While the maximum theoretical co-firing capacity is not yet reached, the market is quickly getting mature. In about 6 power production units, wood pellets are co-fired (between 1% and 20% of total input). The substitution happens only at co-fired power plants. On average 2.8% of coal (in terms of electricity production) is substituted by wood pellets in 2008. The largest single consumer by far is the utility Essent, which has co-fired several hundred thousand tonnes of wood pellets annually at its Amer coal power plant. Furthermore, another large scale consumer has switched since the 1st quarter of 2008 from waste wood to wood pellets. In total, electricity consumption in the Netherlands in 2008 was about 119,000 GWh and the contribution of power production from wood pellets is about 1,700 GWh (CBS Statline 2009).

In order to satisfy this demand the Dutch utility sector started to import large amounts of pellets from e.g. Eastern Europe or North America. The wood pellets are

handled almost exclusively in bulk. Typically, they are imported by large dry bulk carriers to harbors such as Rotterdam and Amsterdam, where they are transferred to smaller river barges, which transport the pellets to the final consumer, large coal power plants.

The Dutch ports of Rotterdam, Amsterdam, Flushing and Delfzijl/Eemshaven have a clear interest to become bioenergy-hubs, a scenario which is not unlikely. With increasing amounts of wood pellets being imported form North America (but possibly also from other continents), and raw material becoming scarce in North-West Europe, it is foreseen that e.g. the Rotterdam harbor could become a major hub where wood pellets are transferred from large ocean-going dry bulk carriers to smaller river vessels and coasters.

6.2 United Kingdom

Having started in the late 1990's the pellet market in the UK is beginning to reach a developed stage, with approximately 68 suppliers of pellets and 13 manufacturers (the first of whom started manufacturing in 2002) [22].

Pellet production and use remained relatively small in the UK until the commissioning (in 2005) of the Balcas Ltd pellet plant at Enniskillen in Northern Ireland with a production capacity of 50,000 tons (now increased to 55,000 tons). This combined with the introduction of a number of grant programmes has meant that the pellet market really started to gain momentum in the UK from 2006 onwards. However, the potential for further development of UK based pellet production is limited due to a lack of raw materials.

Consumption of pellets in the UK occurs on both the large and small scale. On the small scale pellets are consumed by householders and on the large scale they are co-fired in power stations for the production of electricity. What pellets are not generally used for in the UK is the production of heat and power in Combined Heat & Power Plants and for the production of heat in District Heating schemes, both of which are relatively rare (especially fuelled by biomass).

The consumption of high quality pellets in the residential sector is marginal so that significant amounts of these pellets are exported to e.g. Ireland or Italy. On the other hand large amounts of wood pellets are used for co-firing (around 750,000 tons in 2008). This development was driven by the Government's targets for the generation of electricity from renewable sources, as implemented through the Renewables Obligation. This will continue to be a driver for the use of pellets in co-firing although their use in existing coal fired power stations might start to tail off as the value of the ROCs (Renewables Obligation Certificates) from burning non-energy crop pellets are reduced and existing coal fired power stations close down rather than implement the environmental reforms required by the Large Plant Directive from 2015.

The largest share of pellets co-fired in the UK is imported. It is difficult to determine trade patterns for co-firing since imported feed stocks are typically purchased on spot markets and operators have the ability to switch between different suppliers and different feedstocks to pursue best value for money. However, it is clear that pellets are imported from the Baltic States, but possibly also from other European countries (e.g. Germany) and North America.

Looking forward the main driver for residential market development is likely to be the Renewable Heat Incentive which has been proposed by the UK Government for implementation in 2010. Set at an appropriate rate, for a reasonable length of time, it should act as a major incentive to prospective customers for pellet fuel systems as it will help compensate them for the additional costs involved in having such a system installed as against the cost of having a gas or oil boiler installed.

7 SOUTHERN EUROPE (IT, GR)

Pellet market development in Southern Europe is generally hampered by limited availability of raw materials and a lower heat demand in households due to warm climates. The use of high-tech pellet central-heating appliances does not seem to be feasible in these countries. However, the market in Italy has shown the potential of pellet stove heating under these conditions but also that domestic pellet production in these countries cannot fully cover a large demand.

Other countries in Southern Europe (Greece, Spain and Portugal) are currently developing production capacities. Produced pellets however, are still exported due to a lacking domestic demand.

7.1 Italy

The Italian wood pellet market developed almost exclusively for domestic heating with pellets typically packaged in small bags (15 kg) [23]. This market has experienced a fast growth since around 2000. The annual pellet consumption in Italy has grown from 150,000 tons in 2001, to at least 800,000 tons in 2008. However, other sources estimate the consumption in 2008 at around 1.1 million tons [24].

The prevailing pellet appliances are pellet stoves and Italy has become the biggest pellet stove market in Europe, with an estimate of 700,000 units sold until 2009.

Also the production has constantly grown from 160,000 tons in 2001 to approx. 650,000 tons in 2008. A large number of small to medium size producers is active in Italy. Currently more than 90 companies produce pellets but only 20 of them exceed an annual production of 5,000 tonnes. Most of them started their activity using own sawmill waste (sawdust, shavings etc.) as raw material and selling the pellets in their region. Now they are experiencing a shortage of raw material and they are forced to import wood, especially from the Balkans (e.g. Romania and Bulgaria) or pellets from Austria, Slovenia and a number of other countries.

In summary, Italy is not only the most important market (and an important producer) for pellet stoves but also the largest (import) market for bagged pellets.

7.2 Greece

Greece is one of the less developed pellet markets in Europe. The total production during 2008 was around 30,000 tons, while the installed production capacity was 87,000 tons. The first production plant started in 2006 and six more producers started pellet production in the meantime. Two more companies are planning to start pellet production in 2009 [25].

However, there is currently no residential pellet heating market and only a marginal use of industrial pellets so that Greek producers are trying to export the largest share of their product, Italy being the most important import country.

8 EASTERN EUROPE (BG, CZ, HU, PL)

Pellet markets in Eastern Europe are generally characterised by insignificant domestic demand and small but rapidly growing pellet production. This means that, at the moment, most of these countries are exporting the largest share of their production to better developed pellet markets.

However, the demand side at least in some countries (e.g. Poland) is foreseen to catch up regarding both residential and industrial use of pellets.

The situation in Eastern Europe shall be described for four exemplar countries in the following sections.

8.1 Bulgaria

The wood pellet market in Bulgaria is just starting to develop. Domestic consumption is mainly hindered by high investment costs in pellet appliances. Accordingly, the pellet consumption in the residential sector is insignificant. Few pellets are sold in small bags either directly at the pellet plants or through retailers. Prices for bagged pellets were slightly above € 150 per ton in early 2009 (excl. transport, incl. VAT). There is no market for loose pellets and also pellet use in large-scale applications is negligible [26].

Pellets are produced by 14 small-scale manufacturers with a total estimated production capacity of about 54,000 tons/year. Since the domestic demand is small, 80-90 % of the pellets are exported, mainly to Italy by truck transport.

Due to the existence of a well-developed wood processing industry and the abundance of unused quantities of dry wood shavings it is expected that pellet production and use will gain speed in the next years. Furthermore, with the "National Long-Term Programme to Encourage the Use of Biomass for the Period 2008-2020" the Council of Ministers through the Minister of Economy and Energy established a favourable policy framework to support further growth of biomass (and pellet) use for energy purposes.

8.2 Czech Republic

Currently 7 companies in the Czech Republic are producing pellets as their primary activity. Pellets are also produced by a few companies for which the pellets production is of marginal interest and which usually use residues from their wood or agricultural production [27].

The total installed production capacity in 2008 is estimated at almost 150,000 tons, the actual production at almost 100,000 tons [28]. In addition, some manufacturers produce agropellets.

Wood pellets are produced with very high qualities and some manufacturers possess the certificates Önorm M 7135 or DINplus. High qualities are necessary to allow for the export of pellets, mainly to Germany and Austria. Only approximately 10% of the total pellets produced in the Czech Republic are used in the domestic market. For large-scale combustion mainly agropellets are considered.

For the domestic market, pellets are mainly bagged (small and big bags). High investment costs for residential pellet boilers are the main barrier to market growth in the residential sector. Other obstacles for the expansion of the pellets market are the fluctuation of the pellet prices, missing distribution channels and missing delivery systems to small customers.

However, further strong market growth is supported by the national policy framework: A RES Electricity Act facilitates the use of biomass (often agropellets) in CHP plants and the installation of small-scale pellet appliances as well as the investment in pellet production plants is subsidized.

8.3 Hungary

The pellet market in Hungary is one of the smallest in Europe [29]. There is no significant domestic demand (Some hundred pellet appliances installed in 2008) and the production of pellets is just starting. In 2008, only 5000 tons were produced and a significant share of this was agripellets [30]. Especially in South-Eastern Hungary, the production of pellets from mixed biomass might play a role in the future.

A positive step towards further development was the foundation of the Hungarian Pellet Association in 2008 [31]. According to this source, a number of additional pellet plants are being developed so that Hungary's production will multiply in 2009. One of these projects alone will establish additional production capacities of 80,000 tons.

8.4 Poland

Pellets production, mainly for the export, has started in Poland in 2003. In 2008, the installed production capacity already amounted to 665,000 tons and the production to 350,000 tons. Around 20 pellet producing companies are operating in Poland. Most of them work with capacities below 30,000 tons [32].

With a total domestic consumption of around 120,000 tons, Poland was a large pellet exporting country in 2008. This might change in the future since the pellet demand in Poland is increasing rapidly both in the residential and in the industrial sector. Currently, there is a legal duty concerning obligatory production of "green energy" (both heat and electricity) which results in the increased interest of both district heating companies and CHP plants in biomass utilization.

A new regulation given by the Ministry of Economy (dated 14 August 2008) states, that energy producing units (5-20 MW) claiming to produce (partly) renewable electricity in co-generation have to assure that agricultural biomass (energy crops, agricultural residues and residues coming from food processing industry) cover at least 5% of the energy produced (2008). This share is supposed to grow constantly up to 100 % in 2015. Similar regulations exist for larger plants (> 20 MW).

9 SUMMARY

As it was shown in this article, the European pellet market is characterised by heterogeneity at several levels: Mature markets have developed in Central and Northern Europe while pellet markets in e.g. Eastern Europe are just starting to develop.

In addition, the consumption structure varies largely. While in some countries (e.g. Austria and Germany) wood pellets are exclusively used in residential heating, they are mainly used for electricity production in other countries (e.g. the Netherlands). In Sweden and other countries, both usage types are developed equally.

Countries where the pellet production is significantly higher than the domestic consumption (e.g. Germany and countries in Eastern Europe) became pellet exporters to countries with a net pellet demand such as the UK.

A common characteristic of all pellet markets in Europe is the ongoing rapid growth on the demand and supply sides that even occurs in mature markets. On the other hand, the availability of raw materials becomes more and more limited due to the competition with other industries. This effect is currently intensified following the low activity of the construction sector and other wood processing industries and, as a consequence, decreased timber sales.

Even if the recovery of these industries can be foreseen, the European pellet industry will have to meet two major challenges in order to provide for further market growth.

Firstly, a broader raw material basis is necessary to increase pellet production in Europe. Further R&D effort is needed to facilitate the use and to show the environmental and economical viability of alternative wood and non wood feedstocks. Namely, forest thinnings, wood chips, short rotation coppice, agricultural residues (e.g. straw) and dedicated herbaceous energy crops are considered.

Secondly, pellets are traded internationally in significant amounts already today. With growing demand this source of pellet supply will gain importance. Reliable and cost-effective trading schemes need to be developed in order to ensure stable pellet markets in Europe.

Above all, the sustainability of all current and future supply chains needs to be assessed. Trading schemes and production systems that are environmentally or socially harmful must be avoided.

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