The Danish wood pellet market 2010

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Queries concerning methods and calculations should be addressed to the Danish Energy Agency, Statistics Section, statistik@ens.dk. For further information, see

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Contents

1 Introduction

This market overview provides a detailed description of supply and consumption of wood pellets in Denmark in the calendar year 2010.

The supply of wood pellets is described as:

- Domestic production
- Changes in stocks
- Imports/exports

The consumption of wood pellets has been divided into the following segments:

- Combined heat and power plants and heating plants
- Manufacturing industry
- Public service (public buildings)
- Single family houses

Information for the market overview comes from three studies:

1. A questionnaire study of Danish producers, importers and distributors of wood pellets (in the following "distributors")
2. An import enquiry to a selection of Danish heating plants and CHP plants using wood pellets as fuel (in the following "plants")
3. Energiproducenttællingen 2010 (the annual electricity and heat survey)

The questionnaire study regarding distributors has contributed with information on supply and sales of wood pellets. The wood pellet supply is calculated on the basis of information from individual distributors on production, imports/exports and changes in stocks. The distributors have also provided information on the breakdown of wood pellet consumption by market segments: Heat and CHP plants, Manufacturing industry, Public service (public buildings) and Single family houses. A total of 186 questionnaires were sent out to importers, producers and distributors. Of these, 62 questionnaires were answered, and approx. 21 were discarded as no longer being in the sector, duplicates or as closed down.

Participants took part in the study anonymously.

2 Method

A database was developed that covers as many Danish distributors as possible, including producers and importers of wood pellets.

Address information for distributors who do not import or produce themselves, was retrieved from the internet and through industry contacts. However, since this group is not decisive for determining the level of consumption, less emphasis was put on the completeness of this list and on ensuring a high response rate.

Conversely, it is important to include distributors which import or produce, as this supply determines the total Danish supply, and thus consumption. Therefore, work concentrated on ensuring that this part of the list was complete and that everyone responded. By means of telephone interviews, the aim was a response rate of close to 100 for these.

Selected heating plants and CHP plants were contacted to investigate whether these import pellets themselves, and thereby contribute to the national supply. Import enquiries for plants have supplied additional information on any imports to and resale of wood pellets from the plants. The 11 plants with the largest consumption of wood pellets (all over 3000 tonnes of wood pellets per year) were selected for the study as any imports at smaller plants were of limited significance in the overall picture.

The total supply was measured as imports and production adjusted for exports and larger movements in stocks. After this, the supply was assumed to be equal to the total Danish consumption.

The source of the consumption of wood pellets in CHP and heat plants is the annual electricity and heat survey (Energiproducenttællingen) drawn up by the Danish Energy Agency. The consumption outside the transformation sector is defined as total consumption according to this biannual wood pellet survey minus the consumption in CHP and heating plants.

Finally, consumption outside the CHP and heating plants was split into Manufacturing industry, Public service and Private consumers, respectively. This breakdown was based on a percentage analysis of the market which was estimated on the basis of either estimated or recorded breakdown by all distributors in the three sub-markets.

This partly estimated breakdown between Manufacturing industry, Public service (public buildings) and Single family houses entails some degree of uncertainty, which in previous studies in 2001, 2004, 2006 and 2008 has caused consumption to fluctuate somewhat from year to year, especially in the two small categories; Manufacturing industry and Public service. In this year's study, a more stable breakdown between the three sectors has been chosen at 8%, 7% and 85%, which is also proposed for future breakdowns. The figures are partly based on this year's breakdown as provided by the distributors. However, the breakdown of previous years has also been taken into consideration when determining this new standard breakdown.

3 Wood pellet supply

The wood pellet supply is calculated as the sum of domestic production, the difference between imports and exports, and changes in stocks at Danish distributors. The statistics has been based on the replies received, and measures were taken to secure replies from all known producers and importers of wood pellets. This means that the supply aspect is (almost) covered) completely by the study.

In 2010, the total supply of wood pellets was 1,718,976 tonnes. This is 4.3 times more than in 2001.

	Domestic production		Imports		Exports		Reduction of stocks		Total supply	
	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%
2001	173,073	43%	200,871	50%	0	0%	27,347	7%	401,291	100%
2004	187,458	26%	470,588	64%	-795	0%	73,883	10%	731,134	100%
2006	137,080	15%	841,132	94%	-17,948	-2%	-64,468	-7%	895,796	100%
2008	134,280	13%	925,401	87%	- 41,149	-4%	40,987	4%	1,059,519	100%
2010	**137,622**	**8%**	**1,568,952**	**91%**	**-63,386**	**-4%**	**75,788**	**4%**	**1,718,976**	**100%**

Table 1: The Danish wood pellet supply

3.1 Production

Table 1 shows that the production of wood pellets fell from 43% of the total supply in 2001 to 8% in 2010.

In 2010, ten Danish wood pellet producers produced 137,622 tonnes. This approximately corresponds to the same production as two years before, however from two producers fewer.

Domestic production varies considerably from year to year, and particularly within the past six years, the production has been affected by the launch and subsequent shutdown of a very large factory situated in Køge Harbour south of Copenhagen. There are frequent changes in ownership in the sector, and many bankruptcies. Furthermore, there is a trend that new factories, that are currently emerging, are based on wet raw materials (fresh wood), which include installations for drying the wood on site. In absolute figures, current production has fallen by approx. 40,000 tonnes compared to 2001. For the production based on dry raw materials, the current level is limited by the producers' lack of access to raw materials (sawdust and chips from the timber industry). Danish furniture production is suffering during the financial crisis and much of the production has been moved abroad, which means that this part of wood pellet production has not increased.

Table 2 shows a breakdown of the size of producers, and the amount of wood pellets produced by each producer group.

	Producers > 20,000 tonnes			Producers < 20,000 tonnes			Total production		
	Tonnes	%	Numbers	Tonnes	%	Numbers	Tonnes	%	Numbers
2001	168,450	97%	3	4,623	3%	3	173,073	100%	6
2004	166,558	89%	4	20,900	11%	4	187,458	100%	8
2006	91,295	67%	2	45,785	33%	6	137,080	100%	8
2008	85,000	63 %	2	49,280	37 %	10	134,280	100%	12
2010	**92,715**	**67%**	**2**	**44,907**	**33%**	**8**	**137,622**	**100%**	**10**

Table 2: Production by size of producer

The small producers are more or less as significant in the total supply as in previous years. Of the total of ten producers, four produce less than 1000 tonnes per year. Therefore, it is the six remaining producers are actually significant in relation to the total production.

3.2 Imports

In 2010, imports were 1,568,952 tonnes or round figures and not including exports (net imports) 1.51 million tonnes.

The figure for imports can be verified from Statistics Denmark's foreign trade statistics. Imports of wood pellets in 2010 are calculated as 1.44 million tonnes or 1.41 million tonnes after deduction of exports. Foreign trade in this statistic does not include private imports mentioned below; here estimated at 0.06 million tonnes.

Imports have increased considerably in the past 10 years. In 2001, imports were at about 200,000 tonnes. During the last two years, imports have increased by more than 0.5 million tonnes. Today, 91% of the total supply of wood pellets comes from abroad.

The trend in imports and domestic production over a longer period of years, cf. figure 1, shows that the Danish supply of renewable energy has become deeply dependent on imports.

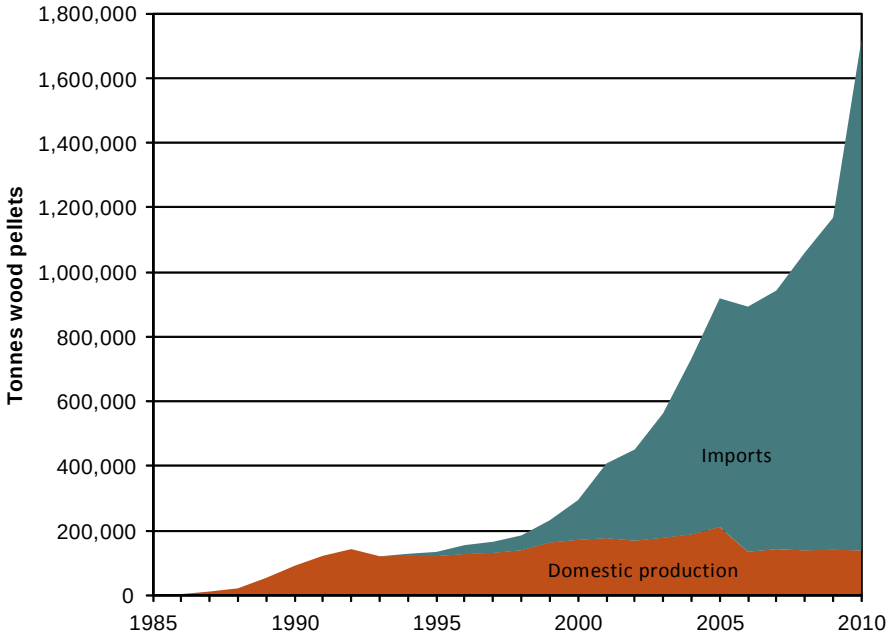

Figure 1: Domestic production and imports of wood pellets to Denmark from 1985 to 2010.

There were 33 Danish importers of wood pellets in 2010, as opposed to 26 in 2008, 37 in 2006, 29 in 2004 and 17 in 2001.

The trend signifies a continued market consolidation for the large importers. Table 3 shows that the 14 largest importers, which each purchase more than 20,000 tonnes per year, accounted for 94% of total imports in 2010. Four large importers accounted for 79% of total imports in 2001.

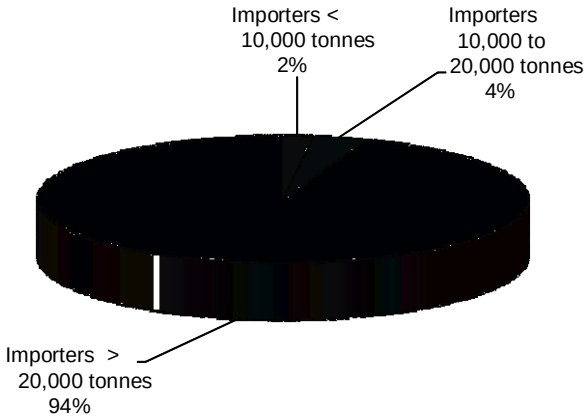

Figure 2: Imports in 2010 by size of importer

The market shares of the smaller importers are decreasing. However, the list of importers shows that new importers are still entering the market.

	Importers > 20,000 tonnes			Importers between 10,000 and 20,000 tonnes			importers < 10,000 tonnes		
	Tonnes	%	Numbers	Tonnes	%	Numbers	Tonnes	%	Numbers
2001	159,180	79%	4	10,000	5%	1	31,691	16%	12
2004	392,475	83%	6	51,500	11%	4	26,613	6%	19
2006	743,173	88%	8	56,273	7%	4	41,666	5%	25
2008	810,439	88%	8	95,148	10%	7	19,814	2%	11
2010	**1,482.197**	**94%**	**14**	**55,000**	**4%**	**4**	**31,755**	**2%**	**15**

Table 3: Imports by size of importer

Imports broken down by country are shown in figure 3, from which it appears that about 40% of imports come from the Baltic States. The figures comprise all imports to Denmark, including imports from Danish-owned production plants abroad. The figures are based on importers' breakdown percentage of imports by country of origin. Virtually all importers have been able to provide this breakdown; however, data could not be retrieved for a small number of enterprises and there is therefore slight uncertainty associated with the breakdown.

The category "Others and not broken down" includes this data.

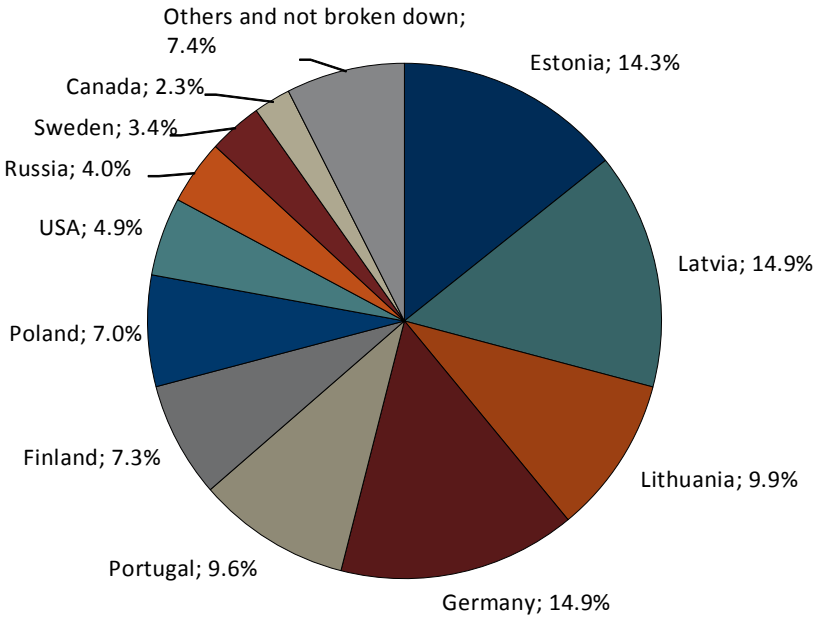

Figure 3: Imports in 2010 by country of origin

Other countries that supply small quantities for the Danish market are: Ukraine, Belarus, the Netherlands, the UK, Argentina, Norway and Indonesia.

The study mentioned above by Statistics Denmark of foreign trade also provides a breakdown by country of origin. The figures here are roughly consistent with the present study. However, according to Statistics Denmark, imports from Germany are smaller and imports from Russia are larger. It should be noted that the country of origin is uncertain due to, among other things, resale from one country to another.

3.3 Private imports (border trade)

In recent years, it has become increasingly popular among private consumers to buy wood pellets in Germany. The reason for this trend is the difference in VAT between Germany (7%), and Denmark (25%). For private imports, the buyer contacts a distributor in Germany to buy pellets. Then the buyer arranges for the pellets to be transported to their home address in Denmark, because legislation on distance selling stipulates that the seller must not arrange the transport, if the sale is to be completed with German VAT.

Incomplete research of wood pellets distributors in northern Germany shows that there are at least 10 distributors marketing wood pellets in Danish.

This trend results in reduced sales in Denmark and is likely to contribute to the fact that Danish distributors, trading with Danish VAT, have had to close down.

In the statement of imports to Denmark in 2010, these private imports are estimated at 60,000 tonnes. This figure is very uncertain, because this type of private purchase is not ordinarily included in any statements. The estimate is based on interviews with industry players who have a feel for the size of the turnover of these northern-German distributors.

3.4 Exports

As in previous years, there is a small export of wood pellets from Denmark. In 2010 this was about 63,000 tonnes in total, a slight increase compared to previous years.

Danish enterprises are active in the international market for wood pellets. Several Danish enterprises buy and resell pellets to for example power plants and distributors in other EU countries. This trade, most of which is measured in several hundreds of thousands of tonnes, has not been registered in this statement, because the pellets do not physically come to Denmark, but are solely traded through a Danish company.

3.5 Changes in stocks

Stocks of wood pellets at Danish distributors fell by approx. 76,000 tonnes in 2010. Changes in stocks are calculated as the difference between companies that have increased stocks and companies that have reduced their stocks.

Some of the major market players reduced stocks in 2010. It is estimated that these movements can be attributed to fluctuations in market price and availability of wood pellets in the international market.

Stock changes are included in the supply to the consumption phase so that stock reductions are considered as supplies for consumption, whereas stock increases are deducted in the consumption calculation.

4 Consumption of wood pellets

The total supply of wood pellets for consumption in the Danish market was 1,718.976 tonnes in 2010, see table 1. In table 4, the wood pellet consumption has been broken down by market segments.

The bulk of market growth is generated by the plants where especially the largest (CHP plants) are very significant. Private consumption is also increasing, but the importance of this market in the overall picture is diminishing. Today, the private consumers only accounts for about 1/3 of the total consumption in Denmark.

Consumption figures for the two small sectors, Manufacturing industry and Public service (public buildings) vary from study to study. This is most likely attributable to the uncertainty linked to the calculation method used for these two consumption categories; see the section on method in the beginning of this report.

	Heat and CHP plants		Single family houses		Manufacturing industry		Public service		Total consumption	
	Tonnes	**%**	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**	**%**
2001	108,000	27%	222,658	55%	41,299	10%	29,333	7%	401,291	100%
2004	362,375	50%	313,606	43%	43,026	6%	12,127	2%	731,134	100%
2006	292,323	33%	469,343	52 %	88,104	10%	46,026	5%	895,796	100%
2008	481,932	45%	471,123	44%	53,976	5%	52,488	5%	1,059,519	100%
2010	**1,039.619**	**60%**	**577,453**	**34%**	**54,349**	**3%**	**47,555**	**3%**	**1,718,976**	**100%**

Table 4: Wood pellet consumption by market segments

The breakdown of wood pellet consumption by market segments is illustrated in more detail in figure 4. In addition to information for the five years for which a comprehensive study of the wood pellet market was carried out, this figure also shows data for the intervening years. The figures were obtained from the Danish Energy Agency's energy statistics, where there is information on the consumption transformation sector for the intervening years (*Energiproducenttællingen*), whereas the figures for the other consumption categories were estimated by interpolation and qualitative assessments of market trends.

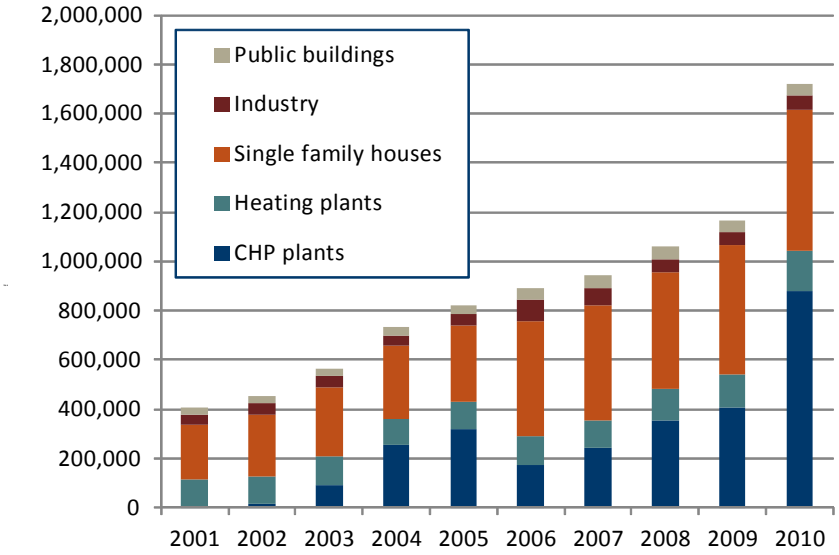

Figure 4: Wood pellet consumption by market segments*

**The years 2002, 2003, 2005, 2007 and 2009 are based on estimates, however not for heating plants and CHP plants.*

4.1 Heating plants and CHP plants

In 2010, a total of 59 plants used wood pellets; four more than in the statistics for 2008. Total consumption by the plants was 1,039,619 tonnes. The plants consist of the two large combined heat and power plants near Copenhagen (Block 2 at Avedøreværket and the newly renovated Block 1 at Amagerværket), Herningværket, 20-30 district heating plants (each typically using between 1,000 and 10,000 tonnes wood pellets a year), and about 30 small plants or plants only using wood pellets to a limited extent for, for example, a peak load boiler. The latter typically use less than 1,000 tonnes annually. Some of the district heating plants use wood pellets as main fuel, while others use only wood pellets occasionally, such as in peak load situations.

Consumption by CHP plants and heating plants has gone up significantly. This is largely due to growth in consumption by Avedøreværket's Block 2, where consumption has varied considerably throughout the years due to fluctuating wood pellet prices and previously also due to supply problems from the factory in Køge. In 2010, consumption peaked, presumably due to a favourable assessment of the overall financial benefits of burning wood pellets instead of coal.

The once significant direct imports of plants' that circumvented the network of distributors have ceased. None of the heating plants resold wood pellets to other Danish distributors or consumers.

4.2 The final energy consumption sector

Wood pellets in the final energy consumption sector are used primarily in stoker boilers, while wood pellet-fired stoves have only gained a limited footing. Growth in the market has been significant for several years. After stagnating in the 2008 statement, statistics now show an increase in recent years of a total of 577,453 tonnes.

This trend in the private market is associated with uncertainty (see the section on method) which is linked to the breakdown between the sectors Private consumers, Manufacturing industry and Public service (public buildings).

Fluctuation in the final energy consumption sector is also linked to the price development for wood pellets compared to the price development for competing fuels, oil and natural gas, including the significance of the fact that, unlike oil and natural gas, wood pellets are not subject to energy taxes. Over the years, there has been a clear connection between the changes in oil prices and interest from private consumers in heating with wood or wood pellets High oil and gas prices in recent years are undoubtedly contributing to promoting the market, but other aspects such as subsidy schemes, scrap schemes, campaigns, etc. have also had an influence over the years on individuals' switching to using wood pellets.

4.3 Trends since 1986

Figure 5 provides an overview of trends in the Danish market for wood pellets since the mid-1980s. The early years were based solely on consumption by the district heating sector. The private sector followed and then most recently CHP plants, see figure 4.

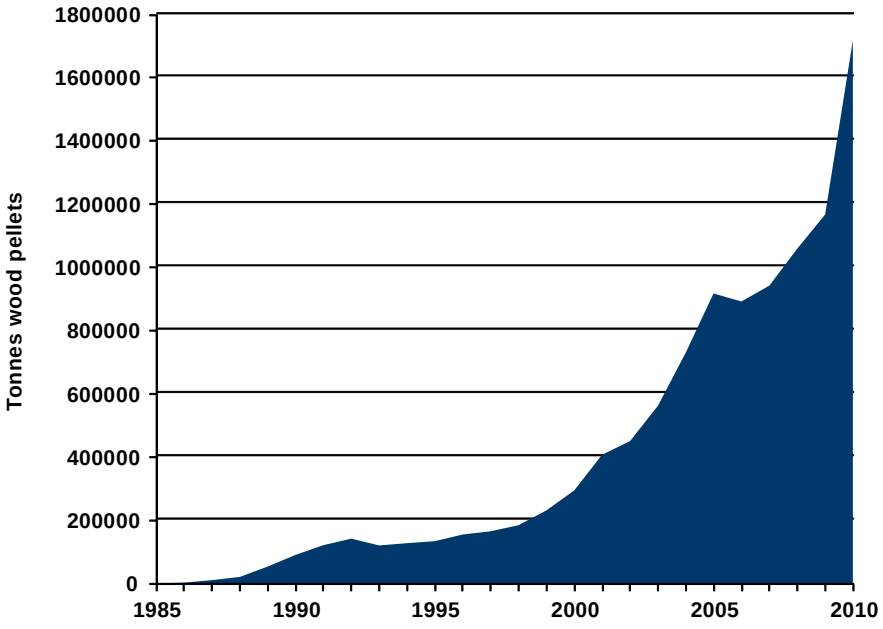

Figure 5: Total wood pellet consumption in Denmark since 1986

5 Prices of wood pellets

Distributors and producers of wood pellets have been asked to provide information on current prices of wood pellets for this and the two latest studies. The prices in the following apply for May 2011 and exclude VAT. Prices apply for retail trade. Trade between importers and distributors is not included. A total of 67 distributors and producers have supplied data for this part of the study.

The study of prices shows a snapshot of the market as it was in May 2011. In recent years, prices of wood pellets have moved considerably. It is common that prices are higher during the heating season, and the rapidly increasing consumption in recent years also seems to push prices upwards.

5.1 Trade in bags

The average price of wood pellets in bags was DKK 1,853 per tonnes in May 2011. This constitutes an increase of 11% compared with the 2009 mean price of DKK 1,664 per tonne, excluding VAT. This price is for sales of whole pallets collected by the consumer, i.e. excluding transport to the consumer. The average price was calculated for wood pellets of different diameter and quality, packed in different bag sizes.

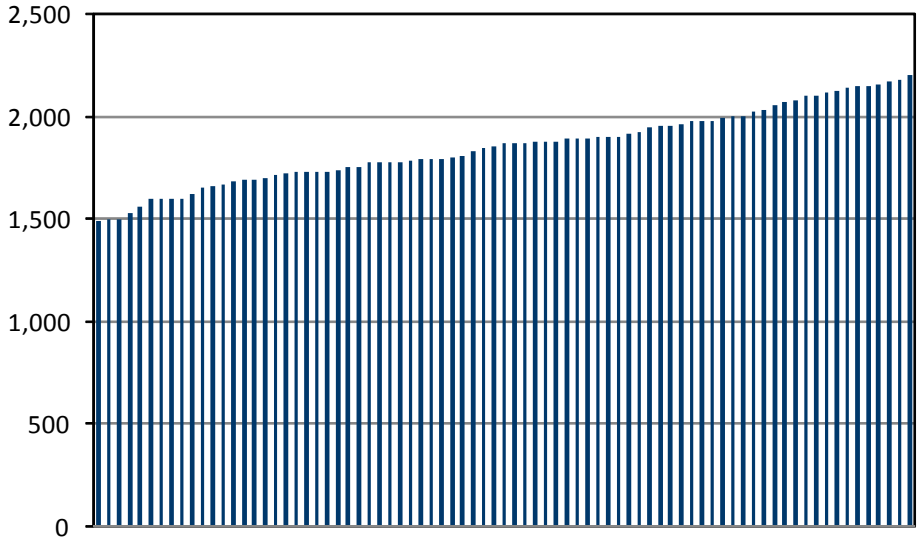

Figure 6: Breakdown curve for distributors' prices in bags, excluding VAT, May 2011, DKK per tonne.

When wood pellets are traded in bags, the sizes 15 kg and 16 kg bags dominate with 77% of the market. It seems that these smaller bag sizes are gaining ground as the two types only took up 58% of the market in the study of 2009. Similarly, the proportion of 25 kg bags has declined from 30% in 2009 to 17% in this new study.

Other sizes have little impact with about 5% of the market.

5.2 Trade in big-bags

The average price for wood pellets supplied in big-bags was DKK 1,751 per tonne in May 2011. This constitutes an increase of 9% compared with DKK 1,607 per tonne in May 2009. This price includes delivery to the consumer.

Most big-bags on the market contain 1,000 kg (71%), whereas only 29% of the market is covered by smaller-sized bags.

5.3 Trade in bulk

The average price for wood pellets supplied in bulk was DKK 1,543 per tonne in May 2011. This constitutes an increase of 1% from the May 2009 level of DKK 1,530 per tonne. This price includes delivery to the consumer.

The prices are stated for various delivered volumes. However, by far the majority of prices are for delivered volumes in the interval 3 to 6 tonnes.

5.4 Summary of prices

Table 5 summarises the above price information. No data have been gathered on prices of wood pellets for large consumers at heating and power plants in this study. See the price statistics of the Danish District Heating Association, and international indexes for the large-scale market.

	Unit size	Average price May 2011, excluding VAT		Sales terms
		DKK per tonnes	DKK per GJ	
Bags	**10 – 25 kg**	**1,853**	**106**	**Collected Min. 1 pallet**
Big-bags	**500 – 1,000 kg**	**1,751**	**100**	**Supplied Min. 1-3 big-bags**
Bulk, Private	**3 – 6 tonnes**	**1,530**	**88**	**supplied 3-6 tonnes**

Table 5: Summary of wood pellet prices on the Danish market May 2011

When converting prices from DKK per tonne to DKK per GJ, a (lower) calorific value of 17.5 GJ per tonne was used.

Therefore, a minor consumer, with an annual consumption of six tonnes wood pellets, could save approx. DKK 600 excluding VAT per year by choosing supply in big-bags rather than collecting bags themselves, and approx. DKK 1,800 excluding VAT per year by choosing supply in bulk rather than collecting bags themselves.

6 Quality

6.1 Branding and standards

Producers and distributors have been asked to provide information on the quality of wood pellets they trade in, as well as the standards they use for specifying quality to consumers.

The overall picture is that distributors are very aware of the quality of the pellets, and that this aspect is very significant for their customers.

Previous studies, conducted in 2007 and 2009, showed that the quality description of the product was primarily based on the name or brand of the distributor or producer. This trend continues in the 2010 study as branding, rather than standards, is used to the same degree today as it was two years ago.

Many distributors operate with two different qualities of pellets, which, depending on the use of standards and branding, are usually presented to consumers with words such as "Super" and "Normal". The difference is specified by some distributors; usually the best quality contains less dust, lower ash content and a slightly higher calorific value than the lower quality.

However, national and international standards are being applied to an increasing extent, as many distributors, are now, sometimes as a supplement to branding, specifying pellets with reference to standards like DIN or CEN. DIN-plus is the most widely used standard, but reference is also made to the international CEN/TS 14961, to SS 187120 and to others.

6.2 Diameter

8mm pellets and 6 mm pellets dominate the market. These two sizes of pellet share the market in the proportion 89% and 11% for respectively 8 mm pellets and 6 mm pellets.

7 Uncertainties in the study

This study is more or less complete with regard to importers and producers of wood pellets, which means that the supply of wood pellets is known with high certainty.

The study of consumption by plants is complete and should be considered fairly accurate.

There is some uncertainty in the breakdown of the consumption for the other market segments (Private consumers, Manufacturing industry and Public service), partly because many of the suppliers can only estimate this breakdown, and partly because a number of smaller distributors have not participated in the study. The uncertainty is solely related to the *breakdown* between the three categories and not to the total.

8 Other data on the wood pellet market

In its annual Energy Statistics, the Danish Energy Agency provides summary information on wood pellets and other types of energy in Denmark, including wood chips, straw, wood waste and firewood. The figures in the Energy Statistics are in energy units, most often Tera Joules (TJ) or Peta Joules (PJ). A calorific value of 17.5 Giga Joules (GJ) per tonne is used for wood pellets, so 1 TJ in the statistics is equivalent to approx. 57 tonnes wood pellets. The total wood pellet consumption in 2010 of 1,718,976 tonnes is equivalent to approx. 30 PJ, which is around 3.5% of Denmark's total gross energy consumption.

The Energy statistics can be downloaded from the Danish Energy Agency's website www.ens.dk under 'Facts & Figures".

The Danish Energy Agency and FORCE Technology have published a number of methodology memos describing assumptions and figures in the Danish energy statistics for wood pellets, wood chips, straw, wood waste and firewood. The memo on wood pellets covers the period 1986 to 2010 and includes information on supply and consumption divided into categories for the entire period.

The methodology memo on wood pellets can be downloaded from the Danish Energy Agency's website (www.ens.dk) under 'Facts & Figures'.

Data for the wood pellet market in Europe are available on the website of the Intelligent Energy for Europe project Pellets@tlas at www.pelletsatlas.info. This website includes an interactive map with data on individual producers and market players in Europe. Tables can be extracted with data on production, production capacity, imports, exports and consumption by sector and country.