



Solutions for biomass fuel market barriers and raw material availability - IEE/07/777/SI2.499477

WP3 – Wood fuel price statistics in Europe - D 3.3

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Intelligent Energy  **Europe**

Contents

Preface	3
1 Introduction and background	4
2 Methodology	5
3 Availability of wood fuel price statistics in Europe	6
4 European wood fuel prices.....	12
5 References.....	20
Appendix A: Conversion factors	21

Preface

This publication is part of the EUBIONET III Project (Solutions for biomass fuel market barriers and raw material availability - IEE/07/777/SI2.499477, www.eubionet.net) funded by the European Union's Intelligent Energy Programme. EUBIONET III is coordinated by VTT and the other partners are Danish Technological Institute, DTI (Denmark), Energy Centre Bratislava, ECB (Slovakia), Ekodoma (Latvia), Fachagentur Nachwachsende Rohstoffe e.V., FNR (Germany), Swedish University of Agricultural Sciences, SLU (Sweden), Brno University of Technology, UPEI VUT (Czech), Norwegian University of Life Sciences, UMB (Norway), Centre Wallon de Recherches Agronomiques, CRA-W (Belgium), BLT-HBLuFA Francisco Josephinum, FJ-BLT (Austria), European Biomass Association, AEBIOM (Belgium), Centre for Renewable Energy Sources, CRES (Greece), Utrecht University, UU (Netherlands), University of Florence, UNIFI (Italy), Lithuanian Energy Institute, LEI (Lithuania), Imperial College of Science, Imperial (UK), Centro da Biomassa para a Energia, CBE (Portugal), Energy Restructuring Agency, ApE (Slovenia), Andalusian Energy Agency, AAE (Spain). The EUBIONET III project runs 2008 – 2011.

The main objective of the project is to increase the use of biomass based fuels in the EU by finding ways to overcome the market barriers. The purpose is to promote international trade of biomass fuels to help demand and supply meet each other, while at the same time the availability of industrial raw materials is to be secured at reasonable price. The EUBIONET III project will in the long run boost sustainable, transparent international biomass fuel trade, secure the most cost efficient and value-adding use of biomass for energy and industry, boost the investments on best practice technologies and new services on biomass heat sector and enhance sustainable and fair international trade of biomass fuels.

This working paper, which is part of EUBIONET III's Work Package (WP) 3 entitled "Price Mechanisms for Wood Fuels", will present the results from a survey among the EUBIONET III partners of wood fuel prices in the respective countries. The working paper is part of the reporting for task 3.1, "Collection of price statistics" of WP3.

1 Introduction and background

The lack of market information has in studies (see e.g. Dahl 2005; Plieninger et al. 2009) been pointed out as an important barrier to further development of the trade in biomass for energy. If there is no readily available information on available quantities, trade flows and price levels, this presents a major obstacle to market actors aiming to trade the commodity in question. Important strategic decisions may have to be taken without sufficient knowledge of market conditions. In order to avoid this, large amounts of financial and human capital need to be invested in acquiring market information for specific business transactions. Neither of these options represents an effective means of business conduct. Furthermore, “[market] *transparency is the enemy of trading margins*” (Roeber 1993, p.77) and increased availability of market information is a vital step on the path towards a fair, competitive and efficient market.

The aim of the work leading up to this working paper has been to use the network of partners participating in the EUBIONET III project to compile a database of price statistics on wood fuels from as many European countries as possible. By making up-to-date as well as historical wood fuel prices available to a broader audience, this work will hopefully make a contribution towards increasing the level of transparency in the European bioenergy market.

Besides presenting the collected price statistics, this working paper will also briefly discuss the level of availability and quality of wood fuel price statistics in the EUBIONET III partner countries. Needless to say, there are great differences in how much statistics is available and whether these are compiled in an orderly and standardized manner or not. By raising this issue, we hope that statistics agencies on a national and European level, as well as bioenergy business organizations, are made aware of possible flaws in the price statistics and encouraged to contribute to increase the quality. This is crucial for the future development of the European bioenergy market.

2 Methodology

This working paper is based on information collected in three steps by the EUBIONET III partners.

The *first* step was carried out in the spring of 2009 when the partners were asked to make a preliminary survey of the availability and quality of wood fuel price statistics in their respective countries. If price statistics were difficult to find and/or of inferior quality, the partners were also asked to discuss and give reasonable explanations for this. The main goal with this initial survey was to obtain an overview of the general state of wood fuel price statistics in the partner countries, thus providing a base for how the subsequent price collection questionnaire was to be designed.

The *second* step was the design of the actual price collection questionnaire. A first draft - based on the initial survey - was constructed and distributed to the partners in the fall of 2009. The partners were asked to give feedback on the draft questionnaire and propose changes which might improve the quality of the questionnaire. However, this process proved to be something of a dilemma as the large differences in the availability and quality of wood fuel prices in the partner countries meant that the feedback from the partners was heterogeneous and to some extent contradictory. Since it was rather awkward to carry out these discussions via e-mail, it was decided that the discussion on the construction of the price statistics questionnaire would instead be finalized at the EUBIONET III meeting in Verona in Italy in February, 2010. At the meeting, some final discussions on the questionnaire took place and a consensus could ultimately be reached. The *third* step was a repeated dissemination of the price survey in January 2011 where prices for 2010 were asked for.

The first round of filled-in price collection questionnaires were submitted by most of the partners in the weeks following the meeting in Verona and were compiled by the Work Package leaders in the Department of Energy & Technology at the Swedish University of Agricultural Sciences in Uppsala, Sweden. Herein, prices are reported in €/GJ, but since the national price statistics were given in a variety of different units and currencies, conversions had to be made. In some cases, there were uncertainties about e.g. the moisture content of the fuel in question, which means that the converted price levels only may be seen as estimations. The second round of filled-in price questionnaires were submitted by partners until late February 2011 and then compiled by SLU.

Price statistics were initially to be collected for five fuel categories: wood pellets, wood briquettes, wood chips, firewood and sawmill by-products. However, there are wide varieties within these groups depending on issues such as the nature of the consumer or the form of delivery. For this reason, the price categories were further widened so that prices are reported both for industrial and residential customers. Also, for wood pellets, prices are reported both for delivery in bulk and in small bags.

3 Availability of wood fuel price statistics in Europe

As was discussed in the above methodology section, the first step of the work in Task 3.1 was to obtain an overview of the availability of wood fuel price statistics in the partner countries. Perhaps not surprisingly, there are large variations between European countries, to a large degree depending on the level of development of biomass energy in the respective countries.

Below is a review of the situation in the partner countries who responded to the initial survey, based on the contributions from the country representatives.

3.1 Austria

In Austria, price statistics for a rather wide variety of wood fuels are collected and reported by agencies on both state and federal levels.

- Prices for wood are collected monthly, sorted per province and type of wood and published in the reports of *Land- und forstwirtschaftliche Erzeugerpreise* ("Producer prices for agricultural and forestry products"). Prices for wood briquettes are collected monthly within the "consumer price index" compilation.
- In the programme *Mikrozensus Sonderprogramm Energieeinsatz der Haushalte* ("Microcensus special programme about the use of energy in households") information about the usage of firewood, wood briquettes, wood pellets and wood chips in households are collected every second year.
- The Chamber of Agriculture in Lower Austria¹ is publishing the *Energieholzpreisindex* ("price index for energy wood"), which is often used as part of the price index for heat of biomass district heating plants. The basis for this index is wood price data from Statistics Austria and own sources.
- The wood pellet business organisation *proPellets Austria - Netzwerk zur Förderung der Verbreitung von Pelletsheizungen* publishes the monthly price for wood pellets for end consumers.

3.2 Belgium

In Belgium, the situation varies somewhat between the regions of the country. For Wallonia, pellets price statistics for small bags or bulk carrier have been collected monthly since 2007. Prices are collected by the Wallon Agricultural Research Centre (CRA-W).

For log wood, there is an ongoing project aiming to develop a price collection procedure, but the methodology needs to be decided. This has proved quite difficult

¹ One of the Austrian *länder*, located in the Eastern part of the country.

because prices depend on the geographic area, the log size, the amount, the humidity level, the transport and the species.

3.3 Czech Republic

In the Czech Republic, the Czech Statistical Office is generally responsible for statistics, but there are currently no official price statistics for wood fuels and/or biomass. The reasons for this lack of statistics are difficult to discern. One of the possible reasons is that there are no price regulation mechanisms for wood fuels and biomass to date. In contrast, the Ministry of Finance applies officially agreed maximum prices for natural gas and electricity. An "objective guided price" is applied for the heat energy. The objective guided price from a producer or a distributor includes economically eligible costs, an adequate profit and taxes.

3.4 Denmark

In Denmark, the Danish District Heating Association every third month issues prices for heat from their member plants from different fuels, including wood pellets and wood chips. However, an obstacle to a further development of Danish wood fuel price statistics is that the large consumers are not interested in publishing the prices.

3.5 Finland

The consulting company *Pöyry* is collecting wood chips statistics directly from the end-users and pellet prices are collected by Finnish Pellet Energy Association. These statistics are published in the journal *BioEnergia* six times per annum. Statistics Finland is officially responsible for publishing wood fuel prices, so information from *Pöyry* and the Finnish Pellet Energy Association is passed to Statistics Finland. They publish these statistics four times per annum in the *Energiakatsaus* journal. Furthermore, a pellet consumer price index that will be published monthly is being developed together with the Finnish Pellet Energy Association. It will now be part of the official Finnish statistics. Until recently, the industry has not been willing to publish pellet price information but this situation seems now to be changing.

3.6 Germany

For Germany, there are statistics available from *C.A.R.M.E.N*, the Bavarian Coordinating Office for Renewable Raw Materials, on prices of both wood pellets and wood chips. German Energy Wood and Pellet Association (DEPV) publishes statistics on price of pellets. The German Federal Statistical Office (2010) has started to publish a new price index for wood for energy production. It considers wood chips, wood pellets and briquettes, and industrial wood. The basic year for the index is 2005 (2005 = 100) and it contains no absolute prices, only the price development as an index. The first publication of the index was in February 2010.

3.7 Greece

In Greece, the General Secretariat for the National Statistical Services does not hold any data about prices of wood fuels. Regarding the prices of wood fuels, delivered at the forests roadside (wholesale prices), the General Division of Forests holds a survey list and real prices in € per m³ are recorded. The list is classified based on the administration units of the Division of Forests (Forest Districts). The retail prices are not surveyed by national authorities. Regarding refined wood fuels (pellets), there is no survey about the price of such fuels, so the information is not available by national authorities.

3.8 Latvia

The most commonly used price statistics on wood fuels is obtained from the *Central Statistical Bureau of Latvia*. The Bureau collects data about price changes for sawdust, firewood, pellets, briquettes, and wood processing residues. The data are however not available for free on homepages or other resources. A fee is charged in exchange for access to the data. Additionally, there are several independent organizations that deal with data collection of wood fuel prices, e.g. *the Latvian Wood Industry Federation* and the *Latvian Bioenergy Association (LATBIONRG)*. However, the collected data is available only for organization members and people registered on the webpage.

3.9 Lithuania

The *National Control Commission for Prices and Energy* has collected average wood fuel market prices for the period 1996-2008. These prices are compared with the prices of other fuels, including pellets as well as chips, sawdust and firewood (as one group). Furthermore, the Department of Statistics to the Government of the Republic of Lithuania calculates price indices for the estimation of production amounts and sends these data to Eurostat.

3.10 The Netherlands

The Dutch statistical office does not collect any data on wood fuel prices. The Copernicus Institute at Utrecht University collected price data for wood pellets both for large scale consumers and for small scale end-consumers as part of the Pellets@las² project, which was finalized by the end of 2009. Furthermore, since the end of 2009, a company called *Endex* has started to publish prices for wood pellets. Incidentally, reports are published (e.g. IEA Bioenergy Task 40 country reports and reports by ECN) in which prices of various biomass streams are reported or estimated, but not on a regular basis. The main reasons for the lack of official statistics are a) no/limited use of unrefined wood fuels like wood chips, and b) no HS code for wood pellets (up until recently) to use for official statistics.

² EU contract no *EIE/06/020/SI2.448557*

3.11 Norway

The Norwegian Bioenergy Association (NOBIO) collects prices for wood pellets and wood briquettes and publishes annual reports on price levels.

3.12 Portugal

In Portugal, there are currently no available statistics on wood fuel prices, primarily because of the immaturity of the Portuguese bioenergy market. This means that the market is not very well organized.

3.13 Slovenia

There are currently no price statistics on wood fuels available in Slovenia, as the wood fuels market is not organized. Most of the wood fuels are sold directly from producer to user. The Statistical Office of the Republic of Slovenia is responsible for statistics in this country, but only collects data on prices for other fuels (coal, oil etc.). From 2004 there is an online biomass exchange - the *Borzen OVE* portal - operating but they are just offering a free trade tool and do not collect price statistics.

3.14 Spain

There is no official information or statistics about prices of wood pellets and briquettes. This is because pellets and briquettes don't constitute a representative resource of energy in Spain. There are several independent organizations related to the wood sector (e.g. *Confemadera, Cismadera, Cesefor*) that handle internal data about prices but these statistics are not available for all stakeholders but only for organization members and people registered on the webpage.

3.15 Sweden

Several different organizations, public as well as private, publish price statistics on bioenergy.

- The *Swedish Energy Agency* has since 1993 been collecting price statistics on bioenergy consumed in district heating as well as in industry. These statistics are published in a quarterly publication entitled *Prisblad för biobränslen, torv mm.* ("Price sheet for biofuels, peat, etc.")
- *The Swedish Association of Pellet Producers (PiR)* has since August 2006 published a monthly price index on wood pellets for bulk delivery to residential customers.
- The bioenergy consulting Firm *ÅFAB* has been publishing regional monthly price statistics for wood pellets since January 2004 for respectively the North, Central and Southern parts of Sweden.

- Since 2010, PiR and ÄFAB have together published a price index which compares the development of wood pellet prices to the prices of competing fuels.

Aside from these organized prices statistic resources, there are several consumer-initiated online price comparison tools where residential wood pellet consumers report how much they have paid for their pellets.

3.16 UK

The wood price statistics in the UK are published in an annual report (also available from the web) and the responsible body is the Forestry Commission. As of yet however, the commission does not publish statistics specifically for wood fuels.

3.17 Price statistics in countries not part of EUBIONET III

3.17.1 Switzerland

- The renewable energy information company *Transan* publishes an online monthly wood pellet price index based on information from Swiss wood pellet producers.
- *Waldwirtschaft Schweiz* (The Swiss Forestry Association) publishes statistics of wood price levels – including different assortments of wood fuels – in its journal *Wald und Holz* ("Forest and wood")

3.17.2 Estonia

Metla (The Finnish Forest Research Institute) collects statistics on prices for fuel wood from state-owned Estonian forests. The prices are published through Metla's online service *MetInfo*.

3.17.3 France

CEEB, the *Centre d'Etudes de l'Economie du Bois* (Center for Studies of Wood Economics) publishes price statistics for different forms of wood fuels, including sawmill residues, wood chips, wood briquettes and wood pellets.

3.18 Pellets@las

The *Pellets@las* project was an Intelligent Energy for Europe (IEE) project that ran from 2007 to 2009 with the aim to "...develop and promote transparency on the European fuel pellet market" (Pellets@las 2009). An important part of the project was the dissemination of wood pellet price information through the Pellets@las website. Price data on different assortments of wood pellets were collected from the participating countries, compiled into a database and made available online for market actors to access.

3.19 Commercial wood fuel price statistics

Since a few years back, a number of companies providing market information have moved into the field of bioenergy.

3.19.1 Argus

Argus Media Ltd. is a company based in the United Kingdom. The company has provided different kinds of energy information on a commercial basis since 1970. Until 1995, the company only focused on the oil market, but that year the company initiated coverage of natural gas markets and Argus has since expanded to cover market developments in coal, electricity, emission rights and many other energy-related topics. In spring 2009, Argus launched *Argus Biomass Markets*, a weekly publication that reports and analyzes developments in the biomass-for-energy markets, with focus primarily on wood pellet market developments. The report includes a price index on wood pellets, based on a survey of market actors of current price levels as well as on information on actual trades that has taken place during the week in question. (Argus Media 2009)

3.19.2 Endex

Endex is an energy exchange based in the Netherlands. The company was founded in 2002 and is wholly owned by the APX group. The company provides price information and offers over-the-counter and derivatives trading in natural gas and electricity. After realizing that there was demand for increased information about developments in the bioenergy markets, Endex began publishing a weekly price index for industrial-grade wood pellets in November, 2008. The price index is based upon information from market actors and is given for wood pellets delivered CIF Rotterdam. (Endex 2009)

3.19.3 FOEX

FOEX indexes Ltd. is a Finland-based company which specializes in providing price indexes for a range of different pulp & paper products. Beginning in late 2009, FOEX also publishes a monthly price index for industrial wood pellets on the Nordic market, called *PIX Pellet-Nordic Industrial*. The price index is based on information from both producers and consumers of wood pellets and is given for delivery CIF Baltic Sea/North Sea ports. According to the company, the industrial wood pellet price index is only the first bioenergy price index to be published by FOEX. Indices for Continental and North American wood pellet deliveries, as well as an index for Baltic Sea delivery of unrefined wood fuels are also being planned. (Teräs & Sihvonon 2009)

4 European wood fuel prices

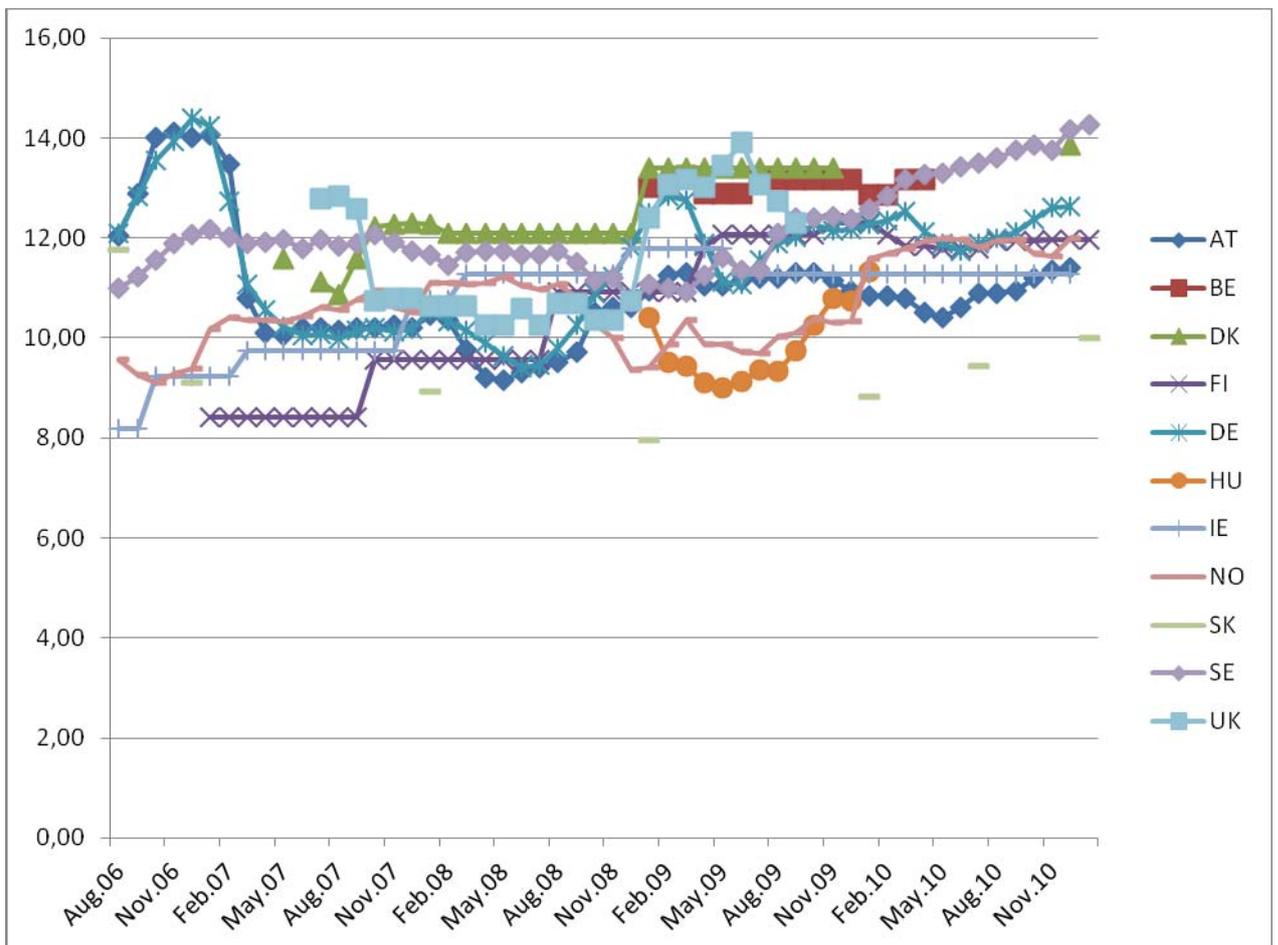
During the early springs of 2010 and 2011 respectively, prices of different assortments of wood fuels in the countries participating in EUBIONET III were collected from the respective partners in two rounds. The instructions for the partners in the first round stated that ideally, time series of prices stretching from the second half of 2006 – the time of the last price collections of the EUBIONET II project – to early 2010, and in the second round for the year 2010 were to be collected. As it proved impossible to obtain time series for all wood fuel assortments in all countries, the partners were instructed to – as a “second best” option – focus on actual price levels at the time of the particular price collections, i.e. early 2010 and early 2011 respectively.

In this section, the results from these price collections will be presented. For each fuel category, price levels at approximately the turn of the year 2010/11 are given for each country. Additionally, time series for the price development between 2006 and 2010 are presented for the countries in which such series were available.

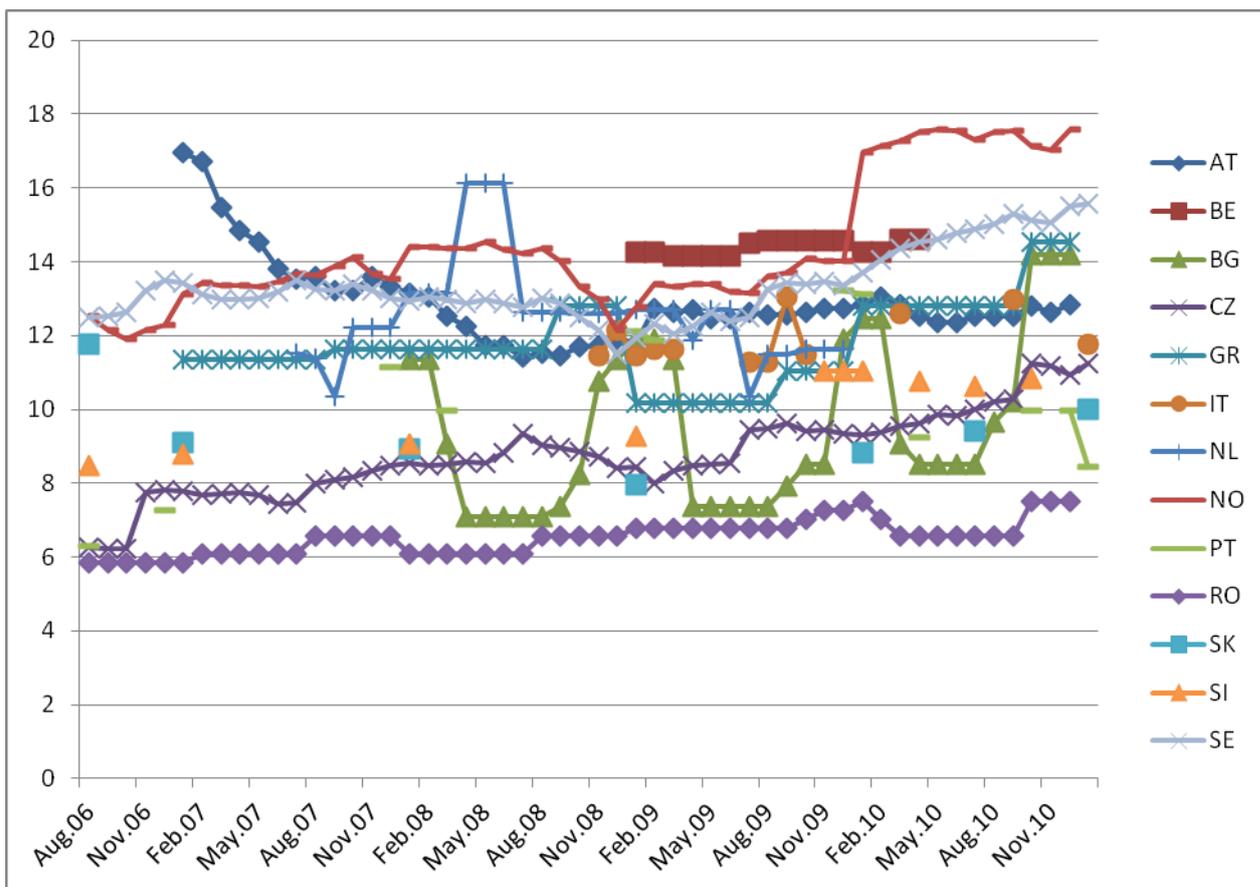
4.1 Wood pellets (residential market)

Since the form of delivery is a vital factor influencing the price of wood pellets for the residential market, the statistics presented is divided into three sections.

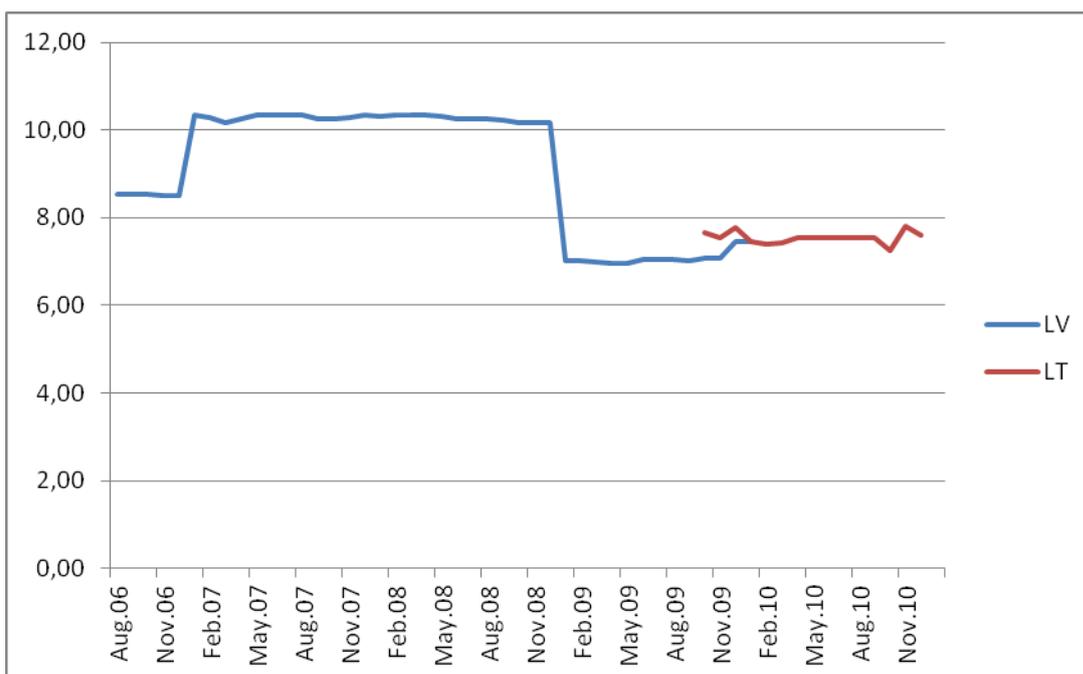
4.1.1 Bulk delivery, €/GJ



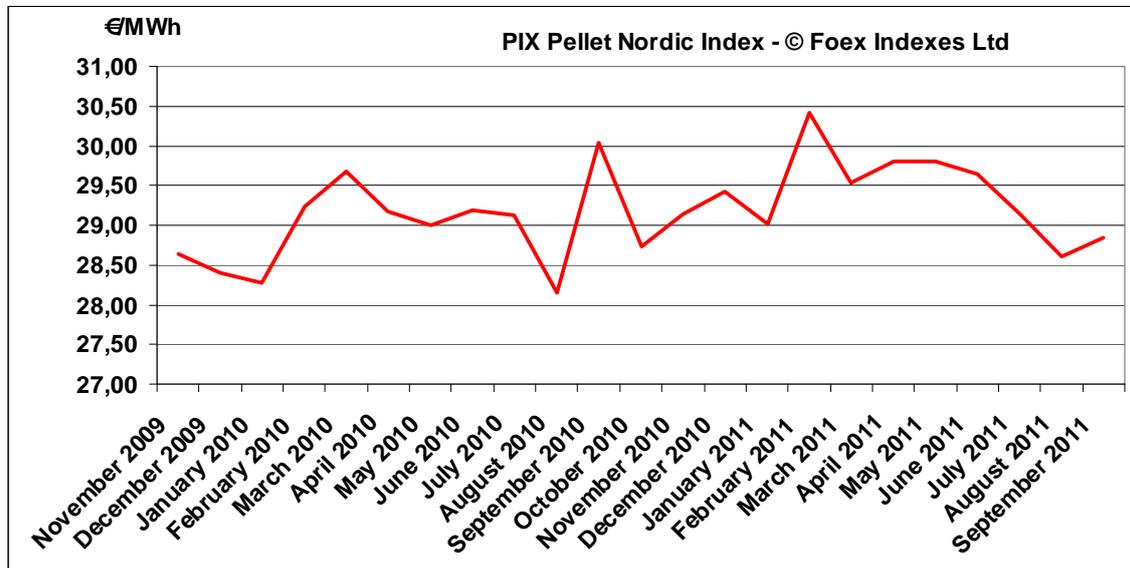
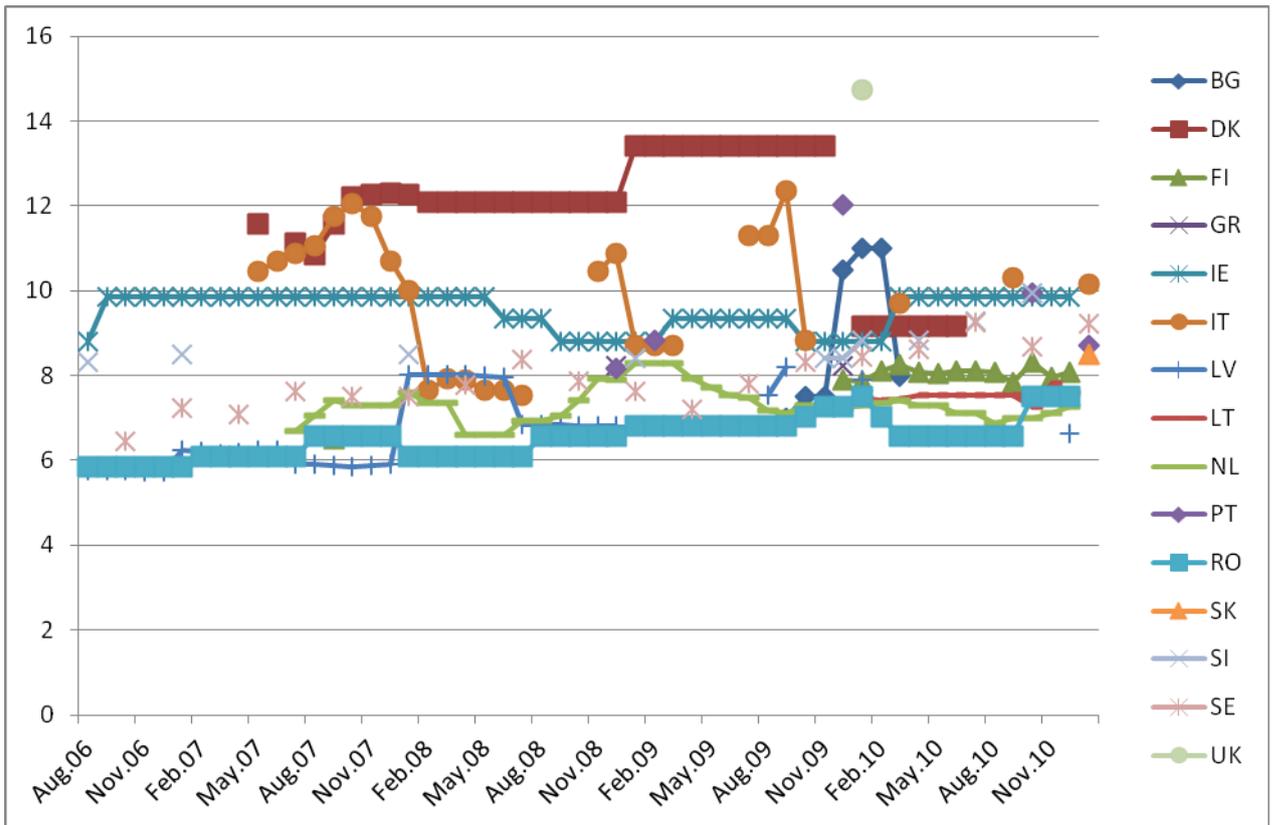
4.1.2 Delivery in small (≈ 15 kg) bags, €/GJ



4.1.3 Unspecified delivery, €/GJ

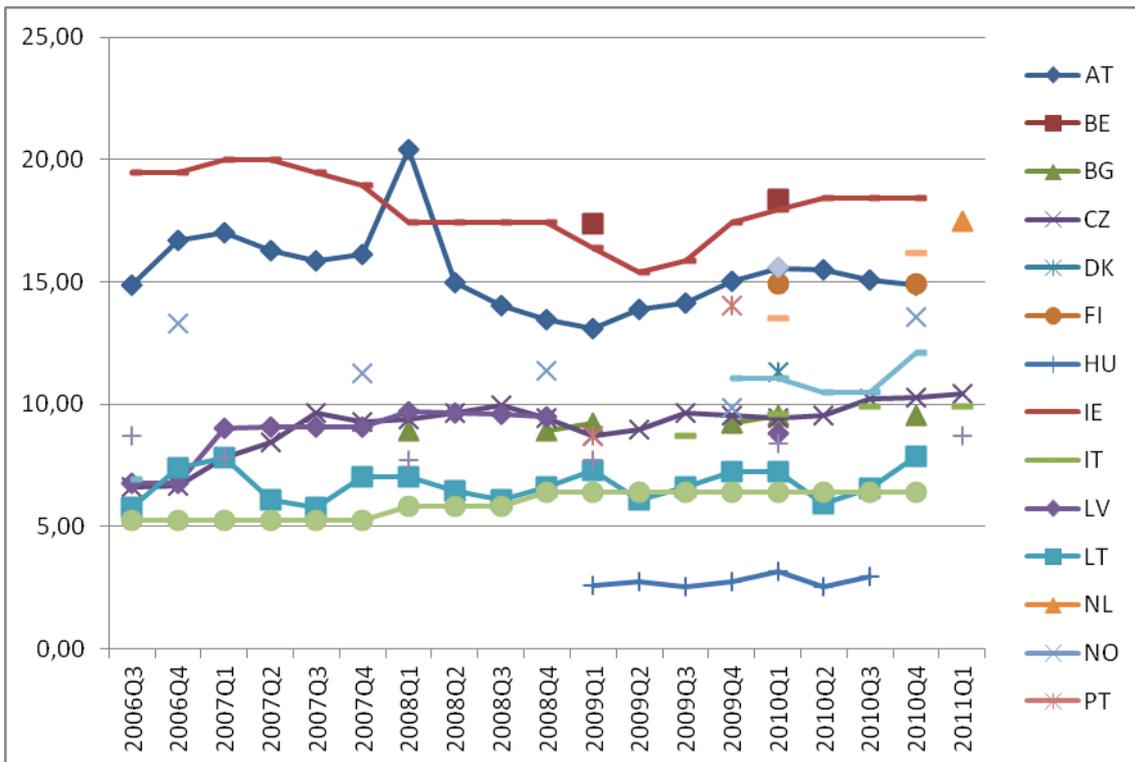


4.2 Wood pellets (industrial market), €/GJ

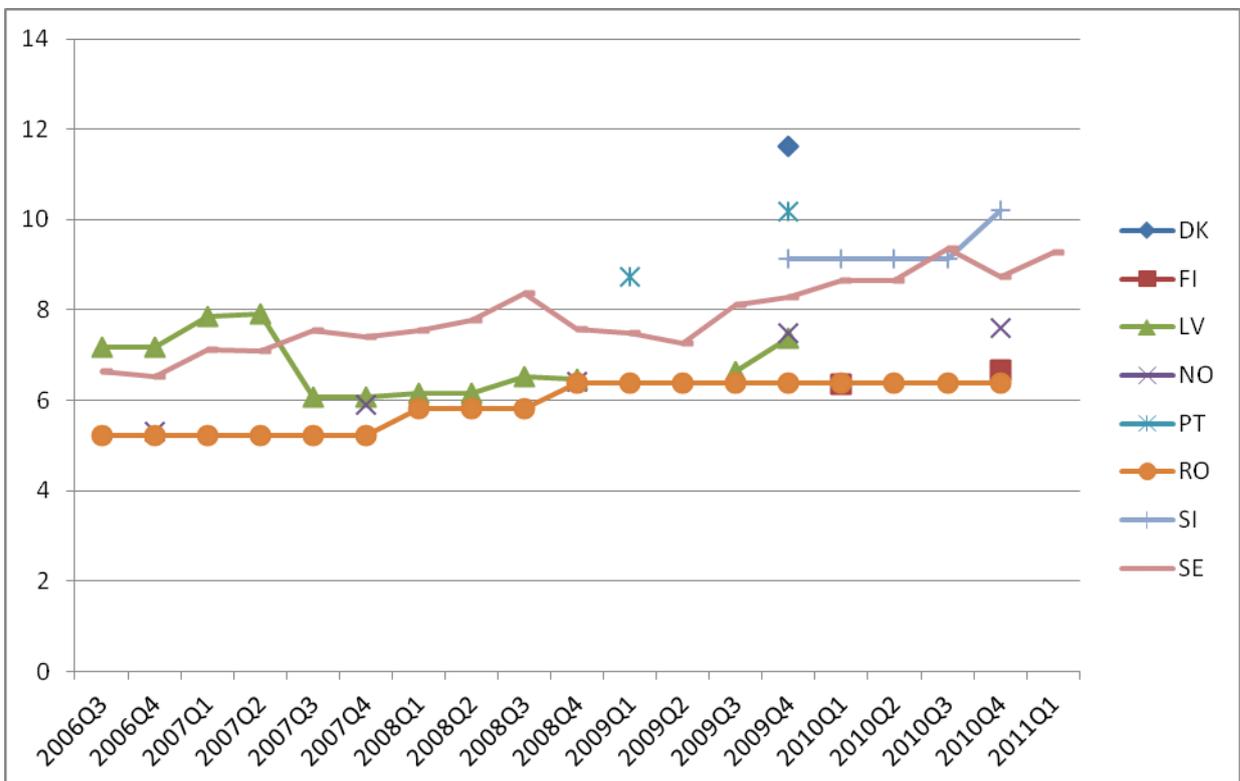


Nordic industrial wood pellet price index. 1 €/MWh equals to 0.2778 €/GJ

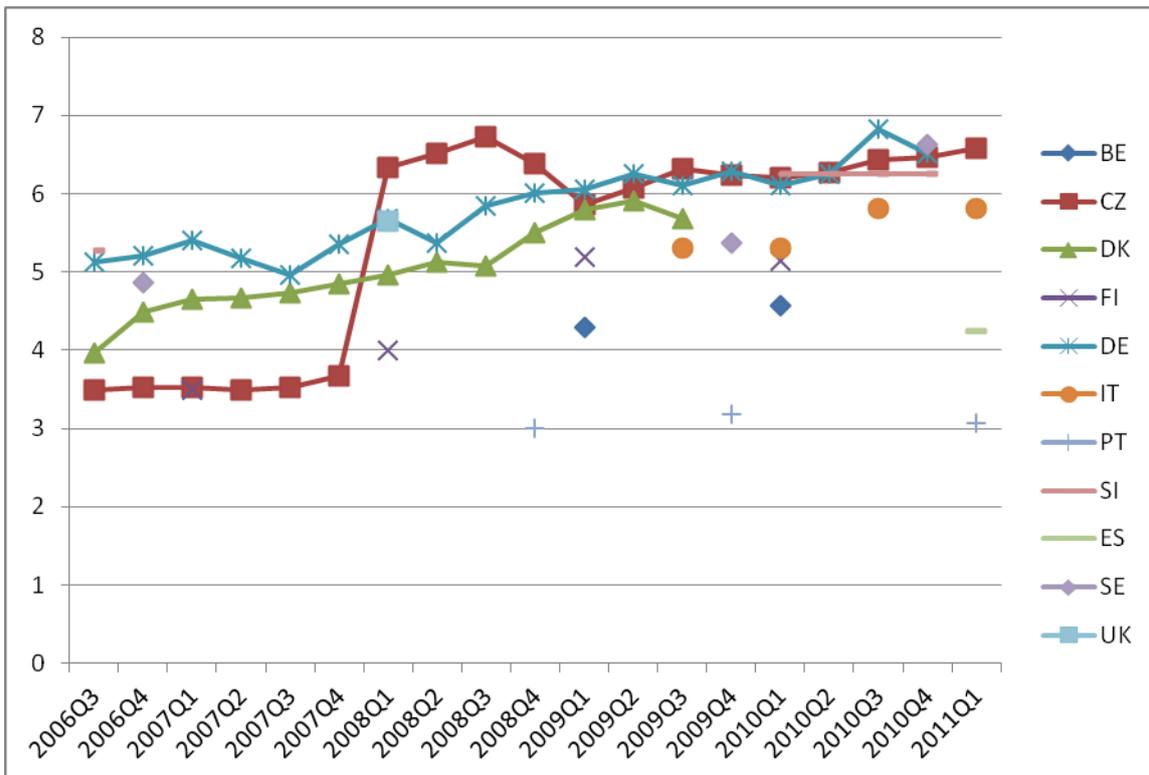
4.3 Wood briquettes (residential market), €/GJ



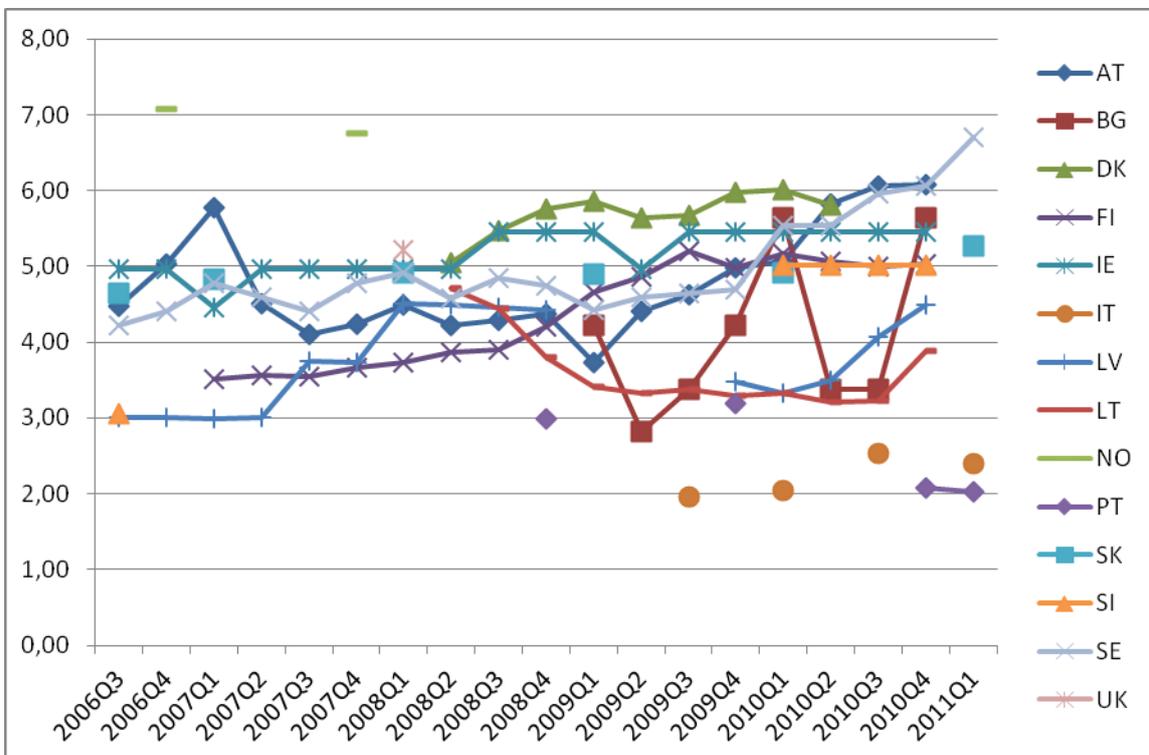
4.4 Wood briquettes (industrial market), €/GJ



4.5 Wood chips (residential market), €/GJ

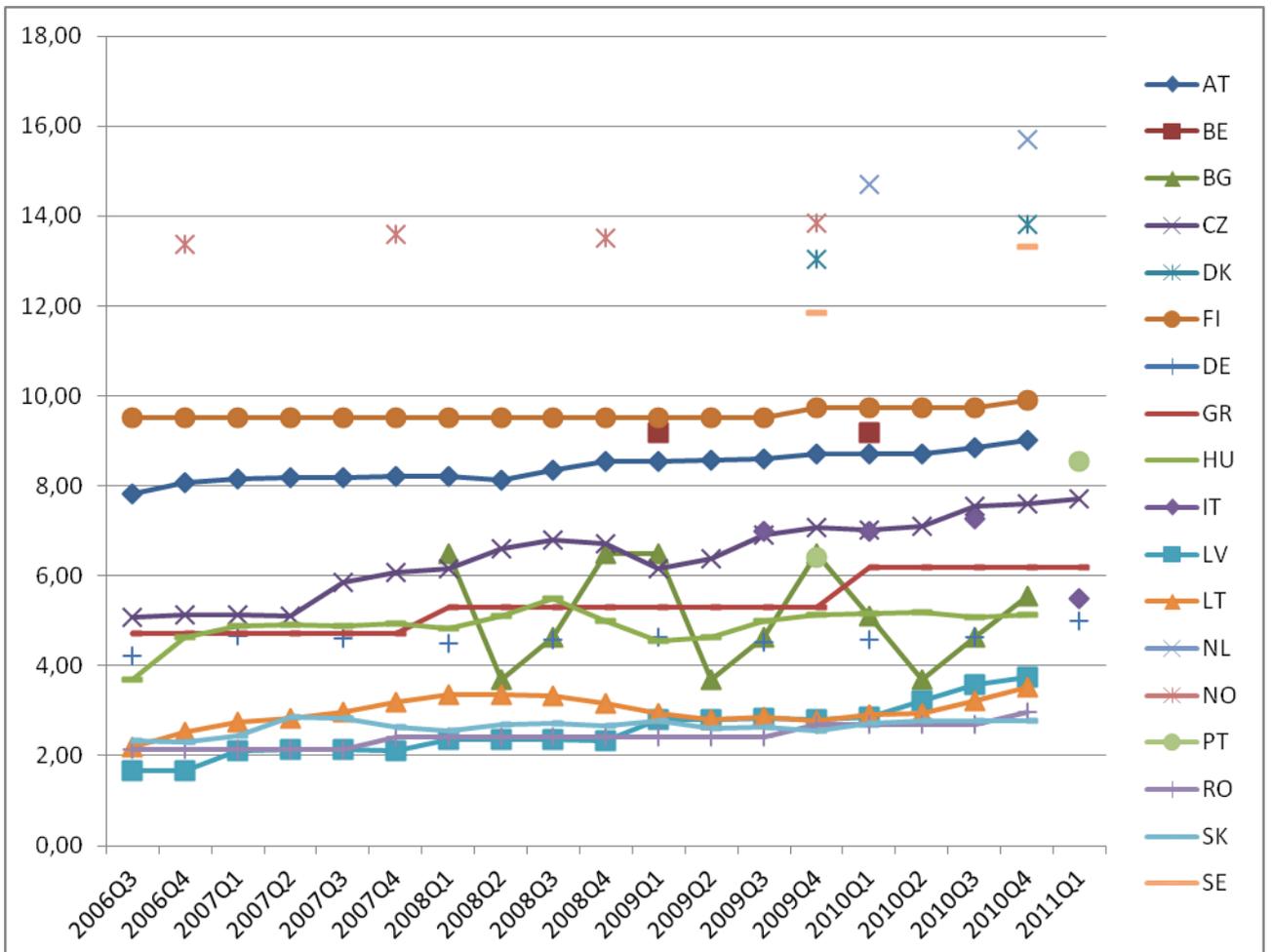


4.6 Wood chips (industrial market), €/GJ

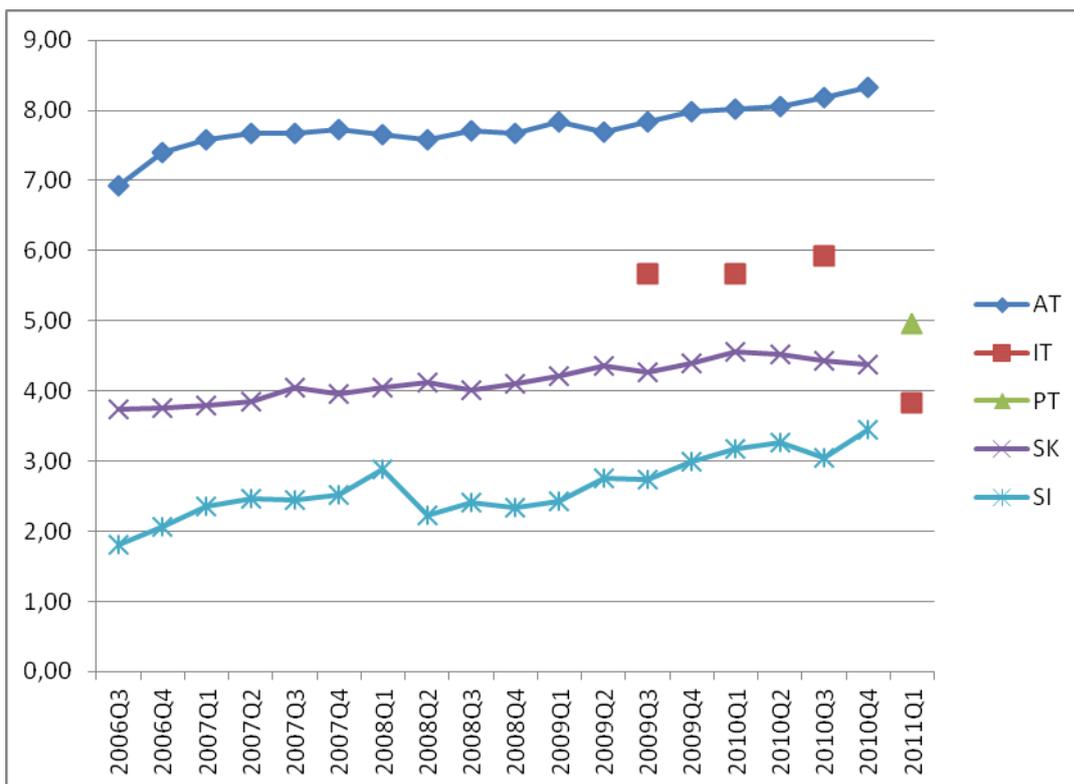


4.7 Firewood (residential market)

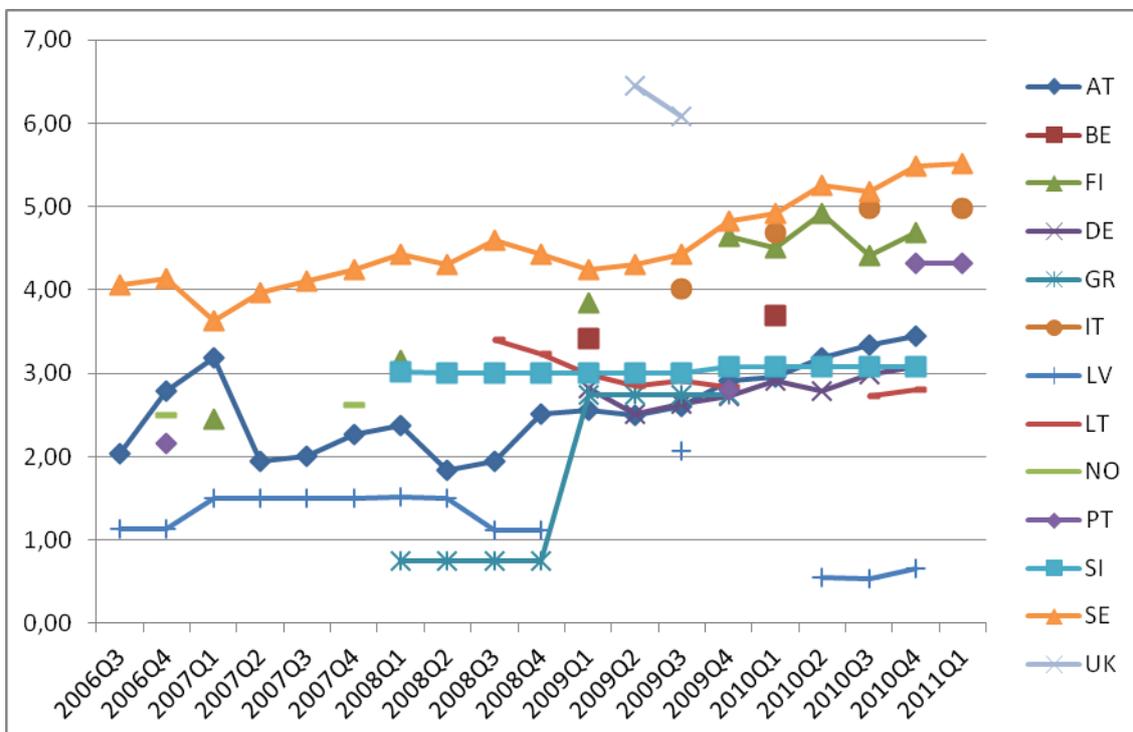
4.7.1 Broadleaved, €/GJ



4.7.2 Coniferous, €/GJ



4.8 Sawmill by-products (industrial market)



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Appendix A: Conversion factors

Since prices are reported in different units in the participating countries, the data reported from the partners has been converted to a common unit, €/GJ, in order for the prices to be comparable. This section presents the energy conversion factors used.

General notes:

- Currency exchange rates have been collected from Eurostat.
- If a price range (e.g. "250-270 €/tonne" has been reported) the average of the minimum and the maximum is shown in the graphs.

A 1 Wood pellets

Unless specific figures for the energy content of the wood pellets, the energy content has been assumed to be 4.7 MWh/metric tonne (=17.2 GJ/tonne).

A 1.1 VAT for wood pellets (res, bulk)

Austria: 10% VAT

Belgium: 6% VAT

Denmark: 25% VAT

Finland: 22% VAT until end of 2010, now 23%

Germany: 7% VAT

Hungary: 25% VAT, currency converted

Ireland: 13.5% VAT

Norway: 25% VAT, currency converted

Slovakia: 19% VAT (August 2006-December 2010), 20% VAT (January 2011-)

Sweden: 25% VAT, currency converted

UK: 5% VAT

A 1.2 Wood pellets (res, small bags)

Austria: 10% VAT

Belgium: 6% VAT

Bulgaria: 20% VAT

Czech Republic: 19% VAT (August 2006-July 2007), 5% VAT (August 2007-December 2007), 9% VAT (January 2008-December 2009), 10% VAT (January 2010-), currency converted

Finland: 22% VAT until end of 2010, now 23%, price data is collected by Finnish Pellet Energy Association and published in a unit €/kWh.

Greece: 23% VAT

Italy: 10% VAT

Netherlands: 19% VAT

Norway: 25% VAT, currency converted

Portugal: 20% VAT (2006-2009), 21% VAT (2010), 23% VAT (2011).

Romania: 24% VAT

Slovakia: 20% VAT (2011)

Slovenia: Prices reported excl. VAT

Sweden: 25% VAT, currency converted. Price is averaged from the reported three regional series (North, Central and South Sweden)

A 1.3 Wood pellets (res, mixed or unspecified delivery)

Latvia: 5% VAT (August 2006-December 2008), 10% VAT (January 2009-), currency converted

Lithuania: 18% VAT (August 2006-August 2009), 21% VAT (September 2009-)

A 1.4 Wood pellets (industrial)

Ireland: Prices reported incl. 13,5% VAT which was then excluded.

Latvia: Currency converted

Portugal: Prices reported incl. 21% and 23% VAT which were then excluded.

Romania: Prices reported incl. 24% VAT which was then excluded. Delivery 250 km included in price.

Sweden: Currency converted

UK: Price reported incl. 5% VAT which was then excluded.

A 2 Wood briquettes

The energy content of wood briquettes is assumed to be 4.7 MWh/ metric tonne (17.2 GJ/tonne)

A 2.1 Wood briquettes (residential)

Austria: 10% VAT

Czech Republic: 19% VAT (August 2006-July 2007), 5% VAT (August 2007-December 2007), 9% VAT (January 2008-December 2009), 10% VAT (January 2010-), currency converted

Denmark: 25% VAT

Finland: 22% VAT until end of 2010, now 23%

Ireland: 13,5% VAT

Italy: 10% VAT

Latvia: 5% VAT, currency converted

Lithuania: 18% VAT (2006Q3-2009Q2), 21% VAT (2009Q3-)

Netherlands: 19% VAT

Norway: 25% VAT, currency converted

Portugal: 20% VAT, Prices given in range (average value used)

Slovakia: 19% VAT (2006-2009), 20% VAT (2011)

Slovenia: 20% VAT

Sweden: 25% VAT, currency converted

UK: 5% VAT

A 2.2 Wood briquettes (industrial)

Denmark: VAT 25%

Latvia: Currency converted

Norway: Currency converted

Portugal: VAT 20%

Sweden: Currency converted (same price series as industrial wood pellets)

A 3 Wood chips

In the cases when the wood chip prices have been reported by the project partners in non-energy units, the prices have been converted to €/GJ using conversion factors depending on tree species and moisture content.

A 3.1 Wood chips (residential)

Belgium: 6% VAT, converted to energy unit using data from Ringman (1995)

Czech Republic: 19% VAT (August 2006-July 2007), 5% VAT (August 2007-December 2007), 9% VAT (January 2008-December 2009), 10% VAT (January 2010-), currency converted, moisture content 12-15%, assumed 17 GJ/tonne

Germany: 7% or 19 % VAT³, 35% moisture content gives 12.5 GJ/tonne

Italy: 10% VAT, 50% moisture, poplar gives 8 GJ/tonne

Portugal: 20% VAT (2006-2009), 21% VAT (2010), 23% VAT (2011), "20-40% moisture content", assumed 30% MC ->13.6 GJ/tonne

Slovenia: 20% VAT

Sweden: 25% VAT, currency converted

A 3.2 Wood chips (industrial)

Austria: Prices given in €/cubic meter with no data on moisture content. Assumed moisture content to be 30%, which gives 2.7 GJ/m³. (Ringman, 1995)

Finland: Wood chips price is published by Pöyry in Bioenergia Journal and the Ministry of Employment and Economy in official Statistics of Finland.

Ireland: Prices reported incl. 13.5% VAT which was then excluded.

Latvia: Prices given in LVL/cubic meter. Moisture content reported as "40-55%". Using the average value, i.e. 47.5%, gives 1.91 GJ/m³.

Lithuania: Prices reported incl. 18% VAT (-2009Q3) and 21% VAT (2009Q4-) which was then excluded.

Portugal: "20-40% moisture content", assumed 30% MC ->13.6 GJ/tonne. Prices reported incl. 20% VAT (-2010Q4) and 23% VAT (2011Q1) which was then excluded.

³ The normal VAT-level in Germany is 19%. The reduced tax rate (7%) applies for some products, which are listed in the German "VAT-law" (Umsatzsteuergesetz, UStG). For wood chips from raw wood the VAT-level is 19%, but if the chips are made from waste wood, wood residues or by-products, the VAT-level is 7%.

Sweden: Currency converted

UK: 24% moisture content -> 14.76 GJ/tonne

A 4 Firewood (residential)

A 4.1 Firewood (broadleaf)

Austria: Prices reported in €/stacked m³. Assumed 25% moisture content and birch ->6.3GJ/m³

Belgium: Prices reported in €/stere. 20% moisture content gives 6.6 GJ/stere

Czech republic: Prices reported in Kc/stacked m³, 20% moisture content, species: beech, oak & birch -> 7 GJ/stacked m³, Currency converted

Finland: 20% moisture content, bulk delivery sold usually as loose m³ (5 GJ/m³), 22% VAT until end of 2010, now 23%. Prices published in e-trading market place like Halkoliiteri and Mottinetti.

Germany: Beech 3000 kWh/m^{3f} & 690 kg/m^{3f} -> 4.3 MWh/tonne dry ->15.5 GJ/tonne, 7% VAT

Greece: 13% VAT. Moisture content reported as appr. 30%, mixed species

Hungary: Prices reported in HUF/tonne, 20% VAT, currency converted

Latvia: Moisture content reported as "15-55%" ->3.85-8.25 GJ/m³, currency converted

Lithuania: 18% VAT (2006Q3-2009Q2), 21% VAT (2009Q3-), currency converted

Netherlands: 19% VAT

Norway: 25% VAT

Romania: 24% VAT

Slovakia: 19% VAT

Sweden: 25% VAT

A 4.2 Firewood (coniferous)

Austria: Prices reported in €/stacked cubic meter. Assumed spruce & 25% moisture content->4.68 GJ/m³

Italy: Prices reported in €/tonne

Portugal: 23% VAT

Slovakia: 19% VAT

Slovenia: Prices reported in €/m³

A 5 Sawmill by-products

Austria: Assumed sawdust of 40% moisture content ->3.8 GJ/m³

Belgium: Assumed sawdust of 50% moisture content ->3.0 GJ/m³

Germany: Assumed sawdust of 40% moisture content ->3.8 GJ/m³

Greece: VAT 23% stated and removed. Assumed sawdust & shavings of 10 – 50% moisture content

Latvia: Assumed sawdust of 40% moisture content ->3.8 GJ/m³, currency converted

Lithuania: 18% VAT (2006Q3-2009Q2), 21% VAT (2009Q3-)

Portugal: Assumed sawdust of 40% moisture content ->3.8 GJ/m³. VAT 21% (-2010Q4) and VAT 23% (2011Q1-)