

Development and promotion of a transparent European Pellets Market  
Creation of a European real-time Pellets Atlas

## Pellet market country report NETHERLANDS



Copyright © Utrecht University  
Copernicus Institute  
Padualaan 5  
3584 Utrecht, the Netherlands



**Universiteit Utrecht**

April 2009

Prepared by Utrecht University  
Martin Junginger  
Richard Sikkema

Contact [h.m.junginger@uu.nl](mailto:h.m.junginger@uu.nl)  
Tel. +31-30-2537 613

This report is available at the pellets@las website at [www.pelletsatlas.info](http://www.pelletsatlas.info)

The pellets@las project is supported by the European Commission under the EIE programme (EIE/06/020/SI2.448557). The sole responsibility for the content of this report lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

## TABLE OF CONTENTS

<b>1. Summary .....</b>	<b>4</b>
<b>2. Introduction .....</b>	<b>5</b>
<b>3. History of market development.....</b>	<b>5</b>
<b>4. Pellet production .....</b>	<b>7</b>
<b>5. Pellet trade and logistics .....</b>	<b>8</b>
<b>6. Pellet consumption .....</b>	<b>10</b>
<b>7. Mixed biomass pellets .....</b>	<b>11</b>
<b>8. Legal framework &amp; Policy.....</b>	<b>13</b>
<b>9. Projections on future developments.....</b>	<b>16</b>
<b>10. Summary and conclusions.....</b>	<b>19</b>

## 1. Summary

The Dutch pellet market is characterized as follows:

- Only few wood pellet producers with limited production capacity: 130,000 tonnes in total. One barrier for further growth of wood pellet production is the lack of raw material, because most sawmill residues have a dedicated use in Belgian particle industry or in Dutch extensive dairy sector.
- A very small market for domestic heating, mainly hampered by lacking policy support for residential pellet boilers, a nation-wide natural gas grid and advanced natural gas boilers, and lacking storage space for wood pellets at typical Dutch houses
- A large demand for wood pellets for co-firing in coal fired power plants. Wood pellet consumption has increased from less than 200,000 tonnes in 2002 to over 900,000 tonnes in 2008. This demand is almost exclusively caused by the so-called MEP feed-in premium, which was in place between 2003-2006, and provided a subsidy of between 6-7 €ct per kWh electricity produced from clean woody biomass.
- 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.

## 2. Introduction

Wood pellet markets in Europe are very heterogeneous, and many are rapidly developing. One of the aims of the Pellets@las project is to describe these markets to provide accurate and up-to-date data.

The wood pellet market in Netherlands has a number of very specific characteristics, and the aim of this country report is to provide a clear and concise overview of the Dutch wood (and to some extent MBP) market up until the end of 2008.

This report organizes as follows: Section 3 provides a short overview of the historic development of the wood pellet market in the Netherlands. Section 4, 5 and 6 describe respectively the wood pellet production, trade and consumption. Section 7 discusses the situation regarding mixed biomass pellets (MBP) in the Netherlands, while section 8 sketches the legal framework and support policies for wood pellets and MBPs. In section 9, future developments are highlighted, and section 10 finalizes the report with a summary and conclusions.

## 3. History of market development

The use of wood pellets in the Netherlands only dates back about ten years. Dutch energy companies began to co-fire biomass and coal in the early 1990s, but mainly waste streams such as paper sludge and (demolition) wood were used. Power companies combusted specific fuel types, in particular demolition wood and sewage sludge, because there was a surplus of these fuels rather than because there was a demand for renewable energy, and the focus was on experimenting with direct and indirect co-firing of small amounts of biomass. In the late 1990s, the focus shifted towards larger amounts of biomass and 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, signed in 2002, and beneficial policy support schemes for the production of renewable electricity from biomass (see also section 8). Due to these favorable economic support schemes, utilities started to look for additional biomass.

The Dutch forest industry is merely based on large timber imports (Germany, Scandinavian countries, Indonesia, West African countries), because Dutch forests are relatively small (350,000 ha or about 8% of the country's land surface). However, the feedstock potential for the production of wood pellets (sawdust or shavings) from domestic industry is rather limited. When regarding the tree species, residues (waste) from (re)sawing process of coniferous species (mostly spruce and pine) and white deciduous species (mostly poplar) are fully dedicated to other destinations. Such destinations are for example, the particleboard industry in Belgium and the extensive Dutch dairy sector (stable litter). Generally, sawdust from tropical wood species is best available; because particle board industries cannot use (tropical) red wood residues in their products and dairy sector is prohibiting these residues due to allergic reactions of their livestock.

So far, two wood pellet producers with a combined capacity of 130,000 tonnes are present in the Netherlands, but it is unlikely that this capacity will increase (see also section 4). Therefore, the Dutch utility sector started to explore possibilities whether biomass could be imported from e.g. Eastern Europe or North America. This coincided with the rapidly increasing imports from Canada to Sweden, and soon the Netherlands also started to import large quantities of wood pellets (see also section 3).

Within the Pellets@las project, three main markets have been defined within the European pellet market (Sikkema et al 2009).

- Non industrial bulk for heating, in this case an average volume of about five tonnes, meeting specific quality standards<sup>1</sup>, is delivered to a district heating plant. Pellets are sold by traders to end consumers. If a producer sells directly to a consumer, he is regarded as a trader, too.
- Non industrial pellets in small bags (15 to 25 kg) *for heating*, with similar standards as non industrial bulk. In this case study, small consumers buy small bags at retailers' shops and use them in small scale heaters at home. The average annual volume sold is about 0.25 tonne.
- Industrial bulk for electricity production at large scale consumers with an annual demand higher than 3,000 tonnes and having less stringent quality standards, compared to the non industrial pellet volumes. The pellets are mainly transported by wholesale merchants or international traders, operating between production plants and large scale consumers.

In some countries, several of these markets co-exist. In the Netherlands, the third market type is clearly dominant, like illustrated in the next sections.

---

<sup>1</sup> One of the following: CEN/TS 14961, Ö-norm M 7135, DIN plus, DIN 51731, Pelletgold, Umweltzeichen 38 or SS 187.120

## 4. Pellet production

The Netherlands has two pellet production plants, one located in the western part of the country one in the middle of the Netherlands (see Figure 1). Together they have a production capacity of 130.000 tonnes, also this production capacity is typically utilized between 80-90% (see and Table 2). The quality of the produced pellets is mainly 'DIN 51731' based. The pellet producers trade the pellets themselves, but also via about six other Dutch traders. About 53% of Dutch production is being used for power production and about 47% for heating (bags, bulk).

**Table 1: Development of the pellets market over period 2005 until 2008 (in tonnes)**

Year	Total production capacity	Total production	Consumption
2008	130,000	120,000	913,500
2007	130,000	107,500	704,000
2006	130,000	110,000	484,000
2005	130,000	110,000	485,000

The biggest producer, Energy Pellets Moerdijk BV, produces wood pellets, a high quality fuel which is CO<sub>2</sub>- neutral, for using in Power stations and Heating systems. They have transport facilities to transport by vessel, train and truck. The other pellet production plant, Plospan Bioenergy BV in Waardenburg, started in September 2005 with the production of pellets, which substantially consist of (tropical) hardwood. This pellet is especially suitable for small as well as medium sized automatic installations, which provide the fireplace automatically with pellets with the help from a transport axel.

**Table 2: Production of wood pellets 2008 based on the size of the pellets plants (in tonnes)**

Size of pellets plants	Production capacity 2008	Total production 2008	Number of pellets plants 2008	Utilization rate 2008 [%]
small-scale (< 30,000 tonnes/year)	0	0	0	0
medium-scale (30,000 – 70,000 tonnes/year)	30,000	20,000	1	67
large-scale (> 70,000 tonnes/year)	100,000	100,000	1	100

Both companies have their fleet of container trucks and trailers with special suction installations collecting the sawdust and other feedstock like fresh wood fibers. It is also possible to deliver containers and change them when they are full. This is done on demand. The same trucks deliver the products to wholesalers and distributors from where they go to the consumers. In both production locations there is an area with a large storage capacity, so that a continuous supply is guaranteed.

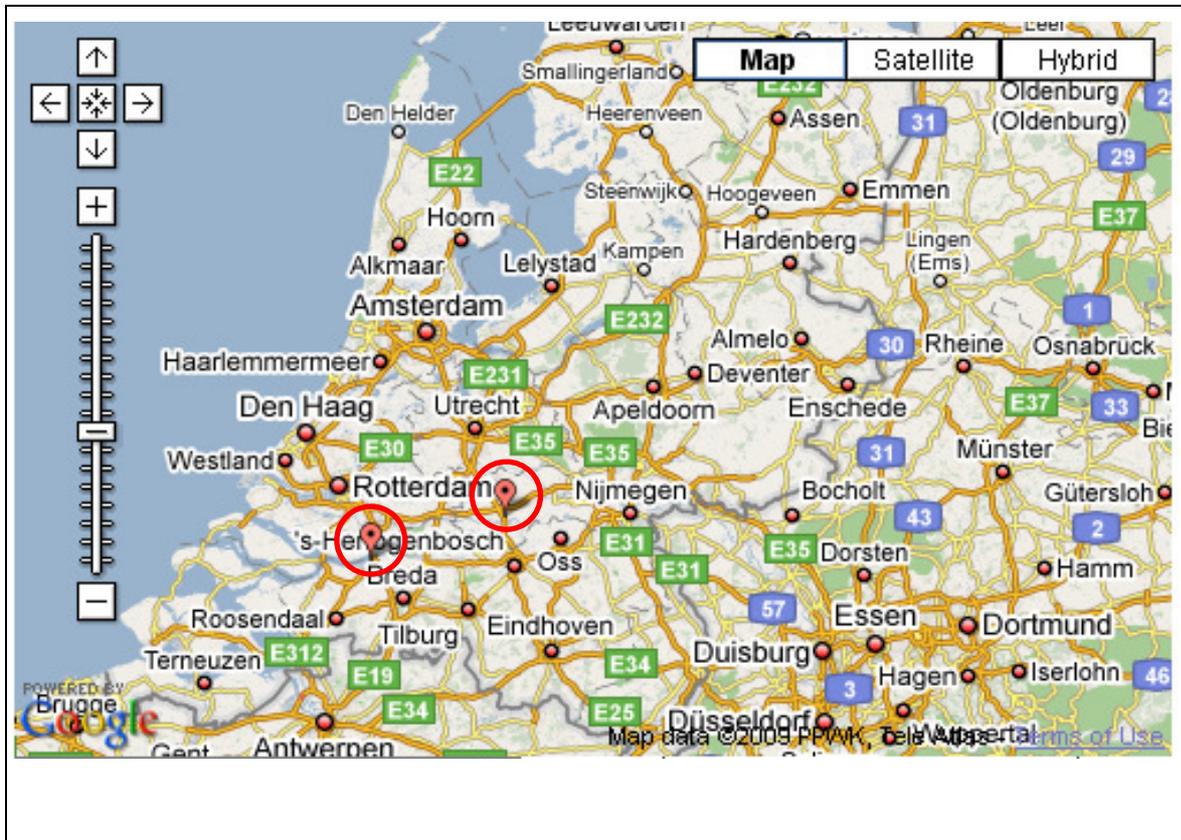


Figure 1: Location of wood pellet plants in the Netherlands in 2008.

## 5. Pellet trade and logistics

The pellet market in the Netherlands is made up via individual enquiries at all pellet actors. Firstly the import and domestic supply of large scale consumers of industrial pellets (power production) is investigated. The export of industrial pellets is assumed to be zero. Secondly the market non industrial pellets for heating is derived from the input from traders, divided into on domestic supply and export volumes. Thirdly, the import of non industrial is extracted from the export and consumption minus the domestic supply (production). Figure 2 shows the pellet balance of the Netherlands over the period 2001 to 2008. Note that prior to 2005, no information is available regarding import and export of wood pellets. Also, all data presented here should be considered as (sometimes rough) estimates, as no official statistics regarding pellet production, consumption and trade existed until the end of 2008. According to Eurostat, from the 1<sup>st</sup> of January 2009, EU member states will record trade monthly based statistics for a dedicated category of wood pellets.

Regarding wood pellet logistics, 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.

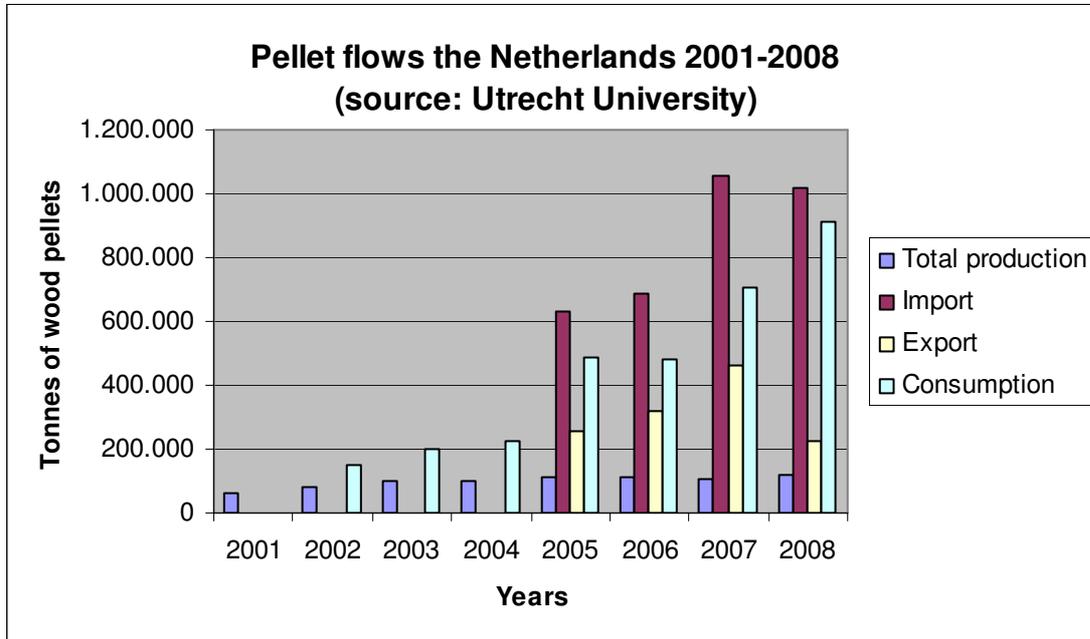


Figure 2: Wood pellet balance of the Netherlands

## 6. Pellet consumption

The pellet consumption is largely based on industrial pellets for power production and just for a small part on non industrial pellets for heating.

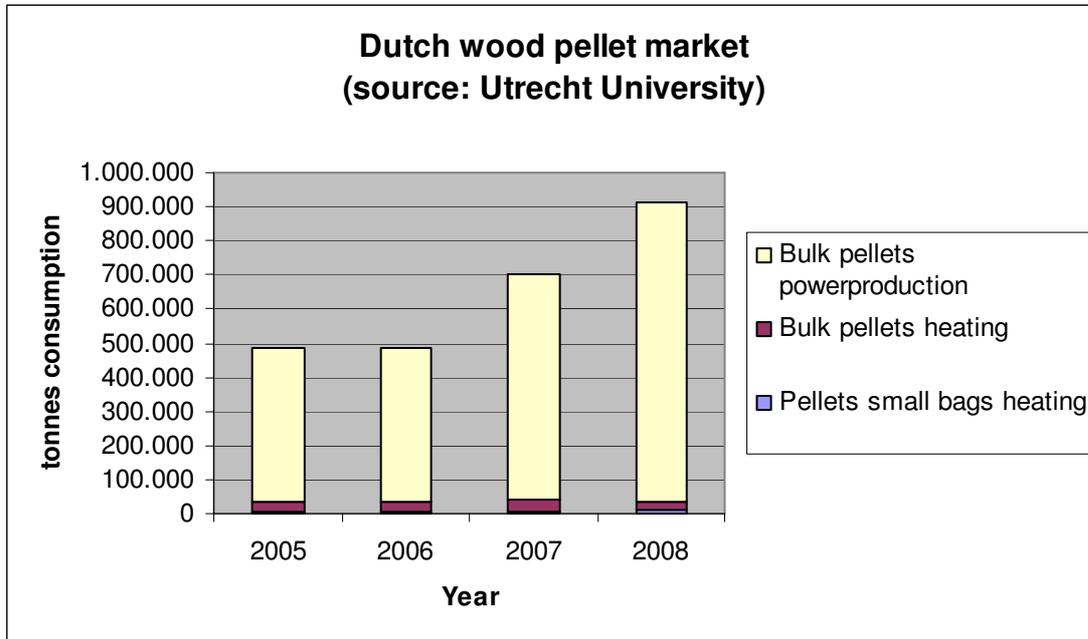


Figure 3: Consumption of wood pellets in the Netherlands - 2005 until 2008

Nowadays, more than 95% of all wood pellets consumed in the Netherlands are co-fired in large coal power plants. In other words, the market in the Netherlands is a large-scale one, and almost exclusively for electricity production. While the maximum theoretical co-firing capacity is not yet reached, the market is quickly getting mature (see also section 3). 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 1<sup>st</sup> quarter of 2008 from waste wood to wood pellets. The power production was abruptly halted several times due to problems with refining process of waste wood: the hammer mill collapsed several times per year and needed a lot of maintenance.

Use of wood pellets for domestic heating in small-scale boilers is rather uncommon in the Netherlands, most likely due to the lack of specific support schemes, the presence of a natural gas grid throughout the entire country and high-efficiency natural gas boilers, and perhaps also limited storage space for wood pellets (typical Dutch dwellings do not have a cellar).

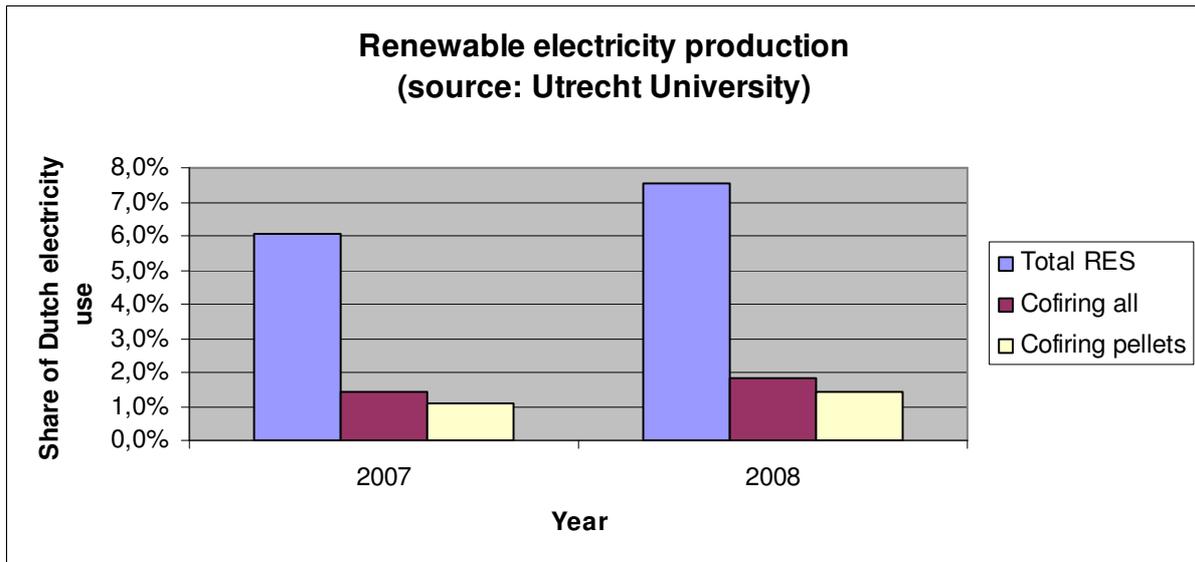


Figure 4: Renewable electricity production in the Netherlands – 2007 until 2008

The production of electricity from renewable energy sources (RES) in the Netherlands has increased from 6.0 % of domestic electricity consumption in 2007 to 7.5 % in 2008 (Figure 4). Main producers are onshore wind farms and co-firing of biomass. The Dutch government strives to realize 9% renewable electricity by the end of 2010 and 20% by the end of 2020. The large power production units co-fired about 25% more biomass in 2008, compared to 2007. The co-firing mainly consists of wood pellets. Other sources are agro residues, and animal manure. In 2005 and 2006 the renewable electricity production was even larger due to another subsidy program. The 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).

## 7. Mixed biomass pellets

Utilization of wood pellets for residential heating is currently only marginally occurring in the Netherlands, probably due to the lack of subsidy programs and the presence of high-efficiency natural gas boilers, limited storage space for wood pellets (typical Dutch dwellings do not have a cellar). Utilization of MBP for medium-to-small-scale heating is to our knowledge currently not occurring in the Netherlands.

If large-scale use of wood and MBP pellets for small-scale residential heating were to occur in the near-by future, the emissions would be regulated under the Bees-B law<sup>2</sup>, which typically regulates all emission from small-scale industrial installations with thermal capacities lower than 20 MW. Finally, in the (for MBP unlikely) application in small-scale residential wood boilers, the Netherlands Emission Guidelines for Air

<sup>2</sup> [Bees-B] Besluit emissie-eisen stookinstallaties milieubeheer-B. Available at:

[http://wetten.overheid.nl/BWBR0004833/geldigheidsdatum\\_18-02-2009](http://wetten.overheid.nl/BWBR0004833/geldigheidsdatum_18-02-2009)

would generally apply. A more detailed overview of all emission rules for biomass use is provided by SenterNovem<sup>3</sup>.

### National MBP market

During 2006 & 2007, about 15,000 tonnes of soy husks in pelletized form were bought by large Dutch utilities for co-firing from the Dutch agro industry. Also about 10,000 tonnes of other mixed biomass pellets were imported. During 2008, the MBP market was coined by the pilot use of coffee husk pellets, directly imported from Brazil. The utility Essent expected to use 250.000 tonnes of these MBP by 2013, gradually replacing coal. However, due to competitive markets and shortage of supply, the use of MBP has been stopped for the time being in 2009.

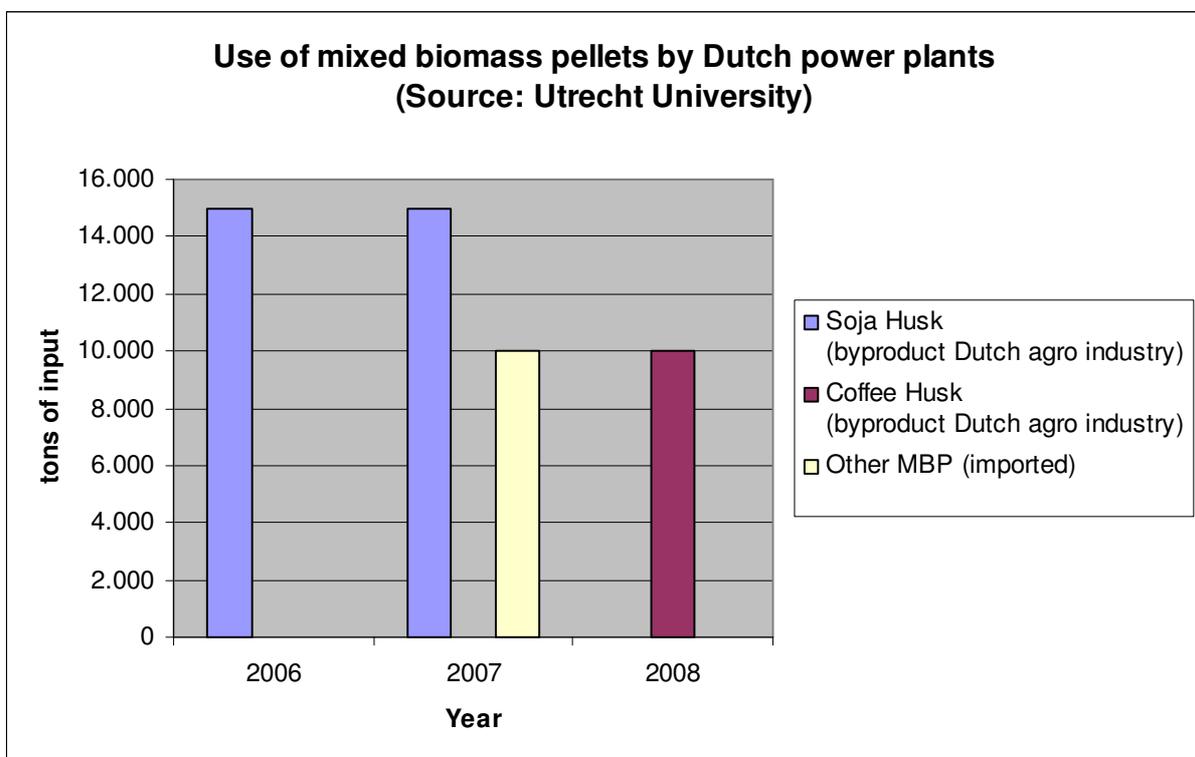


Figure 5: MBP market in the Netherlands – 2006 until 2008

### Factors hampering market development

The main factor is that prices of regular fossil fuels for power production, like coal and natural gas, are more than competitive. While the initiative of Essent was supported by Solidaridad (a Dutch NGO supporting fair trade of amongst others coffee), it turned out that the ash content of some MBP could be up to 14% and such high values are technically problematic for the co-firing process.

<sup>3</sup> [SenterNovem] Toelichting luchtkwaliteit, available at:

[http://www.senternovem.nl/duurzameenergie/aan\\_de\\_slag/aan\\_de\\_slag\\_bioenergie/vergunningverlening/vergunningverlening\\_biomassa/c16c08.asp](http://www.senternovem.nl/duurzameenergie/aan_de_slag/aan_de_slag_bioenergie/vergunningverlening/vergunningverlening_biomassa/c16c08.asp)

## 8. Legal framework & Policy

This section is built up of subsidy schemes, sustainability criteria and legal framework for wood pellets and mixed biomass pellets.

### Subsidy schemes for wood and mixed biomass pellets

The main measure to stimulate the production of renewable electricity is the so-called SDE scheme. It subsidizes the exploitation of new sustainable energy projects. This means that the scheme subsidizes the production of renewable gas and electricity. SDE is not an investment subsidy; it is a feed-in premium subsidy scheme. In the case of electricity from biomass, only a certain number of biomass types can be used to obtain SDE support. The list of eligible fuels includes amongst others clean wood, wood wastes, agricultural residues and input of animal origin (e.g. manure). In total, for 2009, a subsidy amount for electricity from biomass of € 715 million is available (and additionally € 195 million for the production of biogas through anaerobic digestion). However, the use of wood pellets for large-scale co-firing is currently **not supported** under the SDE scheme.

The large amounts of wood pellets co-fired in recent years are mainly a result of the previous subsidy scheme, the so-called MEP system (Environmental quality of the electricity production), a system of feed-in premiums, which was in operation between July 2003 and August 2006. Since July 2003, the MEP is guaranteed to producers of electricity from renewable sources which feed in on the Dutch electricity grid. The subsidy was financed by a levy on all connections to the electricity grid in the Netherlands. The MEP-feed-in premiums apply for a number of renewable energy technologies (e.g. onshore and offshore wind, hydro power, PV) and for various biomass options. For the biomass options, the height of the feed-in premium is rather complicated: it depends on four factors:

- Capacity of the installation (e.g. larger or smaller than 50 MW<sub>e</sub>),
- Type of biomass used (e.g. clean, woody biomass or bone meal),
- Period when the electricity was produced (from July 2003 in periods of 6 months) and
- Point in time when the first request for subsidy was received.

Typically, for electricity produced from clean woody biomass (e.g. wood pellets) a feed in premium between 6 and 7 €ct per kWh was awarded.

Co-firing capacity is still eligible for MEP support. In 2008 a record amount of wood pellets was imported to the Netherlands, but probably will not further increase. 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 SDE support system 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 over the course of 2009, more clarity on this issue will be provided by the Ministry of Economic Affairs.

### **Criteria for the sustainable biomass**

In 2009, market parties, the Dutch government and NGO's have made a voluntary agreement on how to define 'sustainably produced' biomass. These formalized criteria are based on the sustainability criteria defined in 2007 by the Cramer commission. To be able to certify sustainably produced biomass, the Dutch normalisation institute NEN has developed a NTA 8080 standard (in Dutch)<sup>4</sup>. It is the intention to utilize this NTA standard for granting SDE subsidies from 2010 onwards. However, because large-scale co-firing of wood pellets is currently excluded from the SDE, it is unclear how these sustainability criteria will affect the production and import of wood pellets to the Netherlands.

### **Legal framework for wood and mixed biomass pellets**

Wood pellets and, to a lesser extent, mixed biomass pellets (MBP) are used in 2008 for one single large-scale coal power plant ("Amer centrale"), owned by the Utility Essent. Other coal-power plants also co-fire agricultural residues, such as wheat husks and palm kernel shells, but not in pelletized form. In general, these plants have to meet the general local, national and international laws setting emission thresholds for coal-power plants. On a national level, this is regulated by the so-called Bees-A, setting emission thresholds for (amongst others) power plants with a thermal installed capacity greater than 20 MW for emissions of SO<sub>x</sub>, NO<sub>x</sub>, fine dust particles etc.<sup>5</sup> For example, the emission threshold for plants with a capacity of more than 300 MW, commissioned after 1992, is 200 mg/m<sup>3</sup> for SO<sub>x</sub> and NO<sub>x</sub> and 50 mg/m<sup>3</sup> for dust. The Bees-A law is also valid for non-wooden biomass, which is explicitly included in the law. Next to the inclusion of residues from the food –processing industries and the pulp & paper industries, biomass is defined as 'plant material derived from agricultural or forestry activities'. If wood pellets and mixed biomass pellets were to be used in either large scale stand-alone plants or co-fired in waste incineration plants, other relevant Dutch laws are the Netherlands Emission Guidelines for Air<sup>6</sup>

---

<sup>4</sup> See also: <http://www2.nen.nl/nen/servlet/dispatcher.Dispatcher?id=BIBLIOGRAFISCHEGEDEVENS&contentID=273893>

<sup>5</sup> [Bees-A] Besluit emissie-eisen stookinstallaties milieubeheer-A. Available at: [http://wetten.overheid.nl/BWBR0004147/geldigheidsdatum\\_18-02-2009#Hoofdstuk2](http://wetten.overheid.nl/BWBR0004147/geldigheidsdatum_18-02-2009#Hoofdstuk2)

<sup>6</sup> [NER] Netherlands Emission Guidelines for Air, available at: <http://www.infomil.nl/asp/get.aspx?xdl=/views/infomil/xdl/page&ltmldt=164452&Sitldt=111&Varldt=82>

and the law on the combustion of waste<sup>7</sup>. Especially in the latter, also emission thresholds are defined for contaminated metals (e.g. with heavy metals or halogens).

Next to the national laws, local municipalities have in special cases (e.g. when the plant is located close to residential areas) the right to set more stringent emission levels for specific emission (e.g. dioxins, mercury). However, as levels of halogens and mercury are typically very low in mixed agricultural biomass, this is deemed of less relevance in this frame.

---

<sup>7</sup> [BVA] Afvalverbranding: Besluit verbranden afvalstoffen.  
<http://www.infomil.nl.aspx/get.aspx?xdl=/views/infomil/xdl/page&ltmldt=28786&Sitldt=111&Varldt=82>

## 9. Projections on future developments

Projections are illustrated via market developments (section 9.1), a recently established index for pellet prices (9.2) and ongoing research (9.3).

### Expected market developments

As the Netherlands have very limited domestic resources of raw material freely available (see section 3), it is unlikely that any new significant pellet production capacity will be built in the coming years. Given the ambitious Dutch policies for renewable energy and renewable electricity (20% renewable electricity production by the end of 2020), it is very likely that also in the future, import of biomass will be required to meet these targets. As argued however in section 8, it is unclear how and when additional policy measures will be implemented to achieve the required increase in co-firing capacity.

Next to increasing the share of renewables in the Dutch electricity portfolio, security of supply may also become an issue, although rather a minor one. Coal prices have fluctuated strongly in recent years, and as the amount of wood pellets that is co-fired can be changed rapidly, wood pellets may become a strategic alternative in times that coal prices are (extremely) high. However, given the very large global coal reserves, a real shortage of coal is not expected in the next decades, and so the security of supply aspect is much less important than e.g. in countries where wood pellets replace heating oil or natural gas.

Regarding the domestic heating market, it is unlikely that wood pellets will gain significant market shares in the near future. Dutch policy is focusing on other alternatives, such as natural-gas fuelled micro-CHP installations, producing heat and electricity in residential areas, utilization of heat pump, solar heating and heat storage.

The Dutch ports of Rotterdam, Amsterdam, Flushing and Delfzijl/Eemshaven do have a clear interest to become bioenergy-hubs, a scenario which is not unlikely. With increasing amounts of wood pellets being imported from 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.

### Development of a price index for industrial wood pellets

A company called ENDEX established in October 2008 a price index for wood pellets. Traditionally, the ENDEX pricing panels produce price indices for Dutch power, Belgian power and natural gas on a daily basis. These price indices have become benchmarks in the energy market and are used by energy companies and

their customers to take their trading decisions. ENDEX is now expanding its pricing panels with a pricing panel for the bio-energy product industrial wood pellets.

A recent survey among ENDEX members and active players in the bio-energy markets has indicated a strong demand for standardized market price information for several bio-energy products, facilitated by an independent and secure platform. In close co-operation with market players active in these markets, ENDEX is eager to contribute to the further development of the bio-energy market by introducing bio-energy price indices.

As from 20 November 2008, ENDEX publishes reference prices for Industrial Wood Pellet products<sup>8</sup>. The published prices are obtained from a mix of producers, traders and large scale consumers. It is an average price, based on all surveyed prices, divided by the amount of actors involved. A more detailed, weighted average (based on volumes) is more difficult to obtain, because adding up all volumes from producers, traders and large scale consumers may lead to double counting. Generally, prices of industrial wood pellets are given in € per tonne CIF ARA. This price includes all costs, insurance and freight (CIF) until transshipping of pellets from the ocean ships (Panamax) into the storage depots (or smaller inland river vessels) of European biggest pellet harbors of Amsterdam, Rotterdam or Antwerp (ARA).

Currently, ENDEX publishes reference prices for the following contracts:

- 3 front Months Wood Pellet contracts
- 3 front Quarters Wood Pellet contracts
- 1 front Calendar Wood Pellet contracts

The reference prices for the Industrial Wood Pellets are updated weekly, every Thursday at approximately 17:00 hrs (CET). The pricing conditions for the pricing panel members are laid down in a special contract between the pricing panel members (so-called pricing officers) and ENDEX.

Depending on market development and the level of liquidity of the (standardized) bio-energy products, ENDEX aims to introduce:

- Tradable (standardized) bio-energy futures on the ENDEX Futures Exchange (e.g. Wood Pellet Futures)
- OTC clearing service for bio-energy forwards (e.g. Wood Pellets Over The Counter clearing service)

---

<sup>8</sup> For product specifications, see [www.endex.nl](http://www.endex.nl).

## Ongoing research on Torrefaction

The Dutch energy research centre of the Netherlands and various companies are strongly interested and involved in the development of torrefied wood pellets. In November 2007, a consortium of three Dutch organizations (Econcern, the Energy research Centre of the Netherlands (ECN) and Chemfo), has signed a memory of understanding to build a new type of biomass plant, that will produce 'second-generation' pellets. For these pellets, the feedstock will be torrefied, and processed into torrefied pellets (BO2-pellets, as the consortium calls them), which is currently working on the first commercial torrefaction plant.

As a second Dutch initiative, The Hague-based Topell has announced it will produce torrefied pellets, using a Torbed® reactor system developed by Polow energy systems in The Netherlands.

Torrefaction is a thermal pre-treatment technology carried out at atmospheric pressure in the absence of oxygen. It occurs between 200-300°C where a solid, uniform product with a very low moisture content and a high calorific value is produced. During the process, about 10% of the energy value of the original biomass is lost, at less than 75% of the original weight. Especially on long-distance transportation chains, the additional investments and losses in energy during the pretreatment process may be (more than) recovered due to the higher energy density, and subsequent lower transportation costs. For example, Topell claims that typically, their pellets have an energy density of 18 - 20 GJ per m<sup>3</sup> versus 10 - 11 GJ per m<sup>3</sup> for conventional wood pellets. In comparison (see below), (Uslu et al 2009) estimate that torrefied pellets may have an energy density of 20.4-22.7 GJ per tonne, compared to 17-18 GJ per tonne for conventional pellets. It is considered a key technology to process a large variety of different feedstocks (such as wood chips and agricultural residues) into a high-energy density pellet. The current 1<sup>st</sup> generation wood pellets have a limited energy density, require indoor storage and need an extra pulverization step, separate from coal pulverization. Claims are that these limitations are all solved for torrefied pellets, which are hydrophobic, can be stored outside, and milled together with coal in standard hammer mills. General applications of torrefied pellets will be the use in coal fired power plants and as a feedstock for gasification-based production of transportation fuels<sup>9</sup>. The application for heat production (e.g. residential heating) is less viable, due to the smaller distances valid within the chain of conventional wood pellets for heating.

---

<sup>9</sup> For more information, please see:

[http://www.econcern.nl/index.php?option=com\\_content&task=view&id=200&Itemid=66](http://www.econcern.nl/index.php?option=com_content&task=view&id=200&Itemid=66)

<http://www.nom.nl/ng01/index.jsp?articleid=27653> (in Dutch)

<http://www.topell.nl/index.htm>

<http://www.chem.uu.nl/nws/www/publica/Studentenrapporten/Studentenrapporten2005/12005-27.pdf>

## 10. Summary and conclusions

The Dutch pellet market is characterized as follows:

- Only few wood pellet producers with limited production capacity: 130,000 tonnes in total. One barrier for further growth of wood pellet production is the lack of raw material, because most sawmill residues have a dedicated use in Belgium particle industry or in Dutch extensive dairy sector.
- A very small market for domestic heating, mainly hampered by lacking policy support for residential pellet boilers, a nation-wide natural gas grid and advanced natural gas boilers, and lacking storage space for wood pellets at typical Dutch houses
- A large demand for wood pellets for co-firing in coal fired power plants. Wood pellet consumption has increased from less than 200,000 tonnes in 2002 to over 900,000 tonnes in 2008. This demand is almost exclusively caused by the so-called MEP feed-in premium, which was in place between 2003-2006, and provided a subsidy of between 6-7 €ct-kWh electricity produced from clean woody biomass.
- 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.

It can be concluded that the Dutch utilities have successfully managed to source large quantities of wood pellets for co-firing, contributing significantly to the renewable electricity targets of the Netherlands.

Regarding the future, policy makers in the Netherlands are aiming to secure the sustainable production of biomass, explicitly including solid biomass for electricity production, next to liquid biomass production for transport. To this end, a standard based on the Dutch Cramer sustainability criteria is currently developed, which may become operational in 2010, and to which new subsidy schemes may be linked, i.e. consumers of wood pellets will have to prove that wood pellets have been produced sustainably.

Another Dutch ambition for the future is to become a major hub for solid and liquid bioenergy trade. Already in 2008, more than a million tonnes of wood pellets have been traded through Dutch ports. To secure this ambition, further increasing trade, advanced pretreatment technologies and dedicated loading and unloading facilities are required. Torrefaction of wood pellets may be one technological solution to enable more energy-efficient long distant transport.