IEA Bioenergy Task 40 – Country report for the Netherlands 2007

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Task 40: Sustainable International Bio-energy trade

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Executive Summary

This country report is an extensive update of the previous IEA Bioenergy Task 40 Country Report of 2006 (Junginger, 2006). The report is made on behalf on IEA's Bioenergy Task 40 (sustainable energy trade). The figures will likely be used as input for amongst others Eurostat (Energy yearly statistics), IEA (Renewables Information 2007) CBS Trade Statistics and SenterNovem.The report can be downloaded from the website of Task 40: www.bioenergytrade.org.

Main results

1. Cofiring of renewable in power plants contributes the largest share to the domestic renewable electricity supply in the Netherlands

The biggest shares of renewable electricity sources in the Netherlands were at:

- Cofiring powerplants: 32% in 2006 (37% in 2005)
- Wind turbines: 26% in 2006 (22%)
- Waste incineration: 14% in 2006 (15%)

2. The use of wood pellets in power plants is a steadily increasing market in the Netherlands, whereas its use in woodstoves for households is still a marginal market.

The overall input of biomass in power plants has decreased slightly by 3,5% to 29.445 TJ in 2006. Industrial wood pellets have the highest share: about 8 PJ (450.000 ton) was used in 2006. A new trend in the Netherlands is the input of non-industrial wood pellets for small scale energy production. In 2006 about 6.000 ton of wood pellets were used in wood industry and about 30.000 ton at households (Sikkema and Junginger, 2007).

3. Renewable electricity is largely subsidy-driven: the reduction of subsidies on biomass for power production has diminished the import of biomass and the input of such renewable resources.

The input of biomass has risen since 2003 due to the implementation of MEP feed-in subsidies. Consequently, the import of biomass has risen from about 30% in 2005 to about 70 to 80%, as the Netherlands seems not to have sufficient sources to fully cover the demand for biomass. In August 2006 the MEP subsidies were severely reduced for various biomass categories and abolished for additional biomass conversion capacity. As a result, the use of especially solid biomass was reduced in 2006 compared to 2005. The use of liquid biofuels, like palm oil, overall still showed an increase compared to 2005, but is likely to decline sharply in the near future due to sustainability concerns (see point 5).

4. Domestic & non-domestic availability and prices of different biomass types are other drivers for use of biomass for energy. However, more analysis is needed to cover the full range of economic & logistic effects.

In Chapter 6, some price indications for different biomass types and some of their competitive fossil fuel sources are reported. In the next issue of the Dutch country report, this topic may be further elaborated. Also the way of logistics by which main biomass flow into the Netherlands, will be analyzed more into detail.

5. Next to economic (subsidy, prices) and logistic (availability) aspects as main drivers for bioenergy trade, concern regarding the sustainable production of biomass may have a large impact on international biomass markets.

During the fall of 2006, NGO's increasingly raised criticism regarding the use of palm oil in natural gas power plants. As a result, in 2007, no palm oil was purchased for co-firing, which will likely cause a strong reduction of renewable electricity production in the Netherlands. Furthermore, to ensure the sustainable production and use of biomass for energy, new requirements for sustainable biomass resources are developed. The Commission Cramer (led by former professor Cramer of University Utrecht, nowadays the Minister of Environment), developed an overall (meta) sustainability framework for biomass production (Commission Cramer, 2007). The criteria and indicators are currently developed further, and may possibly be used to determine the financial support of distinct biomass resources (see also the next section).

Critical issues influencing future biomass trade in the Netherlands

1. The details and height of the new subsidy scheme for sustainable energy (SDE) in 2008 for biomass energy carriers

As the previous policy support scheme MEP for renewable electricity was basically abandoned in August 2006, there is large interest how the new subsidy scheme for sustainable energy (SDE) will be designed. Expectations are that the new system will be operational during the spring of 2008. While already draft support tariffs have been published, no final tariffs have been announced so far. One interesting development is that subsidies for biomass fuels will be linked to the price of fossil fuels. In the case of increasing fossil fuel prices (e.g. coal, natural gas) the cost gap with renewable sources will be reduced, and thus less subsidy will be required. It is to be seen whether this will stimulate or discourage the import of biomass to the Netherlands.

2. Legal implications of the new (Dutch) sustainability criteria

In the above-mentioned SDE system, sustainability criteria for biomass production are so far only included as a reporting obligation. However, on the longer term, it is envisioned that meeting these criteria will be mandatory to be eligible for subsidies. For this situation, a parliamentary evaluation of biomass use for energy was held in 2007 regarding the risk of violation of current WTO & EU regulations. It was concluded that

- Sustainability criteria for GHG emissions in the chain and for carbon sinks in vegetation & soil can easily be covered in existing national Dutch law (Burgelijk Wetboek) en environmental legislation (EU: REACH).
- Criteria regarding food safety, biodiversity and for quality of air, water & soil were considered to pose medium risks under current WTO rules and should be further developed, depending on whether dedicated certification of certain mains flows for bio-energy (wood, palm oil, soybeans & sugarcane) will be possible.
- The draft criteria for local prosperity and for social well being of local people, were considered “high risk”, as they may not be covered by any current legal framework of EU and WTO, and mandatory inclusion of such criteria could lead to legal actions against the Netherlands.

Acknowledgements

We would like to thank the following persons for their specific contribution to the country report:

- Reinoud Segers of CBS (National Statistical Office of the Netherlands)
- Timo Gerlagh of Senternovem, with regards to waste statistics
- Bert van Asselt & Frank van Erp of Senternovem with regards to biogas statistics & information about the Dutch national energy policy.
- Marc de Wit (Copernicus Institute) for his advice based on the former version of the country report.
- All other parties that supplied information biomass trade and use.

1. General Introduction

The Netherlands had in July 2007 about 16,6 million inhabitants and an average GDP of 25.564 € per inhabitant. The land area is about 3,39 million hectares or about 33.883 square km's, of which 22% consisted of arable land and another 1% of croplands (CIA, 2007). The forest area is about 330.000 ha. The Netherlands are situated in the North Western part of Europe.

Main industries

According to the World Factbook (CIA, 2007), the Netherlands has a prosperous and open economy, which depends heavily on foreign trade. The economy is noted for stable industrial relations, moderate unemployment and inflation, a sizable current account surplus, and an important role as a European transportation hub (especially the harbor of Rotterdam). Industrial activity is predominantly in food processing, chemicals, petroleum refining, and electrical machinery. A highly mechanized agricultural sector employs no more than 2% of the labor force but provides large surpluses for the food-processing industry and for exports. Main agricultural products are grains, potatoes, sugar beets, fruits, vegetables & livestock.

CO_2 reduction requirements

Based on preliminary energy & production statistics, the Netherlands emitted about 205 Megatons of CO_2 equivalents. This is a reduction of about 3 % towards 1990 (MNP, 2007a; MNP, 2007b). The period 1990-2004 had an increase of CO_2 emissions (due to electricity production & transportation sector), and on the other hand a decrease of other greenhouse gases (due to, amongst others, lowering of CH_4 at landfills and the reduction of cattle numbers). Although a higher consumption of electricity was reached in 2005 & 2006, CO_2 emissions were about 5 Megatons lower as 2004. The "lowering factors" were a lower domestic production and a higher import level of electricity, together with an increased use of renewables for domestic energy production.

The Kyoto goal is 8 % reduction of CO_2 emissions towards base year 1990, resulting in an average of 200 Megaton CO_2 equivalents per year in the period 2008-2012 (Ministry of VROM, 2005).

Electricity production & consumption

Table 1.1 shows the renewable electricity production in the Netherlands (Segers, 2007). Total Dutch production of electricity in 2006 was about 99.000 GWh and the consumption was 115.703 GWh (table 1.1).

In 2005 about 6,1% of consumption was based on renewable sources and in 2006 about 6,6%. Onshore wind turbines, besides biomass another important renewable resource, were mainly responsible for this growth. Both the added installed wind capacity (from 1.224 MW in 2005 to 1.559 MW in 2006) and the increasing load factor (relatively more wind in 2006) have led to additional Dutch renewable electricity production.

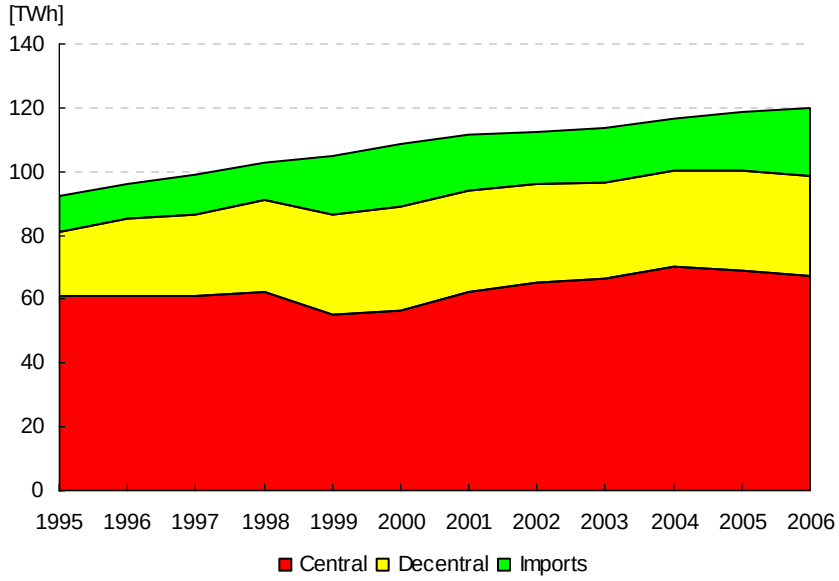
Table 1.1 Renewable electricity production in the Netherlands – 2005 & 2006

	Net domestic production of renewable energy (GWh)		Share of renewable sources (in % of total electricity consumption)	
	2005	2006	2005	2006
Renewable electricity production	100.500	99.000	6,1 (114.471 GWh)	6,6 (115.703 GWh)
- Cofiring of biomass in power plants	3.310	3.110	2,9	2,7
- Wind turbines	2.067	2.734	1,8	2,4
- Waste incineration	1.001	1.012	0,9	0,9
- Other sources	642	726	0,6	0,6

1) Includes losses in the electricity network, but excluding the use for power generation.

According to recent research by Roland Berger Consultants (Roland Berger, 2007), Dutch electricity companies have a relative low share of green electricity production. To comply with consumer demands, they will have to import green electricity from abroad (see also Appendix A).

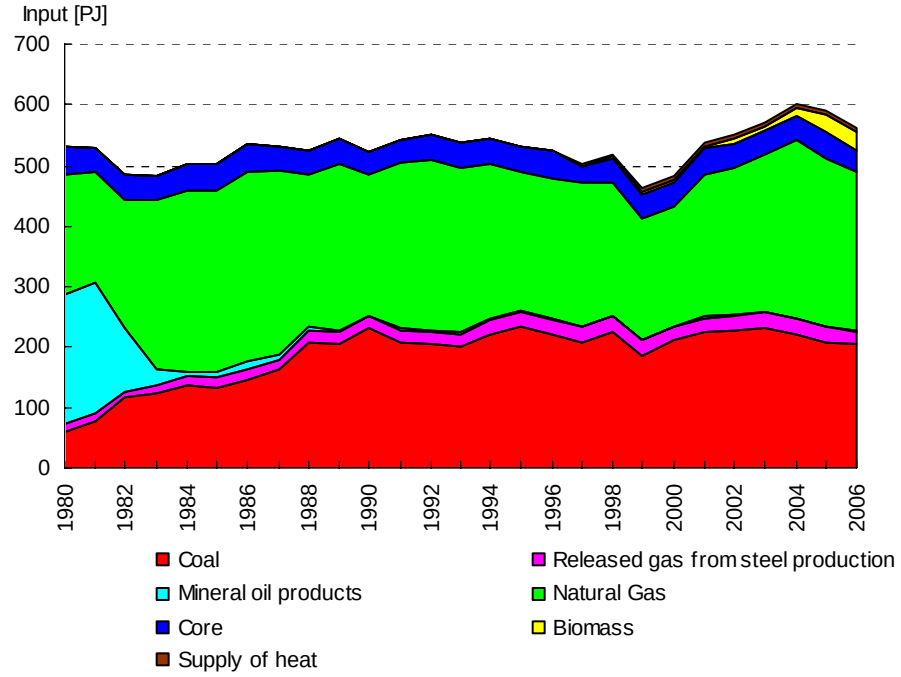
Figure 1.1 Total electricity production in the Netherlands and imports – from 1995-2006



Source: ECN, 2007

The Dutch demand for electricity is mostly being fulfilled by large-scale central electricity plants: in 2006 about 56%. Another part was imported: 18%, whereas the residual part was covered by decentralized combined heat power (CHP) plants (26%).

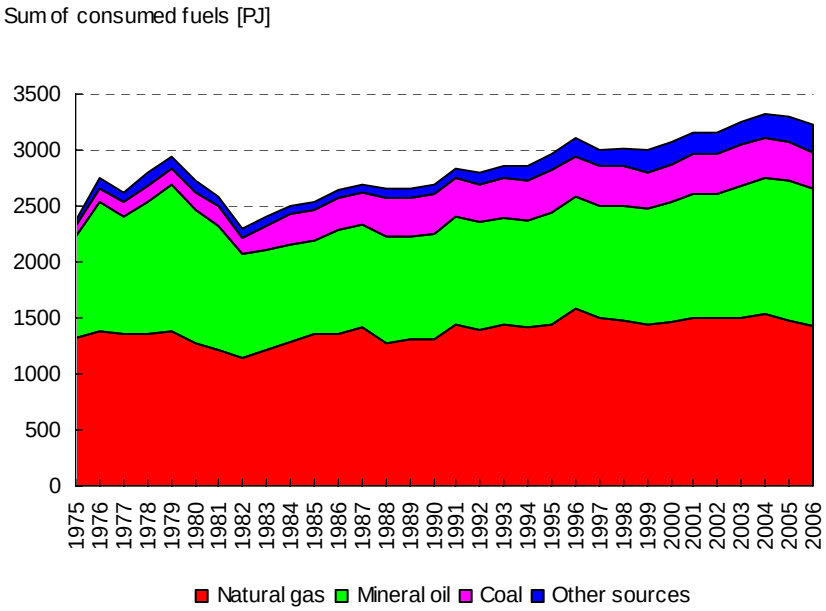
Figure 1.2 Use of fuels for electricity production



Source: ECN, 2007

Most used fuels are coal and natural gas. The use of oil has been halted around 1988. The use of biomass is promoted since 2001 together with the input of coal (cofiring).

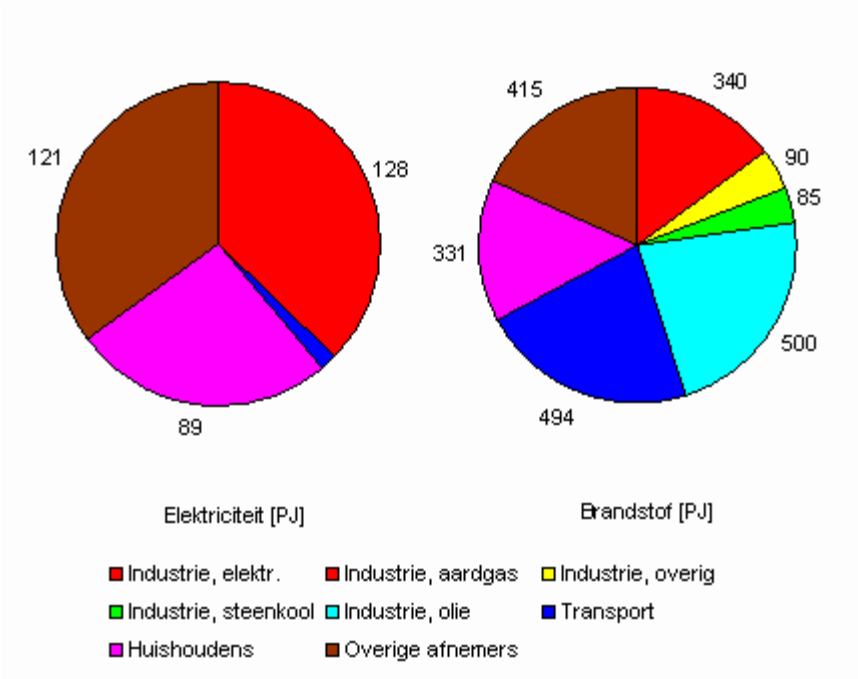
Figure 1.3 Overall use of fuels in the Netherlands



Source: ECN, 2007

If heating is included in the energy consumption, natural gas is far the greatest source. Most of the gas is of Dutch origin, although for the sake of a energy security strategy, the Netherlands also imports gas from UK, Norway, Russia, etcetera. Biomass is included in other sources.

Figure 1.4 Total energy consumption in the Netherlands per sector – 2006



Source: ECN, 2007

In 2006 the total energy use in the Netherlands was about 3.232 PJ, further divided into use of transport fuels, heat & electricity by energy demand (2.598 PJ) plus the conversion of primary fuels into energy (634 PJ). The demand of fuels at households & so-called other users (agriculture, service sector & public sector) consists for a big part of natural gas and for transport fuels of crude oil products.

2. Policy

The policy chapter is divided into the following sections: national targets, subsidies, sustainability criteria & future prospects.

2.1 National targets

Dutch policy for renewable energy from biomass sources are based on the Dutch Biomass Action Plan (see table below) and the EU directive for biofuels.

Biomass action plan

Dutch government is aiming for 10% renewable energy use in 2020 (Biomass Action Plan). All Biomass action plan figures have been derived from the so called "Statusdocumenten" of Senternovem (Daey Ouwens, 2006; Daey Ouwens, 2005a; Daey Ouwens, 2005b). These documents areused as input for the evaluation of policy goals of the Ministry of Economic Affairs (EZ). Figures from actual replaced fossil fuels are based on CBS statistics (see section 4.1).

Table 2.1. The real & estimated amounts of annually replaced fossil fuels by biomass consumption – 2005 until 2020 (in primary TJ).

	Actual replaced fossil fuels		Future prospects	
	2005	2006	2010 [1)]	2020
Total biomass	**58.142**	**59.242**	**109.500**	**190.500**
A. Waste incineration	11.874	12.180	20.000	40.000
B. Cofiring in powerplants (solid & liquid biomass)	29.438	27.189	34.000	68.000
C. Woodindustry	1.847	2.037	7.000	14.000
D. Householdings	5.464	5.564	-	-
E. Other biomass burning (solid & liquid biomass)	4.536	4.839	13.000 (average)	26.000 (average)
F. Biogas	4.983	5.453	7.000 (average)	14.000 (average)
G. Biofuels	101	1.979	28.500 TJ [2)]	

Sources:
Type A until F: Biomass action plan (10% renewables)
[1)] Due to European policy changes in 2007, the share of renewables may be lifted from 10% to 20% by the end of 2020.
Type G. EU regulations prescribe a 5,75% share of biofuels of total fuel consumption per member state.
[2)] source: ECN, 2007. Total fuel use 2006 is 494 PJ.

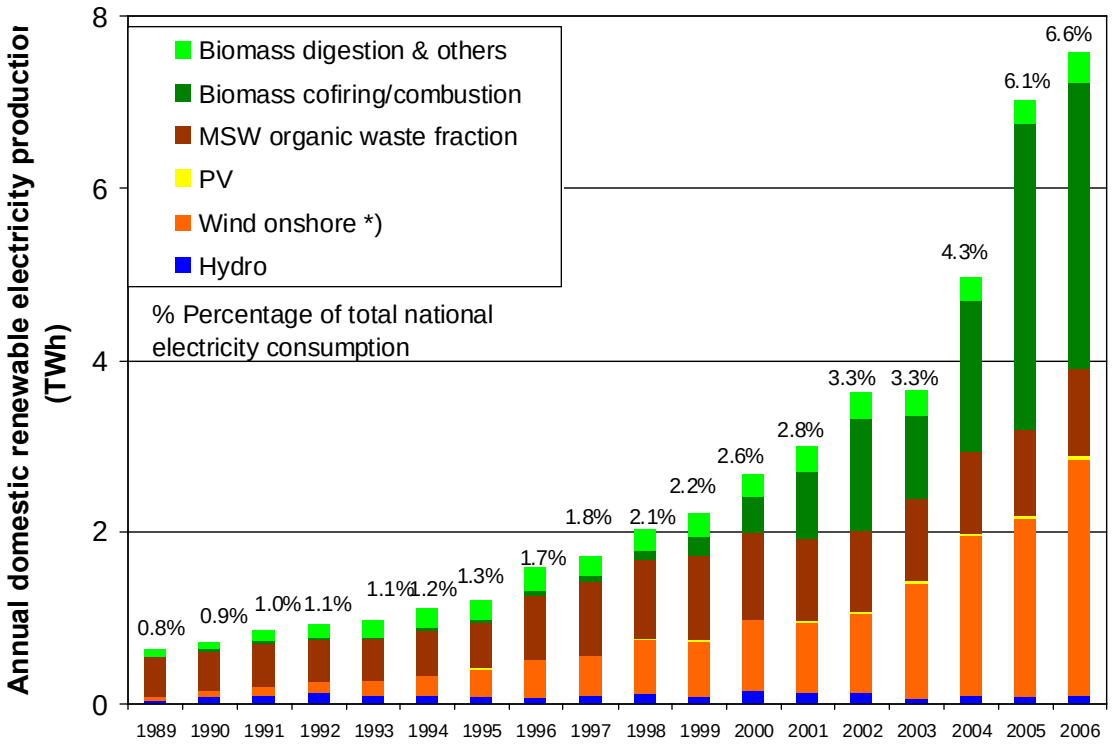
Biofuels

Dutch government was aiming for a 2% share biofuels (based on energy values) from 2006, derived from the EU obligation of a 5,75% share per member state in 2010. The current share (2006), however, is about 0,4 % of the total sold fuels within the Netherland (Segers, 2007).

Renewable electricity
Dutch policy on renewable electricity production (GWh) is also an important aim: 9% of the net domestic consumption in 2010 should be based on renewables sources.

Wind turbines had in 2006 a share of 2,4 % in electricity production, compared to 2,7 % for cofiring of biomass in power plants and 0,9 % of biogenic waste incineration (Segers, 2007). Total renewable consumption was about 6,6%. See Chapter 1 for an overview.

Figure 2.1 Annual renewable electricity production in the Netherlands and contributions per technology- 1989 until 2006.



*) Wind offshore 2006: unknown

2.2 Subsidies

The Netherlands has several instruments for stimulating renewable energy production. Hereafter the EIA and MEP are further described.

Subsidy on energy investments (EIA)
Since 1997, companies can submit their depreciation costs of machineries for sustainable investments for government subsidies (Senternovem, 2007a). In 2006 about 3,6 billion Euro subsidies was granted by government agency Senternovem. These grants consist of amongst others the following bio-energy systems:

- biomass digesters (84 submissions; € 505 million granted),
- biomass burning (283 submissions; € 195 million) and
- anaerobic digesters (249 submissions; € 158 million).

The biggest share, however, was granted to (off shore) wind turbines: 250 submissions with a total share of € 793 million.

Subsidy on renewable energy production (MEP)

In July 2003 the Dutch government introduced the support for renewable energy through subsidies of renewable energy investments during a period of 10 years. Below the current tariffs are shown. However, all subsidies have been cut at the 18th of August 2006. Only earlier approved projects still have these subsidies until the end of prescribed 10-year period (Vereniging Afvalbedrijven, 2007).

Table 2.2 Subsidies of bio-energy – From July 2007 onwards [1] (in €cents / kWh).
(Source: Ministry of Economic Affairs, 2007)

	Waste Incineration	Biomass < 10 MW	Biomass 10-50MW	Biomass > 50 MW	Anaerobic digesters
Closing date for approval	18 August 2006			10 May 2005	18 August 2006
(waste) wood (A-quality)	-	9,7	9,7	2,5	-
Waste wood (B-quality)	-	-	-	6,1	-
Organic fats & oils	-	-	6,0	-	-
Refuse Derived fuel (RDF pellets)	-	2,5	2,5	2,5	-
Bone meal	-	-	-	2,5	-
Landfill gases	-	-	-	-	1,3
Municipal Solid Waste	3,8				

[1] Deadline for submission was 18 August 2006. After that date, subsidies have been frozen.
[2] Related to an efficiency rate of 30%.

The MEP subsidies had a big stimulus on new bio-energy capacity

- Biomass < 10 MW. By the end of 2006, in total 55 small scaled bio-energy plants had a installed capacity of about 56 MW_e. In 2006, about 10 MW_e was built up additionally, divided over 14 new digestion installations on farms and 4 wood burning installations.
- Projects between 10 and 50 MW_e. By the end of 2006, only one plant in this segment was in operation: a 25MW_e wood energy plant. Further, three big projects have gone into the building phase during 2006. Total capacity of these new initiatives is about 63 MW_e.
- Projects > 50 MW_e. All big Dutch power companies have plans for upgrading their capacity. Several licenses for biomass utilization have already been approved.

However, the input of biomass has dropped from 30.522 TJ in 2005 to 29.445 TJ in 2006 (table 4.1). The drop was caused by the stop on subsidies per August 2006.

The average small consumer price per 1st of January 2007 for electricity in the Netherlands is 22 €ct/kWh (CBS, 2007c), including Value Added Tax and other taxes.

Public evaluation of MEP

In 2007, the Dutch government has asked for an evaluation of the MEP (Rekenkamer, 2007). The conclusions were as follows:

- The MEP was **not always consistent with other goals of the national energy policy**. MEP was too much directed to a 9% renewable goal in 2010. Other goals of the Dutch energy policy, i.e. reliability, cleanness & efficiency, were neglected.
  a. With regards to reliability of supply, it was determined that mostly (imported) biomass was used, whereas the long term supply of biomass will be an uncertain factor.
  b. The burning of biomass may be a problem in case of palm oil. As palm oil may have a negative score on the net GHG emission (e.g. due to deforestation), the overall carbon balance of this type of biomass may result in a negative carbon balance.
  c. In some cases the MEP subsidies exceeded levels required to compensate for the initial investment.
- Production of renewable electricity by use of biomass was **not always sustainable**. The Ministry of Economic Affairs has defined sustainable biomass as carbon neutral, whereas (inter)national interpretations lead to an overall sustainability, including the care of biodiversity, food security, etc. See further sections 2.3 Sustainability criteria & 8.1 Trade Barriers.
- The MEP **overlapped with the trade system for greenhouse emissions**. Electricity companies may collect a surplus of emissions rights as they mostly invest in biomass options for reducing CO_2 emissions. Therefore the extra incentive from emission rights to create more efficient power plants may be reduced.

2.3 Sustainability criteria for biomass resources

In order to responsibly integrate financial support into (new) bio-energy plants, new requirements for sustainable biomass resources are developed. The Commission Cramer (led by former professor of University Utrecht, nowadays the Minister of Environment), developed overall (meta) sustainability framework for biomass production (Commission Cramer, 2007).

The framework is based on six themes. Themes i, ii and iii are biomass specific themes, whereas themes iv, v and vi are more general. The latter rely on the triple P approach (people, planet, profit), which is considered the guiding principle for corporate social responsibility in general. These are the following themes:

i. Greenhouse gas emissions
ii. Competition with food and other local applications of biomass
iii. Biodiversity
iv. Environment
v. Prosperity

vi. Social well-being.

The themes were further translated into sustainability criteria. An example is “Insight into the change of land use in the region of the biomass production unit”, which is derived from theme ii. Section 8.1 has an extensive overview of a recent parliamentary evaluation of the Cramer Criteria with respect to international trade barriers.

2.4 Future prospects

Together with provinces and city administrations, the Dutch government is aiming for 2% energy efficiency increases per year (2008 onwards), 20% renewable energy supply in 2020 and a GHG-goal of 30% emission reduction in 2020 compared to the base year 1990. The renewable energy goal can be reached by the use of solid & liquid biomass for electricity production, whereas the emission reduction can, amongst others, be met by renewable electricity production & the EU obligation for biofuels.

Electricity & heat

From 2008 onwards, the Dutch government (via the Minister of Economic Affairs) will grant new subsidies to the use of renewables for electricity production (RDE or Regulation Sustainable Energy). This is the follow up of the MEP system. However, new conditions have come into place. All biomass sources are obliged to be reported in terms of CO_2 balances (by means o a recently developed CO_2 tool).For the use of palm oil, more stringent conditions were set: the full compliance to the criteria for Roundtable on Sustainable Palmoil (RSPO).

Experts (Menkveld et al, 2007) forecast for 2008 and further an additional build up of 100 MW_e capacity at coal-fired plants and 330 MW_e of other installations (stand alone). See also section 4.2.

Transport

The Dutch government (via the Minister of Environment) will promote biofuel obligation and criteria, related to the Cramer Framework (section 2.3) will come into place. Experts (Menkveld et al, 2007), however, expect that the 20% goal cannot be realized due to the proposed set of sustainability criteria.

3. Domestic biomass resources (Production)

The production chapter is divided into a quantitative part (3.1 Supply of biomass) and a qualitative part (3.2 Characteristics)

3.1 Supply of biomass in the Netherlands

According to two more detailed background studies, the supply of biomass for energy ranges between about 130 and 150 PJ, i.e. about 18 to 20 million tons of biomass components. The table below shows the aggregated flows, based on a division structure of the Technical Committee of CEN nomenclature. Differences between categories happen due to different assumptions in the analysis. One example is the uptake of waste paper categories in the Faaij study (recovered fuels), whereas the Koppejan & de Boer study does not take this into account.

Table 3.1 Overview of possible supply for biomass for energy in the Netherlands 1996 & 2010.

Possible sources (based on CEN division of CT 335 & CT 343)	**Overview 1996 (Faaij, 1997)**		**Estimation 2010 (Koppejan & de Boer, 2005)**	
	Supply (in Kton)	Energy value (in PJ)	Supply (in Kton)	Energy value (in PJ)
1. Woody biomass	2.556	24	2.912	40
2. Herbaceous biomass	1.593	15	815	7
3. Fruity biomass	428	2	-	-
4. Organic waste	11.208	53	12.177	57
5. Recovered fuels	3.649	57	2.950	29
Total supply	**19.434**	**152**	**18.854**	**132**

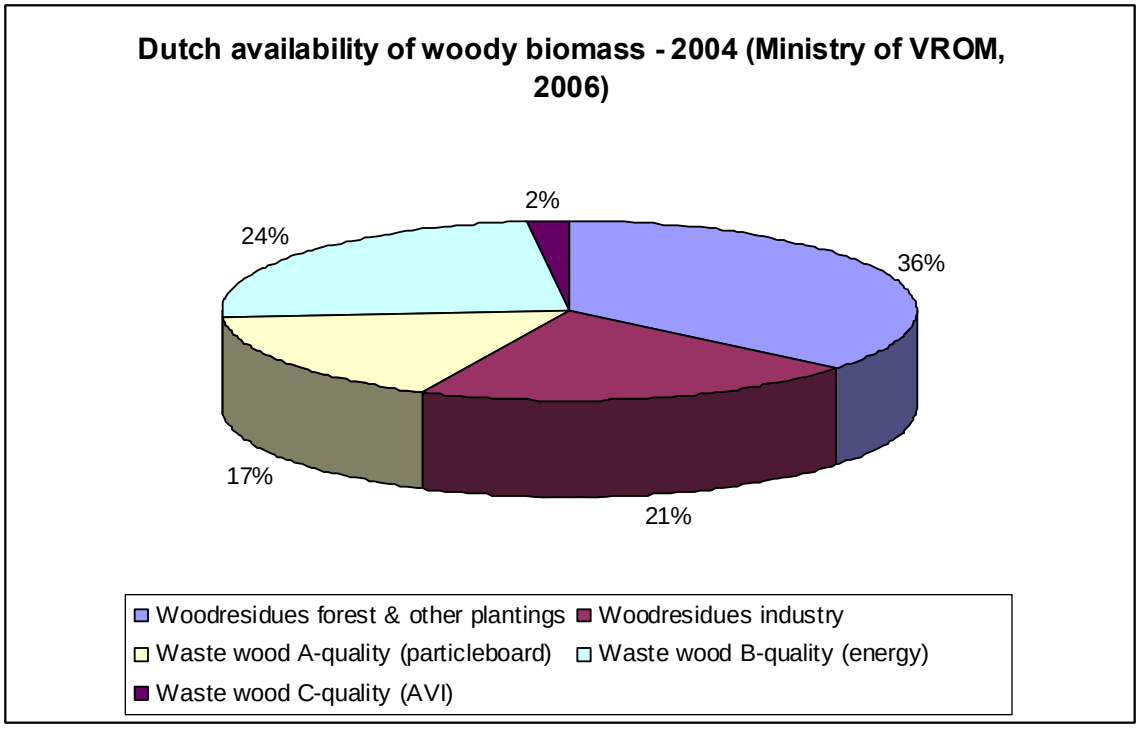
Hereafter, all main flows (except for herbaceous & fruity biomass) are further characterized.

3.2. Supply characteristics of biomass

The following categories are further analysed: solid (woody) biomass, renewable (organic) waste & recovered fuels (RDF).

Woody biomass.
According to a governmental study (Ministry of VROM, 2006), about 2,9 millions tons of woody biomass have been produced in the Netherlands in 2004.

Figure 3.1 The availability of wood residues in the Netherlands (2006).



A special category is the production & trade of pellets. In 2006 the Netherlands produced about 110.000 ton of wood pellets. Pellets are used at cofiring, wood-industry & households (Sikkema and Junginger, 2007). See Chapter 4 for further details.

Renewable (organic) waste
The most import organic waste component is municipal waste from households. This waste contains about 47 % biogenic components, both in 2005 & 2006. Total Dutch households waste recovery is about 6,3 million ton in 2005 and 6,41 million ton in 2006, i.e. an increase of almost 2%.

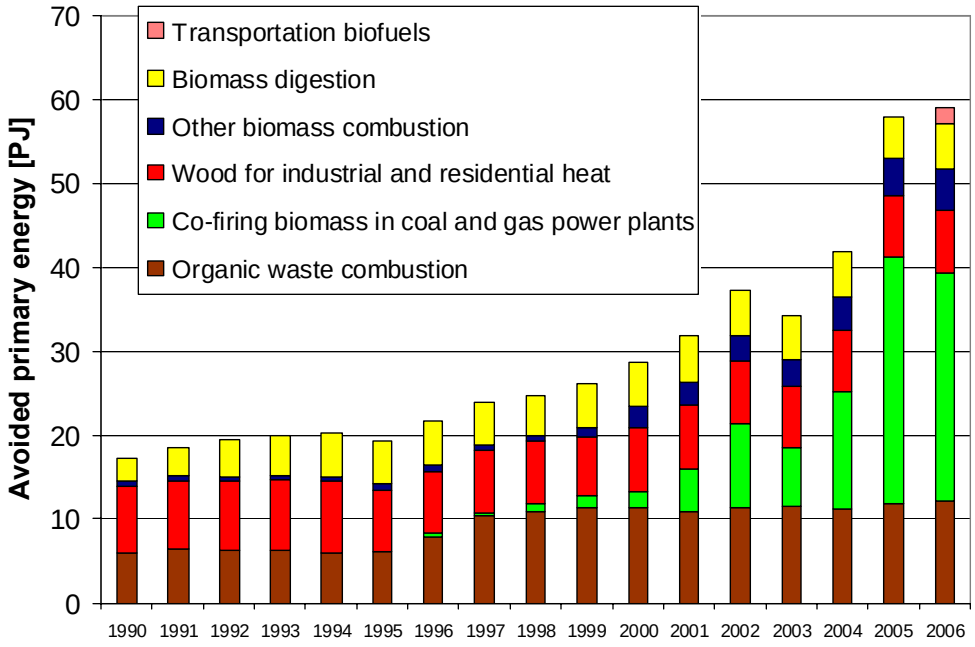
Refused derived fuel (RDF pellets)
Several Dutch are being specialized in converting waste into special pellets, called refused derived fuels (RDF). According to the ECOVA database, about 420.000 ton of waste fraction is directly produced from extracted waste residues. About 330.000 ton is exported as RDF pellet and about 90.000 ton (of plastic bottles) is bundled together for recycling. We assume no biogenic contents.

Refused derived fuel (paper fluff)
Further, the Dutch paper industry in some cases produces pellets from “Pre consumer paper waste”, including plastics. Besides “waste paper waste” also ink sludges (“fluff”) is used into these pellets. Examples of RDF producing companies are: CDEM, Rofire & Foxfire. These pellets (volumes & biogenic contents unknown) are used within the Dutch cement industry for energy.

4. The use of biomass in the Netherlands (Consumption)

According to Senternovem (Daey Ouwens, 2006), the first half of 2006 the production of renewable energy has been all time high, due to the increased use of biomass for co-firing. The second half the input has strongly diminished, as the subsidies for biomass use (see MEP subsidy in section 2.2) have been closed by August 2006. Although the replaced fossil fuel at power plants (B) was lower in 2005, the total biomass input in 2006 has grown. The growth was mainly caused by the consumption of biofuels in the Netherlands.

Figure 4.1 Avoided primary energy consumption by production of electricity, heat and transportation fuels from biomass.



4.1 Current use

The most important shares of renewable energy sources in the Netherlands are:

- Cofiring in power plants: 32% in 2006 (37% in 2005)
- Wind turbines (not in biomass table below): 26% in 2006 (22%)
- Waste incineration: 14% in 2006 (15%)

The table hereafter is based on CBS figures (based on environmental annual reports), with the exception of input of renewables for cofiring.

Table 4.1 The use of biomass for renewable energy in the Netherlands – 2005 & 2006
(Sources: Segers, 2007; Segers, 2006).

	Input renewables (in TJ)		Replaced fossil fuels (TJ prim/yr)		Electricity production (GWh)	Heat Production (TJth)
	2005	2006	2005	2006	2006	2006
Total biomass	**74.531**	**73.197**	**58.142**	**59.242**	**47.07**	**14.810**
A. Waste incineration	26.659	27.109	11.874	12.180	1.012	3.831
B. Cofiring in powerplants *)	30.933	28.512	29.438	27.189	3.110	552
- solid biomass	56%	47%	-	-	-	-
- liquid biofuels	44%	53%	-	-	-	-
C. Woodindustry	1.995	2.201	1.847	2.037	0	1.833
D. Householdings	9.316	9.316	5.464	5.564	0	5.191
E. Other biomass burning	5.628	6.059	4.536	4.839	227	2.607
- solid biomass	97%	97%	-	-	-	-
- liquid biomass	3%	3%	-	-	-	-
F. Biogas	0	0	4.983	5.453	358	796
G. Biofuels	-	-	101	1.979	0	0

*) CBS figures have been revised by detailed enquiries at cofiring plants (+1,3% in 2005; -3,1% in 2006).

Hereafter, all main categories of biomass use are further haracterized. The trade of biomass is covered by Chapter 7.

A. Waste incineration
All disposal waste from households & industries (section 2.2) is being burned in special waste incineration plants (AVI's). The organic content is about 47%.

B. Cofiring in powerplants
Cofiring can be divided into two main categories:

- Solid biofuels: in 2006 about 13.500 TJ of solid biofuels was used, which is a decrease compared to 2005 (17.500 TJ).
- Liquid biofuels: the use of liquid biomass resources increased from 13.500 TJ in 2005 to 15.000 TJ in 2006.

The overall input of biomass in power plants has decreased by 3,5% to 29.445 TJ in 2006. The decrease is mainly caused by freezing subsides under the MEP schema (Chapter 2). Wood pellets have the highest share: about 8.000 TJ (450.000 ton) was used both in 2005 & 2006. Another important source is waste wood (B-quality). About 150.000 tons have been used (SITA Nederland, 2007) in 2005 & 2006.

C. Wood industry
The input of renewables, i.e. wood for energy production within the wood working industry, is little by little growing, due governmental incentives for investments in renewable energy capacities (see section 2.2). The input is being estimated on basis of the amount of stoves, heating capacity and average winter temperature. In 2006 the input was about 2.200 TW, i.e. about 150.000 ton of wood has been used for heating systems.

A new trend is the input of wood pellets instead of unprocessed wood. In 2006 about 6.000 ton of wood pellets was used (Sikkema and Junginger, 2007). It is estimated to grow to about 10.000 ton pellets in 2007.

D. Households

The input of renewables, i.e. wood for heating houses, is rather stable. The input is being estimated on basis of the amount of stoves, heating capacity and average winter temperature. In 2006 about 9.300 TJ has been used.

A new trend is the input of wood pellets instead of unprocessed wood. In 2006 about 30.000 ton of wood pellets was used (Sikkema and Junginger, 2007).

E. Other biomass burning

Similar to cofiring, other biomass burning can be divided into two main categories:

- Solid biofuels: almost all (97%) of other biomass burning concerns solid biomass. In 2006 about 6.000 TJ was used (2005: 5550). An important source were wood residues & chips: about 270.000 tons have been used in 2005 & 2006.
- Liquid biofuels: only one other mill uses liquid fuel, i.e. the burning of fatty residues from the frying of potatoes, etcetera. About 180 TJ has been used.

F. Biogas

The total production & consumption of biogas have both lifted 14%. Table 3.2 shows the production of biogas via the following sources:

- From Sewage sludge
- Landfill gas
- Manure /farmland
- Other gases

Table 4.2 The domestic production of biogas in the Netherlands – 2005 & 2006 (Source: CBS, 2007b).

	2005	2006	2005	2006
	Production		Consumption [1)]	
Total biogas (in TJ)	**5.867**	**6.696**	**5.095**	**5.803**
- of landfills	2.503	2.814	1.909	2.126
- of sewage sludge	2.124	2.142	1.946	1.936
- of manure / farmlands	82	521	82	521
- other biogas	1.158	1.220	1.158	1.220

[1)] Consumption is production minus the immediate burning of the biogas ("Affakkelen").

Please note that figures of replaced fossil fuels by biogas use (table 4.1) are lower compared to those of consumption in table 4.2. The efficiency of electricity production from biogas is generally lower than the average efficiency of fossil fuels.

G. Biofuels

The Dutch government has indicated to strive for an 2% share of biofuels from 2006, leading to a share of 5,75% in 2010 (EU directive). Actual figures for consumption are not available. To indicate the growing importance of biofuels, the national production of biofuels is shown in the following table.

Table 4.3. The production & use of biofuels in the Netherlands

Sources: (EBIO, 2007; CBS, 2007a; EBB, 2007;)

Fuel type		Units	2004	2005	2006	2007
Biodiesel (3 plants)	Production	Kton	-	-	18	115*)
	Consumption		3,53 (0,05%)	2,65 (0,04%)	25,48 (0,35%)	-
Bioethanol / ETBE (1 plant; cereals)	Production	Million Liters	14	8	15	-
	Consumption		-	-	38,1 (0,55%)	-

*) Mid 2007: new plant started in Eemshaven

In 2006 about 0,55% of ETBE, based on total sells of petrol in the Netherlands) is used, and about 0,35% of biodiesel (total sells of diesel). On average about 0,43% of biofuels is sold (total sells of diesel, petrol & LPG).

4.2 Trend analysis

Future prospects are only given for those categories relevant for possible additional biomass trade (which is the main focus of IEA Bioenergy Task 40). The categories are:

- Waste incineration
- Cofiring
- Other biomass burning
- Biofuels

The other categories (households, wood industry & biogas) are left out, as all input is from domestic sources. For example, biogas projects like BMC in Terneuzen is excluded, as the use of non domestic sources is not the case.

Table 4.4 Possible new power production capacity (excluding biogas projects) in the Netherlands from 2008 onwards (Source:Senternovem, 2007b; Vereniging Afvalbedrijven, 2007***)***

	Power-production (MW_e)[1)]	Input renewables (in ton)	Input renewables (in TJ)	Biomass resources:
A. Total biomass projects via waste incineration companies [2)]		**460.000**	**2.100**	
Twenche Hengelo (planning to start in 2008)	n.a.	140.000	650	Waste wood; digester's residues; green waste households (GFT)
HVC Alkmaar (planning to start in 2009)	n.a.	170.000	750	Waste wood Digester's residues
AVR Rijnmond (planning to start in 2008)	n.a.	150.000	700	Waste wood; prunings;
B. Total projects via Power plants (low estimation)	**1.284**	**750.000**	**9.400**	
Delta Moerdijk (one plant in 2008)	35 MW_e	400.000	4.300	Chicken manure
Evelop Delfzijl (1st of 2 plants in 2008)	49 MW_e	350.000	5.100	Waste wood & residues
NUON Delfzijl (Magnum plant in 2011)	1200 MW_e	p.m.	p.m.	Various biomass sources
E. Other biomass burning	**50**	**80.000**	**2.900**	
Biox, 3 locations for use of liquid biofuels (1st of 3 plants starts in 2009)	50MW_e	80.000	2.900	Palm oil
G. Biodiesel				
Nedalco, Sas van Gent (ethanol capacity unit in 2008)	-	n.a.	200 million litres of ethanol	Cellulose raw material

n.a. = not available;
[1)] 1GWh = 3,6TJ
[2)] Excluding the additional capacity of waste incineration.

Regarding the input of non-domestic sources (see also section 7.1 for current biomass trade), we assume the following categories may be of interest for future developments:

- Palm oil. For each projected stand-alone plant roughly about 80.000 tons of (imported) palm oil may be needed.

- Wood residues & waste wood. Both power production (Evelop) and waste incineration are aiming for waste wood & other residues (like pruning's). According to the organization of waste incineration plants, delay may occur due to the subsidy stop for renewable energy investments (MEP) since August 2006.
- Biomass flows. The original goal is to reach a reduction of about 300 kton CO_2 per year. It is uncertain which and how much biomass flows will be needed.
- Chicken manure. About 400.000 ton will be needed. However it is not known whether this manure should be imported, besides the domestic availability.

Due to a new subsidy instrument (RDE) for electricity producers, experts (Menkveld et al, 2007) estimate that about 200 MW cofiring will be installed additionally until 2012 together wit 330 MW for other energy installations (stand alone).

In a draft version of the regulation, experts from ECN & KEMA (Tilburg, 2007) advised the Dutch government on possible subsidies for the new SDE . See draft subsidies in table 4.5.

Table 4.5 Preliminary feed-in premiums for elelectricity from bioenergy –(in €cents / kWh).(Source: Ministry of Economic Affairs, 2007)

	Waste Incineration	Biomass < 10 MW	Biomass 10-50MW	Biomass > 50 MW	Anaerobic digesters (< 10 MWe)	Other systems
Biomass type	**Draft advises from 2008 onwards**					
Wood	-	11,1	8,4		13,1	-
Wood pellets	-			6,5 (coal fired)	-	-
Organic oils	-	16,6	15,0	8,1 (gas fired)	-	-
Agro residues	-	-	-	3,8 (coal fired)	13,1	-
Disposals & sludge	-	-	-	-	-	4,7-5,3
Landfill gases	-	-	-	-	4,5	4,5
Municipal Solid Waste	5,0-5,9	-	-	-	-	-

5. Current biomass actors and project developers

Table 5.1 shows an overview of sectors involved in the use of waste & renewable energy for energy production. The biggest market actually involved is cofiring of biomass (sector B).

Table 5.1 Overview of actors involved in waste & biomass sector in the Netherlands

Sector	Number of installations	Main kinds of biomass	Domestic suppliers	Foreign suppliers
A. Waste incineration	14	Waste with a 47% organic fraction	3 Waste collecting companies	No import
B. Cofiring in power plants	5	Pellets	Own trade enterprises, plus one industrial pellet producer	Through specific international traders (bulk carriers, coasters, etc)
		Waste wood	3 Waste collecting companies	No import
C. Wood industry	n.a.	Internal processing wood residues	Not applicable	No Import
D. Households	791.334	Logs & wood residues	State forest & wood industry	No import
		Pellets	2 wood pellet producers	Hardly any import
E. Other biomass burning	12	Internal processing residues	Not applicable	No import
		Domestic paper based pellet ("fluff") for cement	3 specific (RDF) pellet producers	No import
		Wood chips	Regional forest owners	Import from German sawmills by lorries
F. Biogas	n.a.	Immediate burning & energy production	Not applicable	No import
G. Biofuel production plant	n.a.	Cereals	Farmers	Common agro trade flows

About 32 actors ***(Senternovem, 2007b)*** play a role in developing new biomass projects. Most companies are dealing with gaseous biomass. These players are relatively small, compared to those for liquid biomass and solid biomass. Amongst the solid biomass players, five big power plant companies will rely on a big share of available biomass in the Netherlands including imports.

6. Biomass prices

Below you will find some price indications for different biomass types and fossil fuel sources for comparison. In the next issue of the country report, this topic may be discussed in more detail..

Table 6.1 overview of fuel prices at Dutch plants – 2005 & 2006 (in Euro / GJ)

	2005	2006	Sources:	Remarks:
Renewable Waste for heat & electricity generation				
municipal & other waste	n.a.	n.a.		About 47% renewables content
manure	-	-10,0	Tilburg, 2007	Ex power plant
Solid & liquid biomass for heat & electricity generation				
wood residues	-	7	Koppejan & de Boer, 2005	Wood chips ex energy plant
wood pellets industrial use	-	8,5	Sikkema and Junginger, 2007	CIF Rotterdam No specific standards
wood pellets households	-	15,7	Sikkema and Junginger, 2007	Ex works High standard (DIN+)
waste wood (cat A)	1,4	2,5	SITA Nederland, 2007	Ex Particle board plant
waste wood (cat B)	1,4	2,5	SITA Nederland, 2007	Ex energy plant
waste wood (cat C)	n.a.	n.a.		Ex waste incinerator
agro-residues	-	3,6	Tilburg, 2006; Tilburg, 2007	Ex energy plant
palm oil	-	13,6 - 16,3	Tilburg, 2007	Ex plant (low range cofiring; high range: stand alone)
Liquid biofuels for transport				
bio-ethanol	n.a.	n.a.		Rapeseed oil (fob ex mill)
Biodiesel	9,6	-	Doornbosch, 2007	Soybean oil (fob ex mill)
Alternate fossil fuel sources				
Natural gas 1	*6,9*	*9,4*	*ECN, 2007*	*Delivery power plan industry price; no VAT*
Natural gas 2	*11,9*	*14,1*	*ECN, 2007*	*Small consumer price (households)excl VAT*
Heating oil 1	*n.a.*	*n.a.*		*Delivery industrial plants*
Heating oil 2	*n.a.*	*Na.*		*Small consumer price (households)excl. VAT*
Coal	*1,5*	-	*Seebregts, 2005*	*Ex power plant*

7. Biomass import & export

The trade chapter is divided into imports, exports, logistics and a discussion of the trade statistics presented.

7.1 Main import flows

Table 7.1 Share of non domestic biomass sources for Dutch renewable energy production - 2005 & 2006

	Input renewables (in TJ)		Import of biomass (in TJ)		Share of imports, related to total solid & liquid biomass input (in %)	
	2005	2006	2005	2006	2005	2006
Total biomass	**74.531**	**73.197**	**23.229**	**20.584**	**31%**	**28%**
A. Waste incineration	26.659	27.109	0	0	0%	0%
B. Cofiring in powerplants *)	30.933	28.512	23.160	19.867	75%	70%
- solid biomass	-	-	11.977	8.187	39%	29%
- liquid biofuels	-	-	11.183	11.680	36%	41%
C. Wood industry	1.995	2.201	0	0	0%	0%
D. Households **)	9.316	9.316	0,2	0,5	0%	0%
E. Other biomass burning	5.628	6.059	1.069	727	19%	12%
- solid biomass	-	-	1.069	727	19%	12%
- liquid biomass	-	-	0	0	0%	0%
F. Biogas	0	0	0	0	0%	0%
G. Biofuels	-	-	n.a.	n.a.	n.a.	n.a.

*) CBS figures have been revised by detailed enquiries of Copernicus at all Electricity companies.
**) wood pellets at households, partly via non domestic sources.
n.a. = not available

The following categories are further explained: renewable waste, solid biomass and biogas. The import section is closed by an overall overview of biomass import for electricity production.

Renewable waste

- The import of municipal waste is negligible (assumption of SenterNovem).
- RDF pellets are almost not imported.

Solid biomass

- Wood residues: no net import of wood residues for energy takes place (section 7.2).
- Wood pellets & pellets from agricultural residues. In 2006 about 455.000 ton of industrial pellets were imported (2005: 240.000), for cofiring at electricity plants. If import of non industrial use (households) and re-export is included, the import of wood pellets is about 690.000 ton (12,1 PJ). In 2005, this complete import flow was 630.000 ton (11,1 PJ).

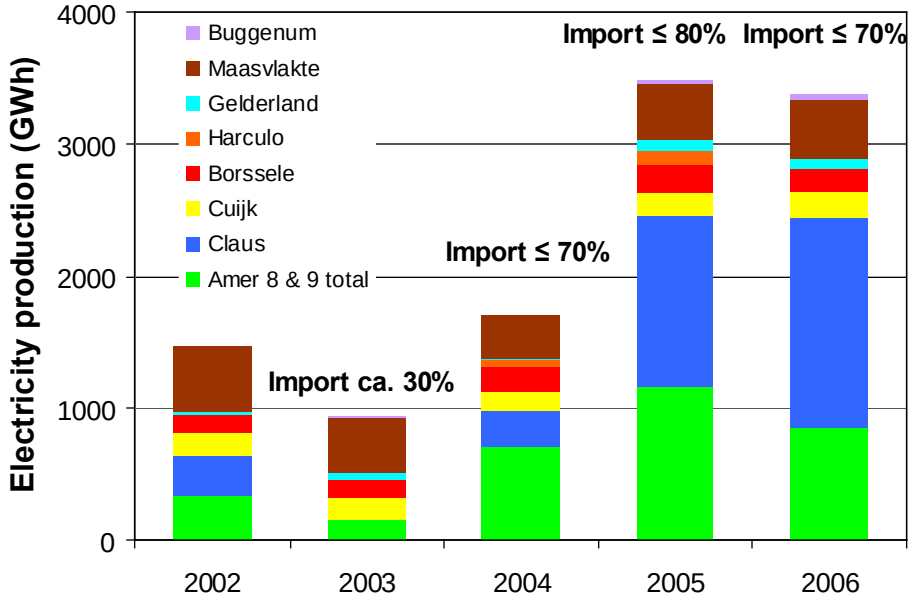
- Waste wood (A, B & C category). Almost no import of waste wood has occurred in 2005 & 2006.

Biogas
All gases are domestically produced & directly used for electricity production

Overall view for electricity production

The input of biomass has risen since 2003d ue to the implementation of MEP feed-in subsidies. Consequently, the import of biomass has risen from about 30% in 2005 to about 70 to 80%, as the Netherlands seems not to have sufficient sources to fully cover the demand for biomass. In August 2006 the MEP subsidies were severely reduced for various biomass categories and abolished for additional biomass conversion capacity. As a result, the use of especially solid biomass was reduced in 2006 compared to 2005. The overall use of liquid biofuels, like palm oil, still showed an increase compared to 2005, but is likely to decline sharply in the near future due to sustainability concerns.

Figure 7.1 Electricity production (> 20MW$_e$) from biomass cofiring & stand alone combustion plants.



Note: estimated import shares are calculated based on the amount of electricity produced.

Source: Junginger, 2007

7.2 Main export flows

Table 7.2 shows both export & import flows since 2006.

Table 7.2 Indicative overview of biomass trade flows for Dutch energy production – 2003 until 2006 (in Kton & PJ).

Trade categories	**2003**		**2004**		**2005**		**2006**	
Units	**kton**	**PJ**	**kton**	**PJ**	**kton**	**PJ**	**kton**	**PJ**
Solid biomass	135	2,3	435	6,45	880	13,1	545	9,0
- of which industrial wood pellets[*)]	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*240*	*4,2*	*455*	*7,8*
Liquid biomass	5	0,2	90	3,4	325	11,2	350	11,7
Total imports for energy [a)]	**140**	**205**	**525**	**9.85**	**1.176**	**23.5**	**894**	**20.5**
Solid biomass								
- Waste wood (A& B quality) [b)]	930	11,1	895	10,7	225	1,1	225	1,1
- Wood pellets	n.a.	n.a.	n.a.	n.a.	255	4,5	315	5,5
- Other solid biogenic waste streams (bone meal, sludge from waste water treatment) [c)]	30	1.1	30	1.1	n.a.	n..a.	n.a.	n.a.
Liquid biomass [d)]								
- Pre consumer paper waste (fluff)	75	1	75	1	0	0	0	0
Total exports for energy	**1.045**	**13,1**	**1.000**	**12.9**	**480**	**5,6**	**540**	**6,6**

Notes:
n.a. = not available
a. Imported biomass for domestic consumption for energy purposes, i.e. excluding imports that are re exported.
b. According to a survey carried out by De Vos and Christian (2003), approximately 45% of all waste wood exported was destined for energy production. As no more recent figures were available, we assumed this percentage valid for 2004. Figures for 2005-2006 were derived from more recent inventory (Ministry of VROM, 2006).
c. For other wood sources, for 2005-2006, total amounts were known, but not the amount destined for energy, except for (re-)exported wood pellets. Therefore, in "total exports" we only sum up exported waste wood and wood pellets. This is likely an underestimation.
d. Liquid biomass is underestimated as re-export of several categories is not taken into account. For example, Rotterdam & Amsterdam harbors also handle palm oil for further export to countries like Germany.

The following categories are further explained: renewable wastes and solid biomass.

Renewable wastes

- Municipal waste. Due to a landfill ban in Germany (June 2005) the export of Dutch combustible waste to Germany decreased to about zero (Gerlagh, 2007).
- RDF pellets. The export of RDF (see also section 3.2) is about 330.000 tons, consisting of 47% biogenic fraction (assumption).

Solid biomass

- Wood residues forestry & forest industries. Recent analysis by Probos & UNECE Timber Section (Steierer, 2007; UNECE; FAO & University of Hamburg, 2007): about 0,75 million ton of wood has been used for energy in 2005, originating from Dutch forests & forest industries. As about 1,65 million ton is annually available from Dutch sources (Ministry of VROM, 2006), the export of Dutch woody biomass is about 900.000 tons, excluding any re-export from abroad. Hence, all residues will be used at Belgium & German particleboard & fibreboard industries and no residues will be available for energy use.
- Woodpellets & pellets from agricultural residues. The Dutch export of wood pellets was about 280.000 ton in 2005 and about 390.000 ton in 2006 (Sikkema and Junginger, 2007).
- Waste wood (A, B & C category). According to a report by Ministry of VROM (Ministry of VROM, 2006) and an extra check with Dutch waste & recycling company SITA Nederland, about 500.000 ton of waste wood (A & B quality) has been exported to Belgium (40%), Germany (40%) and other countries. Main destination is the particleboard industry.

7.3 Logistics of biomass trade flows

This section will be elaborated in the next issue of the Dutch country report (2008).

7.4 Incompleteness of trade flows

Generally, the collections of production & consumption statistics on biofuels are well organized and mapped. However, data on international trade of biofuels are still limited. Only few trade data on biofuels are currently available: e.g. fuelwood and charcoal. After the observations in a few case studies (Sikkema, 2007), it is rather obvious that:

- **International flows on biofuels are incomplete**. Organizations dealing with global statistics of bioenergy, mostly compile production & consumptions figures (e.g. FAO, IEA, UNECE). However, as official trade statistics are lacking, the subsequent international flows are limited to rough estimates. An example is wood pellets. Wood pellet trade flows are unknown, as its trade is simply categorized as “wood residues”.
- **A first allocation of raw materials is complicated.** To distinguish raw material data for energy purposes from those for other uses is quite difficult. Energy markets are volatile and its further processing relies much on current market prices, storing facilities, et cetera. For example grains can be used both for feed (cereals) and fuel (bio-ethanol), but at the time of passing the border its ‘fate’ may be still unknown.
- **A second allocation of residues may be overlooked.** Production lead to main products & residues. It is relevant to trace where these remaining parts will stay for a

second destination. For example, the use of (German) roundwood at a (German) sawmill may lead to the export of its residues & chips to Finland for further use in a plant for woodpellets or for woodpulp production. This is called indirect trade.

8. Current barriers and opportunities and critical issues for future biotrade in the Netherlands

8.1 Current Barriers

Renewable electricity is largely subsidy-driven: the reduction of subsidies on biomass for power production has diminished the import of biomass and the input of such renewable resources.

The input of biomass has risen since 2003 due to the implementation of MEP feed-in subsidies. Consequently, the import of biomass has risen from about 30% in 2005 to about 70 to 80%, as the Netherlands seems not to have sufficient sources to fully cover the demand for biomass. In August 2006 the MEP subsidies were severely reduced for various biomass categories and abolished for additional biomass conversion capacity. As a result, the use of especially solid biomass was reduced in 2006 compared to 2005. The use of liquid biofuels, like palm oil, overall still showed an increase compared to 2005, but is likely to decline sharply in the near future due to sustainability concerns.

Domestic & non-domestic availability and prices of different biomass types are other drivers for use of biomass for energy. However, more analysis is needed to cover the full range of economic & logistic effects.

In Chapter 6, some price indications for different biomass types and some of their competitive fossil fuel sources are reported. World-wide price changes in general can strongly influence trade patterns. One development crucial for the construction of bio-ethanol plants in the Netherlands in the past two years have been the development of (decreasing) ethanol prices and (increasing) grain prices, which have effectively halted the plans of a number of bio-ethanol plants in the Netherlands. It remains to be seen whether the Netherlands will aim to meet the 5.75% biofuels target in 2010 by either importing raw material and become a large-scale biodiesel and/or bio-ethanol producer (see also 8.2), or whether it will import the final commodities.

In the next issue of the Dutch country report, this topic may be further elaborated. Also the way of logistics by which main biomass flow into the Netherlands, will be analyzed more into detail.

Next to economic (subsidy, prices) and logistic (availability) aspects as main drivers for bioenergy trade, concern regarding the sustainable production of biomass may have a large impact on international biomass markets.

During the fall of 2006, NGO's increasingly raised criticism regarding the use of palm oil in natural gas power plants. As a result, in 2007, no palm oil was purchased for co-firing, which will likely cause a strong reduction of renewable electricity production in the Netherlands. Furthermore, to ensure the sustainable production and use of biomass for

energy, new requirements for sustainable biomass resources are developed. The Commission Cramer (led by former professor Cramer of University Utrecht, nowadays the Minister of Environment), developed an overall (meta) sustainability framework for biomass production (Commission Cramer, 2007). The criteria and indicators are currently developed further, and may possibly be used to determine the financial support of distinct biomass resources (see also the next section).

8.2 Current opportunities

Despite the barriers sketched in the previous section, there are also clear opportunities trade in the Netherlands. A key role for this is the strategic geographical position as distribution hub for North-Western Europe. In the past year, a large number of initiatives were announced for various biomass plants, mainly located in or near to the harbor areas. The harbor of Amsterdam (Gorris, 2007) presented an inventory of initiatives in the harbors of several Dutch harbors, see Table 8.1. these initiatives include the production of bio-ethanol and biodiesel, the construction of handling facilities (e.g. to handle and store wood pellets), and the production of (various kinds of) pellets and production of electricity.

Table 8.1 Bioenergy initiatives *announced*, to be realized by 2010 in various Dutch harbors, in ktonnes of biomass/ biofuels processed.

	Solid biomass	Liquid biomass / biofuels
Amsterdam	200	520
Rotterdam	1.500	920
Groningen Seaports (Delfzijl)	800	580
Zeeland Seaport (Flushing)	200	180
Total	**2.700**	**2.200**

Clearly, the estimated overall solid and liquid biomass use of almost 5 million tonnes would have to be imported, representing a fivefold increase compared to imports in 2006. A part of these initiatives have so far only been announced, for others, the plans has started and construction has commenced. While it is very likely, that only a (small) part of the initiatives summarized in table 8.1 will actually be realized, it is apparent that the number of biomass plants in the Netherlands is strongly growing, and so will biomass imports (and likely also exports).

8.3 Critical issues influencing future biomass trade in the Netherlands

The new subsidy scheme for sustainable energy (SDE) in 2008 for biomass energy

As the previous policy support scheme MEP for renewable electricity was basically abandoned in August 2006, there is large interest how the new subsidy scheme for sustainable energy (SDE) will be designed. Expectations are that the new system will be operational during the spring of 2008. While already draft support tariffs have been published, no final tariffs have been announced so far. One interesting development is

that subsidies for biomass fuels will be linked to the price of fossil fuels. In the case of increasing fossil fuel prices (e.g. coal, natural gas) the cost gap with renewable sources will be reduced, and thus less subsidy will be required. It is to be seen whether this will stimulate or discourage the import of biomass to the Netherlands.

Legal implications of the new (Dutch) sustainability criteria

In the above-mentioned SDE system, sustainability criteria for biomass production are so far only included as a reporting obligation. However, on the longer term, it is envisioned that meeting these criteria will be mandatory to be eligible for subsidies. For this situation, a parliamentary evaluation of biomass use for energy was held in 2007 regarding the risk of violation of current WTO & EU regulations. It was concluded that

- Sustainability criteria for GHG emissions in the chain and for carbon sinks in vegetation & soil can easily be covered in existing national Dutch law (Burgelijk Wetboek) en environmental legislation (EU: REACH).
- Criteria regarding food safety, biodiversity and for quality of air, water & soil were considered to pose medium risks under current WTO rules and should be further developed, depending on whether dedicated certification of certain mains flows for bio-energy (wood, palm oil, soybeans & sugarcane) will be possible.
- The draft criteria for local prosperity and for social well being of local people, were considered “high risk”, as they may not be covered by any current legal framework of EU and WTO, and mandatory inclusion of such criteria could lead to legal actions against the Netherlands.

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Appendix A CO_2 emission benchmark of European energy producers

According to a recent consultant study (Roland Berger, 2007) Dutch energy companies may have low renewable domestic production compared to their portfolio of total sold renewables. A big share of their renewables sales to the consumer markets is covered by the import of renewable certificates. The following figure shows the renewables in electricity consumption divided over import and domestic generation (Roland Berger, 2007). After 2003, the year of the MEP introduction, it is shown that the relative share of domestic generation is growing, whereas the import share remain more or less stable. Total renewable consumption rose from 4.100 GWh in 2000 to 16.700 GWh in 2006.

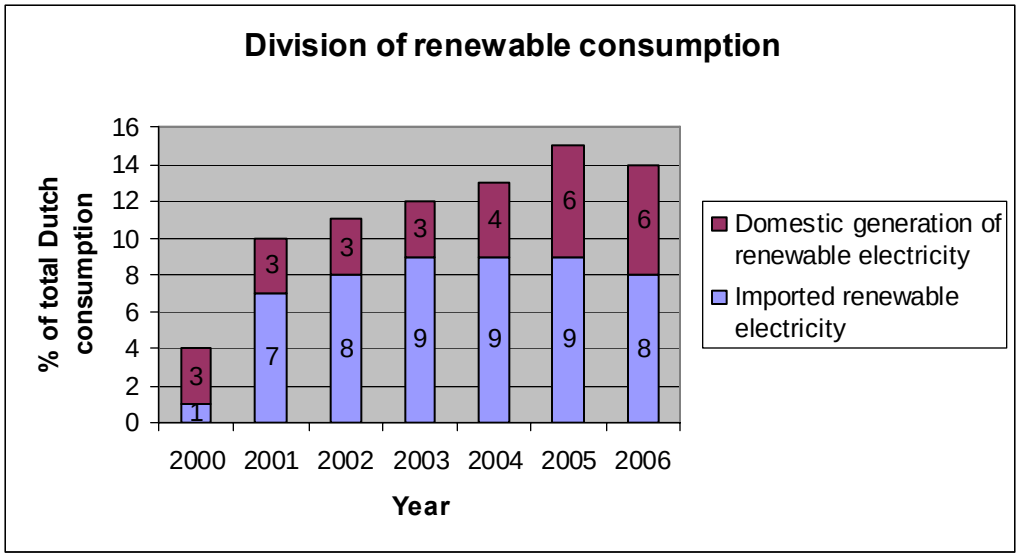

Figure A.1 The share of renewable electricity within total Dutch electricity consumption – 2000 until 2006.

Further, the consultants (Roland Berger, 2007) state that Dutch electricity sector may hardly have reduced their greenhouse emissions since 2002, compared to their counterparts in other European countries. However, all Dutch or foreign owned power plants have a general European 'carbon footprint' of 314 to 490 g CO2/kWh in 2006. Only four companies have a lower emission rate, due to:

- High share (> 70%) of nuclear and / or hydro energy, i.e. Fortum (Finland), British Energy (UK) & EDF (France). Their footprint ranges from 107 to 136 g CO2 / kWh.
- High wind energy capacity, i.e. Iberdrola (Spain) with a footprint of 231 g CO2/kWh.