2011
Bioenergy Status Document
Contents

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Summary

The bioenergy status document 2011 shows the current status of bioenergy in the Netherlands, including trends and expectations for the future. The objective of this document is to provide both tiers of government and market parties with an insight into the developments in bioenergy.

Targets and realisation

The government targets for renewable energy are in accordance with the EC Renewable Energy Directive (2009/28/EC). In 2020, 14% of the national gross final end use must come from renewable sources. The Dutch government estimates that this will equate to approximately 300 PJ. It is estimated that approximately 88 PJ of renewable energy was produced in 2011, approximately the same as in 2009 (88 PJ), and slightly more than 2010 (86 PJ).

The Renewable Energy Directive stipulates that in 2020, at least 10% of all petrol, diesel and electricity used in the transport sector must come from renewable sources.

The Dutch Secretary of State for Infrastructure and the Environment, Joop Atsma, wants that percentage to be reached in 2016. In 2011, the mandatory share of renewable energy was 4.25%. According to expectations, this requirement has been administratively achieved. Because some types of biofuels can be double counted however, the actual physical supply was significantly lower than in 2009. Administrative double counting does count towards the 10% target for renewable energy in transport, but not towards the overall 14% target. For that reason a higher share of double-counting biofuels is not proportionally beneficial towards the overall target.

Conversion of biomass into bioenergy

Approximately three-quarters of the renewable energy produced in the Netherlands in 2011 came from biomass. The remainder was produced from sources such as hydropower, wind power and solar energy. Renewable energy from biomass is for the most part produced by waste incineration plants, co-firing in power plants, the use of wood-burning stoves, and from the use of biofuels in the transport sector.
Bioenergy per conversion technology

Co-firing in power plants
In 2011, electricity production from the co-firing of biomass fell slightly, to 11.3 PJ (3,139 GWh), while heat production was estimated to be 1.2 PJ. Together these account for 14% of all renewable energy in the Netherlands. The sector has made an agreement with the minister to continue the same level of co-firing of biomass in coal-fired power plants until 2015, despite the phasing out of the Environmental Quality of Electricity Production (MEP-scheme).

Waste incineration plants
The total incineration capacity of all waste incineration plants rose slightly to 7 Mton per year. Approximately 90% of this capacity is used, partly for incinerating imported waste. Because the biogenic fraction of waste is also increasing, renewable energy production at waste incineration rose slightly. In 2011, 6.9 PJ of electricity was produced, and an estimated 5.4 PJ of heat (together accounting for 14% of the gross final end use). All large waste incineration plants have been awarded R1 status.

Wood-burning stoves
Over the last few years, wood-burning stoves in private households have been increasingly used as a renewable heat source, rather than as an atmospheric element. The expectations are that wood consumption in private wood-burning stoves will remain stable in the years to come. The number of newly installed stoves in industry has been decreasing in recent years. Taken together, wood-burning stoves in households and industry provide around 17% of renewable energy in the Netherlands.

Other combustion
This category includes facilities that produce renewable electricity and/or heat by burning, for example, chicken manure, wood chips, or prunings and wood waste. Some of these plants received Environmental Quality of Electricity Production (MEP) subsidies. When these expire, the installation can qualify for the Renewable Energy Production Incentive Scheme (SDE+). This has brought, for example, the bioenergy power plant in Cuijk back into use. This category produces around 6% of renewable energy in the Netherlands.
**Digestion and biogas production**

The number of digesters in the Netherlands has increased significantly over the past decade. In particular, the numbers of co-digesters (manure + organic waste), and digesters for organic waste (BMW and food processing industry) and sludge (wastewater treatment and sewage sludge) have increased, because the regulations governing the construction of digesters have been simplified. The biogas produced is increasingly used for the production of electricity (3.8 PJ) and heat (4 PJ, excluding raw gas production), amounting to 9% of the gross final end use of renewable energy.

**Green gas**

The upgrading of biogas to green gas (natural gas quality) still plays a relatively minor role: accounting for 1% of renewable energy in the Netherlands. This proportion is expected to increase considerably in the coming years: two-thirds of the SDE+ subsidies awarded in 2011 were granted to green gas projects, mainly to organic waste digesters. The sector has signed several Green Deals with the minister in order to stimulate green gas production, and the intention is to increase production tenfold by 2014.

**Transport**

In 2011 the Decree on Renewable Energy in Transport came into force, thus implementing European legislation. The Decree requires fuel suppliers to supply a minimum of 4.25% biofuels for transport in 2011 (rising to 5.5% in 2014), and to reduce greenhouse gas emissions from the fuels. Only certified fuels count towards this target, and biofuels from certain waste streams may administratively be double counted. Because suppliers made extensive use of the possibility for administrative double counting in 2010, actual physical supplies decreased significantly.
1 Introduction and method

The 2011 Bioenergy Status Document gives an overview of the current status, identified trends and expectations for the production of renewable energy from biomass in the Netherlands. This status document was first published in 2003\(^1\), with relevant market parties and tiers of government as its main target groups. In 2012, the 2011 status document was drawn up by CE Delft on behalf of NL Agency (Sustainable Energy in the Netherlands programme, DEN). The document was prepared in close cooperation with Statistics Netherlands (CBS), the Bioenergy Platform, CertiQ and other programmes within NL Agency such as the Renewable Energy Production Incentive Scheme (SDE) and Climate Neutral Gaseous and Liquid Energy Carriers (GAVE). NL Agency remains responsible for the content.

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\(^1\) For previous editions, see www.agentschapnl.nl/content/statusdocument-bio-energie-2010-nederland.

Monitoring renewable energy: gross final end use

The statistics in this document are reported in terms of gross final end use, as described in the Renewable Energy Monitoring Protocol [NL Agency 2010]. The status document is thus in line with the European Commission’s Renewable Energy Directive: the targets for the share of renewable energy for each Member State in the Directive are expressed in terms of gross final end use. Gross final end use is the energy supplied to the end users of energy (industry, households, transport and agriculture), and is split into 3 components: electricity, heat and transport.
The gross final end use of electricity is defined as the total domestic electricity production, including the internal power consumption of the producers. For heat it means the amount of heat sold, plus the use of biomass in boilers and stoves. Unsold heat from combined heat and power (CHP) plants is indirectly counted via the proportion of fuel input into CHP plants that is allocated to heat production.

The gross final end use of biogas converted to natural gas is calculated by first calculating the renewable share of natural gas consumption (as natural gas production from biogas divided by total natural gas consumption). This share is then multiplied by the sum of (i) the final end use of natural gas, (ii) electricity production from natural gas, and (iii) the sales of heat from natural gas [Eurostat 2011].
2 Quantitative contribution

Renewable energy in the Netherlands

The gross final end use of renewable energy in the Netherlands is shown in Figure 1. Energy from biomass and wind power contribute the most to the total quantity of renewable energy. Data for 2011 are based on provisional figures for renewable electricity from Statistics Netherlands [CBS StatLine 2011, 2012] and extrapolation of the consumption of renewable heat and transport fuels in 2010.

The Renewable Energy Directive identifies three distinct sectors wherein the final end use of energy counts towards the 2020 targets: electricity, heat and transport. Figure 2 shows the development of the final end use of renewable energy in these three sectors.

The production of renewable energy has increased significantly in the last decade, particularly in the electricity sector. This development is closely linked to government policy. As a result of government stimulus schemes the final end use of renewable energy has increased over the past decade, from less than 30 PJ in 2000 to almost 90 PJ in 2011.

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2 In accordance with the Renewable Energy Directive the normalised data for hydropower and wind energy are used.
In order to achieve the target of 14% renewable energy in 2020, an estimated approximately 300 PJ of renewable energy will be needed in that year [Central Government, 2010].

The growth of renewable energy production seems to have stagnated: since 2009 the gross final end use has remained virtually unchanged. The main cause of this seems to be new regulations regarding the supply of biofuels. Some types of biofuels may be double counted towards achieving the renewable energy targets in the transport sector (10% in 2020), and fuel suppliers may administratively transfer a surplus in biofuels supplies in one year to the following year. Suppliers are making use of this en masse, and as a result the physical supply of biofuels in 2010 decreased by 6 PJ compared to 2009. Administrative double counting does count towards the 10% target for renewable energy in transport, but not towards the overall 14% target. For that reason a higher share of double counting biofuels is not proportionally beneficial towards the overall target. Moreover, it appears that the number of SDE subsidies awarded has not yet translated into a strong increase in renewable energy, because part of the new capacity has not yet been realised.

In addition, the co-firing of biomass in power plants and other combustion of biomass declined slightly in 2011.

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Note that the quantities of biofuels physically supplied in 2011 are not yet known. These have been estimated by taking the figures for 2010, and increasing them by an amount corresponding to the increase in the supplier obligation: 0.25 percentage points.

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Biomass for three sectors

In accordance with the Renewable Energy Directive, Statistics Netherlands reports on the gross final end use of renewable energy in various sectors. The distribution of the gross final end use of biomass between electricity, heat and transport is shown in Table 3.

Electricity production is based on preliminary data from Statistics Netherlands [CBS StatLine 2012]. Heat generation is estimated based on observed trends. The consumption of biofuels is estimated based on figures up to and including 2010, taking into account an increased blending obligation in 2011 [CBS StatLine 2011].
Electricity sector

Statistics Netherlands makes a distinction between the following categories in the generation of renewable electricity from biomass:
- Waste incineration plants;
- Co-firing in power plants;
- Other combustion4;
- Conversion of biogas from digesters.

The increase in the waste incineration plants category is due to the increasing amounts of waste being burned, an increase in the average efficiency of the waste incineration plants, and a larger biogenic fraction (biomass) in the waste (51% in 2011). The use of biomass in power plants decreased slightly in 2011. Electricity production from other biomass decreased by over 21% in 2011, due to – among other things – the maintenance of some facilities, the end of the MEP subsidy, and the high price of oily and fatty biomass [CBS 2012]. The production of electricity from biogas from co-digesters also decreased slightly in 2011. No data are yet known for 2011 for other biogas plants, such as wastewater and sewage treatment plants, and landfill gas.

4 This category primarily covers the burning of (waste) wood and chicken manure.
In order to meet the European renewable energy targets, the aim is to produce 43 PJ of electricity in 2020 from solid biomass, and 17 PJ from biogas (compared to 117 PJ from wind, for example) [EZ 2010]. In 2011, production was approximately 21 PJ from solid biomass, and 4 PJ from biogas.

**Heat sector**

Heat production from renewable sources mainly comes from small-scale combustion such as wood-burning stoves in industry and households. The production of heat from wood-burning stoves in households has been growing slightly for years, but the margins of error are large (up to 50%). In addition, waste heat from electricity generation plays an important role, especially in power plants and waste incineration plants. The production of heat from biogas has shown strong growth in recent years, especially the co-production of heat from CHP plants. Statistics Netherlands counts raw biogas that is upgraded to green gas and injected into the gas grid as renewable heat and electricity, based on the distribution of natural gas consumption in the Netherlands. The supply of raw biogas has increased slightly in recent years because the gas is increasingly being used directly for electricity or heat. The eligibility of green gas in the SDE+ scheme means production will probably increase again.

For technologies in which the production of both electricity and heat occurs, heat figures for 2011 are estimated based on the observed trends in electricity production in 2011. For other technologies, heat figures are based on the trends observed until 2010.

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5 For technologies in which the production of both electricity and heat occurs, heat figures for 2011 are estimated based on the observed trends in electricity production in 2011. For other technologies, heat figures are based on the trends observed until 2010.
In accordance with the Renewable Energy Action Plan, it is expected that heat in 2020 will mainly be generated through the combustion of solid biomass (27 PJ), direct combustion of biogas (12 PJ), and green gas injected into the natural gas grid (24 PJ) [EZ 2010]. The production of heat in 2011 amounted to approximately 24 PJ from solid biomass, 4 PJ from the direct combustion of biogas, and 1 PJ from the injection of green gas (see also [Central Government 2011d]).

**Transport sector**

The use of biofuels before 2006 was marginal. Since 2007 the market for biofuels has grown rapidly, thanks to the obligation to include a (increasing) percentage of fuels from renewable sources in supplies. This obligation also applies under the new Decree on Renewable Energy in Transport (2011), which states that certain biofuels may be double counted administratively for their contribution to the transport target. In addition, obligated registered parties that have a surplus of certificates may partially carry these over to the following year. This may cause a discrepancy between the administrative supply as reported to the EU under the EU Renewable Biofuels Directive from 2003 [Central Government 2011a], and the physical supply as reported by Statistics Netherlands in national and international energy statistics and reported to the EU under the EU Renewable Energy Directive [Central Government, 2012]. Figure 6 shows the administrative supply of biofuels in 2010 used to meet the transport targets [Central Government 2011a]. The carry over of supply from 2009 to 2010 using so-called ‘biotickets’, and the increased proportion of double-counting biofuels (mainly biodiesel), ensured that the physical supply of biofuels in 2010 declined, despite reaching the administrative supply targets [CBS 2010].

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**Figure 6** Biofuels in the transport sector in 2010; administrative supply (PJ)

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6 The double counting of biofuels from waste streams is currently applied in the Netherlands, but not yet in other Member States. Once other countries introduce this double counting, the relative share of biofuels in the Netherlands is likely to fall again. In addition, Dutch Secretary of State Atsma (Environment) announced that the rules for double counting will be tightened up, as a result of which the double-counting share will drop further.
3 Bioenergy policy framework developments

Directives and renewable energy
Member States of the European Union have mutually agreed, in the form of Directives, on which energy policy to follow. The most important is the Renewable Energy Directive (RED, Directive 2009/28/EC [EU 2009a]). The RED sets two important quantitative goals: a minimum 20% share of renewable energy in the final end use of the EU in 2020 (for the Netherlands this translates into a renewable energy target of 14%), and a minimum 10% share of renewable energy in the consumption of petrol, diesel and electricity for transport. Member States have submitted action plans outlining how they expect to achieve their targets (see [Central Government 2010]), and the report biennially to the EU on the progress made (see [Central Government 2011d], for the report on 2009-2010). Between June 2011 and February 2012 a public consultation took place on European strategy in the field of renewable energy beyond 2020, and the results of this are currently being collated.

Figure 7 shows the amount of renewable energy realised up until 2011, the 2020 target, and the indicative path [Central Government 2010]. The share of renewable energy in 2010 amounted to 3.75% [CBS StatLine 2011].
In 2011 the final end use of renewable electricity remained stable, and the final end use of renewable energy in the heating and transport sectors is estimated to have increased slightly. Because total energy consumption in the Netherlands fell in 2011 [CBS StatLine 2012], the percentage of renewable energy increased to 4.1%. In order to meet the intermediate targets of the indicative trajectory in the action plan, a percentage of 5.3% must be achieved in 2012. This appears to be an ambitious task (see also [PBL and ECN 2011]).

The Fuel Quality Directive (FQD; 2009/30/EC [EU 2009b]) requires, as from January 1 2011, a gradual reduction in the greenhouse gas intensity\(^7\) of fuels sold. This requirement also applies to fuel for mobile equipment, which does not count towards transport in the EU Renewable Energy Directive\(^8\). In 2020, the greenhouse gas intensity of all transport fuels must be reduced by at least 6% compared with 2010.

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**Bioenergy policy framework in the Netherlands**

Policy on (renewable) energy in the Netherlands is in line with the above EU Directives in the field of renewable energy. The following sections briefly describe the general policies that apply to multiple technologies. Legislation and subsidies that apply to a single technology are described in Chapter 4. One important current incentive in support of renewable energy in the Netherlands is the Renewable Energy Production Incentive Plus (SDE+) scheme. Besides this, there are also several other incentives.

**SDE+**

The Renewable Energy Production Incentive Plus (SDE+) scheme was introduced in 2011, and is the successor to the SDE subsidy, which was open to applicants from 2008 to 2010. The biomass technologies eligible for this operational subsidy are waste incineration plants, biogas production in wastewater and sewage treatment plants, thermal conversion, and digestion of solid and liquid biomass. Co-firing of biomass in power plants is not covered by the SDE+.

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\(^7\) This means to the amount of greenhouse gas emissions per litre of fuel, calculated over the whole lifecycle of the fuel, and including extraction, refining, transportation and consumption.

\(^8\) The scope of both directives is therefore not exactly the same. In translating these into national policy, the Dutch government tries to align with both directives as much as possible.
Predecessor of the SDE
The predecessor of the SDE was the Environmental Quality of Electricity Production (MEP) subsidy scheme. Like the SDE, the MEP subsidies focused on the production of renewable electricity, but the MEP was based on a fixed rate per produced kWh and reimbursed for up to 10 years. When the scheme closed in 2006, some investment plans were already well advanced. To allow small agricultural businesses to qualify, the transitional MEP (OVMEP) scheme was introduced. Digestion plants smaller than 2 MWe were eligible, if the environmental and building permits were applied for before 2006. MEP and OVMEP subsidies that have already been granted will continue to be reimbursed, and will thus remain in the Dutch state budget until 2017.

The SDE+ differs in a number of ways from the old SDE. Under the new scheme, there is one budget for all technologies, meaning the technologies compete with one another. Applicants may apply in phases for an increasing amount of subsidy, wherein the first phase is intended for technologies that can be applied with the lowest grant. The SDE budget in 2011 amounted to € 1.5 billion, of which € 0.5 billion was allocated to renewable electricity (primarily onshore wind, followed by small-scale thermal biomass conversion and organic waste digesters), and € 1 billion to renewable gas (mainly organic waste digesters) [NL Agency 2012a].

The SDE+ scheme was opened on March 13, 2012. Surprisingly, the large number of granted SDE applications has not yet led to a sharp increase in the production of renewable energy. This is because a large part of the granted capacity has not yet been realised.

Changes to the SDE+ in 2012:
In 2012, the number of registration phases increased from four to five [Verhagen 2011]. Furthermore, the total subsidy budget increased to € 1.7 billion. The staged heat reimbursement has been abolished. Instead, renewable heat technologies such as CHP and biomass boilers are now also eligible for subsidy.

The SDE+ subsidy also applies to biomass installations which run out of MEP subsidy but are not yet at their technical end-of-life. Finally, it will be possible for producers to accumulate subsidy rights for up to one year (‘banking’), so these do not expire due to technical problems.
Other financial incentives

- The Energy Investment Allowance (EIA; budget in 2011: € 151 million) stimulates investment in energy-saving measures and renewable energy because, in addition to normal depreciation, 41.5% of the investment expenses may be deducted from the taxable profit. Each year an Energy List9 is compiled, in which operating assets that are eligible for subsidy are listed. This includes several assets that make use of biomass, such as boilers, CHP plants, and plant for upgrading biogas and for biofuel production. Appearing for the first time on the Energy List in 2012 are aerobic biomass reactors and dry biomass digesters.
- Investments in environmentally friendly operating assets are promoted via tax incentives such as the Environmental Investment Allowance (MIA; budget in 2011: € 101 million) and the Random Depreciation of Environmental Investments (VAMIL; budget in 2011: € 24 million). Under the MIA scheme, as with the EIA, investments can be deducted from taxable profit. The VAMIL scheme offers entrepreneurs the ability to depreciate investments according to personal discretion. Investments that qualify for this scheme are published on the ‘Environment List’ [NL Agency 2012b]. This includes, among other things, biogas drives for transport and machinery, and certain types of digesters.
- With ‘green investment’, savers and investors can get tax allowance for investments in approved green funds and securities. Green investing is intended mainly as an ‘investment subsidy’, and currently includes two types of biomass projects: a biogas upgrading facility and a biofuel production plant. As from 2011, the tax credit for individuals investing in sustainable projects was reduced from 2.5% to 1.3%. The government’s intention is to lower the percentage to 0% in 2014 [NL Agency 2011a].
- One part of the Top Sector approach (see below) concerns the R&D Allowance tax regulation (RDA and RDA+). This regulation took effect on January 1, 2012 and includes a tax allowance for expenditures on Research and Development. A budget of € 250 million is available in 2012, rising to € 500 million in 2014. Applications can be submitted as from May 1, 2012.

9 See www.agentschapnl.nl/programmas-regelingen/energielijst-eia.
Additional policy

- In 2011 the Minister of Economic Affairs, Agriculture and Innovation closed so-called ‘Green deals’ with citizens, community organisations and businesses. These deals are designed to encourage greater sustainability by removing barriers, encouraging cooperation, or modifying laws and regulations (for an overview of the Green Deals closed in 2011, see [Central Government 2011b]). See Chapter 4 for specific Green Deals by technology.
- In 2011 the Ministry of Economic Affairs, Agriculture and Innovation launched the Top Sector policy\(^\text{10}\). One of the Top Sectors is the energy sector, of which bioenergy is one of the major topics. Although the details of the Top Sectors are currently still being drafted, the so-called ‘bio-based economy’, including biomass conversion technologies, will be ascribed a major role. It is expected that many companies in the biomass sector will make use of the R&D Allowance tax regulation (see ‘Other financial incentives’, above).
- In 2010, several laws and regulations came in force covering the use of biomass for energy production and facilitating the realisation of bioenergy projects. The Environmental Permitting (General Provisions) Act (Wabo), the Crisis and Recovery Act, and the State Permitting Coordination Programme came all into effect and can have an effect on accelerating the authorisation of bioenergy projects.
- From 2008 to 2012, as part of the Innovation Agenda, a total of € 483 million was made available for Research and Development of renewable energy technologies. Themes include ‘biobased resources’, ‘new gas’, and ‘the greenhouse as an energy source’.
- NL Agency supports pilot schemes for the production of renewable biomass through its Sustainable Biomass Import (DBI) and Global Sustainable Biomass (DBM) programmes.

\(^{10}\) See www.top-sectoren.nl.
Co-firing in power plants

Policy framework
Electricity production subsidised by the MEP scheme will be reduced in steps and be fully phased out in 2015. The grants awarded will be paid out until the end of the agreed project durations. Co-firing in power plants is not eligible for the Renewable Energy Production Incentive schemes, SDE and SDE+. The Dutch government wants co-firing to eventually become compulsory [EL&I 2011]. In 2011, the minister signed a ‘Green Deal’ with Energie-Nederland. This agreement means that energy companies will maintain the level of co-fired biomass in their power plants at 10%, at their own expense and risk, until 2015. Meanwhile, consultations are ongoing to add a supplier obligation at a later date. In the Green Deal it has been agreed that energy companies can save up ‘green rights’ on 2% co-firing, and may apply these at the time any supplier obligation is introduced.

Trends and developments
In total, approximately 14% of renewable energy in the Netherlands is generated by co-firing of biomass in coal- or gas-fired power plants, primarily as electricity (see Table 1). In 2011 electricity generation in these plants decreased slightly, from 11.7 PJ in 2010 to 11.3 PJ (3.1 TWh) in 2011. The main fuel used is wood pellets, supplemented with wood chips, waste wood and non-woody biomass from primary agriculture or agribusiness. Most of the co-firing is accounted for by RWE Essent (the Amer-9 power plant in Geertruidenberg), and GDF Suez (the Gelderland-13 power plant in Nijmegen). In 2013, a new E.On power plant on the Maasvlakte will come into operation with a capacity of 1,070 MW. It is expected that 30% biomass will be co-fired in this installation. The construction costs amount to € 1.2 billion.

In the future a greater contribution is expected from pre-treatment technologies such as torrefaction, which will allow higher percentages of biomass to be co-fired in power plants. In 2010 the first torrefaction plant was opened by Stramproy in Steenwijk, with a capacity of 90,000 tons of bio-coal per year. The factory was damaged by a fire in early 2012, which temporarily stopped production [AgriHolland 2012]. Topell Energy has a factory in Duiven with a capacity of 60,000 tons per year. This factory is now operating with a capacity of 100 tons/day. Torr Coal from Sittard has a production line for 35,000 tons of torrefied biomass just across the border in Belgium. A permit for a second production line was turned down in 2011. There are also preparations for the construction of a pyrolysis plant in Hengelo. The plant is being built by the firm BTG and will become operational in late 2013. The gasification of biomass occurs at
several places in the Netherlands. Biomass is gasified on a large scale at Nuon’s Willem-Alexander power plant in Buggenum (Limburg). The gasification of waste wood takes place in Essent’s Amer power plant in Geertruidenberg.

Waste incineration plants

Policy framework
In the 2011 SDE+ regulation, waste incineration plant incentives were staged to encourage cogeneration in existing plants, wherein the subsidy per kWh increased for waste incineration plants with higher efficiencies. As from 2012, the staged incentives have been replaced by a separate subsidy category for heat utilisation from existing waste incineration plants. All Dutch waste incineration plants have satisfied the energy efficiency requirements for so-called ‘R1 status’ and were formally awarded this in the revision the Dutch National Waste Plan (LAP) in early 2012 [NL Agency 2011B]. This status means that incineration may be considered as a recovery operation and no longer as disposal (D10). In practice, this means for example that so-called B-wood, for which the LAP stipulates that the minimum standard for processing is ‘recovery’, may be incinerated in waste incineration plants with R1 status.

Trends and developments in projects
The amount of waste incinerated has risen slightly in recent years, from 5,542 kton in 2006 to 6,459 kton in 2010 [NL Agency 2011c]. Moreover, the biogenic fraction of waste increased slightly to 51% [NL Agency, 2011d], so the share of electricity and heat considered ‘renewable’ also increased. It is expected that the biomass fraction of waste will increase, due among other things to better source separation of plastic packaging. Waste incineration plants generate about 14% of all renewable energy in the Netherlands.

11 ‘R’ stands for recovery, or useful application.
At the end of 2011, the Reststoffen Energie Centrale (REC – Waste-to-Energy Plant) went into operation in Harlingen, with a capacity of 228 kton of waste per year. In late 2011 the ReEnergy industrial waste incinerator opened in Roosendaal with a total capacity of 291 kton of waste per year. This brings the total national incineration capacity up to 7 Mton of waste per year, of which approximately 90% is utilised. As a result of this over-capacity it has provisionally been agreed that no new large-scale plants will be built. Part of the excess capacity is utilised by imports of household waste from Germany, the United Kingdom and Italy.

In early 2011 the Twence Waste-to-Energy plant began delivering steam to nearby AkzoNobel for the production of salt. Also in 2011 a heat pipe to Enschede was completed, supplying 5,000 households and businesses with waste heat from the incinerator. The E.On ‘Energy from Waste’ plant in Delfzijl produces 140 tons of steam per hour and also has an electrical capacity of 42.2 MW.

In early 2012 AVR started the construction of a heating grid in Rotterdam-Zuid. The company has a 30-year contract with Warmtebedrijf Rotterdam to supply heat to 50,000 households in Rotterdam as from mid-2013. AVR also has advanced plans to eventually supply steam to the Botlek region. The Bavin waste incineration plant in Veendam was granted R1 status for a capacity of 26 kton, but the operator went bankrupt before the plant went into operation.

Table 4 gives an overview of waste volumes used for the generation of electricity and heat. The data presented relate to 2010 and show the gross electricity generation and the amount of delivered heat [NL Agency 2011c].

### Table 4: Overview of Waste Incineration Plants in 2010

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<th>RENEWABLE ELECTRICITY</th>
<th>RENEWABLE HEAT</th>
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Wood-burning stoves in households

There have been relatively few developments in the field of wood-burning stoves in households. The thermal efficiency of built-in stoves and freestanding stoves has increased slightly over time, as has the number of freestanding stoves sold [Koppejan 2010]. In accordance with the European Ecodesign Directive (2009/125/EC [EU 2009c]), it is expected that more stringent product requirements for wood-burning stoves will come into effect in 2013, including for example the mandatory use of filters. Wood-burning stoves in households are responsible for 14% of renewable energy in the Netherlands, but the margin of error in measuring the amount of wood burned is very large [CBS 2011].

Wood-burning stoves in industry

Policy framework

Besides the Energy Investment Allowance (EIA) scheme, the Netherlands did not have a financial policy in 2011 that supported biomass-fired heat generation. In 2012, the SDE+ opened up to some heat technologies, including biomass boilers with a capacity of more than 0.5 MWth. Emissions from heat generation installations larger than 1 MWth are covered by the Emission Requirements for Medium-sized Combustion Plants Decree (BEMS), which included requirements for NOx, SO2 and particulate matter emissions. For generation smaller than 1 MWth, the requirements of the Dutch Emissions Guidelines for air (NER), part F7, apply.

Trends and developments

The installed capacity of wood-burning stoves has increased in recent years from 319 MWth in 2005 to 435 MWth in 2010 [CBS 2011]. In particular, the number of plants smaller than 0.5 MWth installed on farms has risen sharply in the past 5 years. In total, this category contributes 3% of renewable energy in the Netherlands.
Miscellaneous combustion

Policy framework
This category includes plants for the incineration of paper sludge, biomass combustion in cement kilns and other incineration besides power plants [CBS 2011]. As from 2012, the SDE+ scheme has been opened up to bioenergy power plants for which the MEP subsidy has expired, but which have not yet reached their end-of-life.

Trends and developments
The category ‘miscellaneous combustion’ is responsible for approximately 6% of renewable energy in the Netherlands. The larger plants in this category include the wood-burning plants in Alkmaar (HVC), Cuijk (Essent), Hengelo (Twence) and Rozenburg (AVR). In Moerdijk (BMC) there is a plant that burns chicken manure, in Sittard (BES) there is a facility for green waste, and in Renkum (Norske Skog Parenco) there is a paper sludge incinerator.

In Delfzijl, Eneco is building a new 50 MW bio-power plant, which will be commissioned in mid-2013. The Essent power plant in Cuijk (capacity 25 MWe) had previously been shut down after the company stopped receiving the MEP subsidy. With the opening up of the SDE+ scheme to such installations, the power plant went back into operation in January 2012.

Digestion plants and biogas production

Biogas in the Netherlands is generated from various types of installations, such as landfill gas and sewage treatment plants, and municipal digesters and digesters in agricultural and food-processing companies. A portion of the biogas produced is used locally for electricity and heat production. The remainder is upgraded to green gas and injected into the natural gas grid. This section only covers the use for electricity and heat production. Green gas is discussed in a separate section.

Policy framework
The 2012 Renewable Energy Production Incentive Scheme plus (SDE+) subsidy includes some changes for biogas technologies. For sewage and wastewater treatment plants the new scheme only includes an electricity category. Because no new landfills may be developed, as from 2012 the production of energy from landfill no longer qualifies for the SDE+ scheme [NL Agency 2012a]. For co-digesters the co-digestion positive list identifies which organic materials may be used as co-substrate for digestion, in order for the digestate to be designated as animal manure for fertilisers. This list was expanded in 2011. New legislation is in development that will set standards for the maximum amount of contaminants that the co-substrates may contain. In 2011 the minister signed a Green Deal with the agricultural sector that will accelerate the permit process for small-scale digestion projects.

12 Appendix A subsection IV of the Dutch Fertilisers Act.
Trends and developments

About 9% of Dutch renewable energy is generated from biogas (excluding green gas). Almost half of this comes from co-digestion plants, followed by sewage treatment plants, biogas from organic waste and landfill gas. Co-digestion plants in agricultural companies have grown strongly in recent years. In these installations, biogas is produced from the digestion of manure in combination with co-substrates (such as corn). A recent study showed that the cost of co-substrates is a particular bottleneck in the further development of production capacity [NL Agency 2011e]. The number of companies with a facility increased from 17 in 2005 to 93 in 2010 [CBS 2011]. For the 2011 SDE+ subsidy, 8 applications for co-digesters were honoured [NL Agency 2012a]. A simplification of the permit process would stimulate large-scale implementation of second-generation digestion plants in the agricultural sector. In a Green Deal made with the government, LTO has announced an initiative to install 200 Agrimodem units (pure manure digesters) in agricultural companies. This will allow fertiliser substitutes and 20 million m³ of biogas to be produced from manure.

The production of biogas released during the digestion of sludge in sewage water treatment plants shows a slight upward trend. In recent years this biogas has increasingly been used for electricity production instead of being committed to other processes [CBS 2011]. The production of landfill gas has decreased in recent years as less waste is being dumped. The Statistics Netherlands category ‘biogas from organic waste’ primarily includes the production of biogas from wastewater treatment plants, the food industry and the digestion of biodegradable municipal waste (GFT). These facilities all qualify for the category of organic waste digestion in the SDE+ scheme. Biogas production in this category has increased significantly in recent years, particularly for use in electricity production.

Besides digestion, gasification also plays a small role in the production of biogas. In Nieuwdorp (Zeeland) there is a plant for the gasification of category B waste wood (3.5 MWth) and the use of the syngas for the production of heat. HVC and ECN plan to build a 10 MWth gasification plant in 2013 on the HVC site in Alkmaar.
Upgrading to green gas

Policy framework
Green gas is produced by upgrading raw biogas to natural gas quality, which can then be injected into the existing gas grid and thus replace natural gas. The green gas needs to have the same properties as the natural gas in the grid, but the definitive quality requirements of green gas have not yet been established. To become connected to the regional grid, suppliers must comply with Article 12b of the Gas Act: ‘Gas connection and transport conditions – regional grid operators’ [NMa 2011]. Different grid operators may have different additional requirements, which can lead to long consultation processes. The Association of Energy Network Operators (TSO/DSO) in the Netherlands (Netbeheer Nederland) is coordinating the preparation of common and unambiguous connection and transport conditions. A proposal is expected in 2012.

For several years biogas upgrading facilities have been eligible for the Energy Investment Allowance (EIA, see Chapter 3), and since 2008 the production of green gas has been subsidised by the SDE and SDE+ schemes. To reduce the costs of upgrading facilities, biogas pipelines may be interconnected via a so-called biogas hub, in which the biogas is collected and upgraded to natural gas quality at a central location, and then injected into the (national) gas transmission grid. As from 2011, the SDE+ was opened to biogas hubs in which raw biogas is collected for use in a communal boiler or CHP plant. In 2011 the minister signed a Green Deal with the horticultural sector, in which it was agreed that the internal consumption of green gas in the production facility would also become eligible for SDE+ subsidy13.

Spotlight: Green gas from fish residues
One of the largest green gas digestion plants in the Netherlands opened in Spakenburg in February 2011. The pioneering company A. van de Groep & Zonen uses waste from fish markets and rejected dough-based products to produce biogas. This gas is upgraded to natural gas, after which it is injected into the gas grid. The plant produces 690 Nm3 of green gas per hour and has an electrical capacity of 0.63 MW. The plan is to double the supply of green gas within a year (source: [GAVE 2012]).

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13 This also applies to internal energy consumption in other sectors.
Trends and developments

The production of green gas in recent years has accounted for a relatively small proportion of the total amount of renewable energy in the Netherlands (1%). The inclusion of green gas in the SDE and SDE+ schemes seems to be leading to the rapid development of green gas: in 2011, two thirds of the SDE+ subsidy was granted to green gas projects. Most funding is requested for organic waste digesters [NL Agency 2012a]. In addition to the national government, provincial governments, local authorities and partnerships are also encouraging the development green gas production sites. In 2011, some stakeholders established the Green Gas Netherlands Foundation (Stichting Groen Gas Nederland), with the aim of combining their knowledge and experience in the field of green gas. The foundation has signed a Green Deal with the minister in which it has been agreed to reach an output of 300 million Nm³ of biogas in 2014, a tenfold increase from current levels. This Green Deal also states that Vertogas, the green gas certifying authority, will be incorporated into the Dutch Gas Act.

Biofuels for transport

Policy framework
The most important policy development in 2011 was the Dutch implementation of the RED and the FQD (see also Chapter 3). This legislation replaced the 2007 Dutch Transport Biofuels Act. The renewable energy for transport act decreed that in 2011, the obligated registered parties must replace at least 4.25% of total transport fuels with biofuels, increasing to 5.5% in 2014. Meanwhile, Secretary of State Atsma also wrote to the Dutch House of Representatives, announcing that the blending percentages would be greatly increased, to 10% in 2016 (see Figure 8) ¹⁴.

¹⁴ See also Chapter 6 regarding ways to ensure these obligations are fulfilled in a sustainable manner.
Only biofuels that satisfy European sustainability requirements count towards the annual obligation. Biofuels produced from waste, residues, non-food cellulosic material and lignocellulosic material may under certain conditions be double counted to meet the annual obligation. In early March 2012, Secretary of State Atsma announced that the rules for double counting would be tightened. Biogas and renewable electricity can also be used towards compliance with the annual obligation if these are used in road transport and mobile machinery, with renewable electricity supplied to road vehicles counting 2.5 times towards the annual obligation. Following the Haverkamp/Leegte motion to parliament in 2011 new regulations were established for biokerosene, whereby biokerosene that meets the sustainability criteria also counts towards the targets as from January 2012 [Central Government 2011c].

Quantities of biofuel may be traded administratively by means of so-called ‘biotickets’, which also count towards the annual obligation and the reduction in greenhouse gas intensity. Using these biotickets, an administrative transfer can also take place between two consecutive years, and thus the share of renewable fuels in the physical supply can differ from the administrative supply. Because suppliers have made extensive use of this possibility, the physical supply decreased sharply in 2010, whilst the administrative target was achieved [CBS 2010]. For 2011 and 2012, a maximum of 25% of the annual obligation can be met through this administrative carry over.

Compliance with Dutch regulations

The Dutch Emissions Authority (NEa) is responsible for the implementation, monitoring and enforcement of Dutch biofuels regulations. Since 2011, the obligated registered parties have been required to report biannually on their biofuel flows by means of a biofuels balance. In the first half of 2011, companies were only required to indicate which sustainability system they applied to guarantee the sustainability of the biofuels. As from July 1 2011 this must also be confirmed by an auditor.

The NEa has prepared guidelines for companies and auditors regarding the requirements and the preparation of these confirmation statements [NEa 2011c]. In 2012, companies need only report once a year on their biofuels balance for biofuels destined for the Dutch market. In addition, reporting within the framework of the European Fuel Quality Directive (FQD) has been simplified if a party also already reports under the RED.

Besides implementation of the European directives, up until December 2011 it was also possible to submit applications for the ‘Sustainable mobility pilots: driving on biogas and higher blend fuel’ subsidy programme. In total, € 2.6 million was available for the conversion of cars to make them suitable for running on green gas, biogas or blends containing more than 10% biofuel.
**Trends and developments**

In recent years, the minimum blending obligation has been achieved. Fuel suppliers clearly make use of the administrative double counting of biodiesel from waste streams, thus decreasing the physical supply. An overview of initiatives, with or without new production methods or raw materials, can be found on the website of the Climate Neutral Gaseous and Liquid Energy Carriers programme (GAVE) \(^{15}\). There are several biofuel projects in the development of start-up phases.

By late 2010 the Netherlands had a biodiesel production capacity of over 1,300 million kg per year, but less than 400 million kg was produced [CBS 2011]. This was partly due to the reduced targets at home and abroad and the possibility to top up with double counting biofuels, and also to competition from plants outside Europe. In 2011 the new NesteOil production site went into operation with a capacity of 900 million litres per year. The biodiesel from NesteOil will be produced according to a new process based on the hydrogenation of vegetable oil. Cargill in Bergen op Zoom has a new bioethanol plant in operation with a capacity of 40 million litres per year.

\(^{15}\) www.sn-gave.nl/voorbeeld_all.asp.
5 Sustainability

Sustainability criteria for biomass streams play an increasingly important role. Sustainability issues can particularly occur in the production and conversion of biomass, such as deforestation or competition with food production. Through the development of sustainability criteria, and systems to verify these criteria, these issues are resolved. In particular, criteria for biofuels have been developed significantly, and the European criteria from the RED have been implemented in Dutch legislation. The development of criteria for solid and gaseous biomass for energy purposes (electricity, heat and gas) is less advanced.

The Commission for Biomass Sustainability Issues (Corbey Commission\textsuperscript{16}) advises the government on sustainability issues in the development of a bio-based economy. The committee identifies ways to increase the share of sustainable biomass in the Netherlands, by looking at an extension of sustainability criteria to cover other applications of biomass, as well as to cover fossil fuels and food production. The commission also focuses on achieving the 10% transport target of the RED, for example by looking for the optimal use of sustainable biofuels. At the end of 2011 the commission recommended to the government that it starts with guaranteeing the sustainability of biofuels, before increasing the obligations for production and supply [Corbey 2011]. In the meantime the government decided to immediately increase the supply obligations (see Chapter 4). The commission’s term was extended by two years in June 2011.

The following sections describe the developments in the field of sustainability certification for both biofuels and solid and gaseous biomass for energy purposes.

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\textsuperscript{16} See: www.corbey.nl.
Sustainability of liquid biomass


Sustainability requirements for liquid biomass (bioliquids) and transport biofuels are set out in the European Directives on Renewable Energy (RED; 2009/28/EC) and Fuel Quality (FQD; 2009/30/EC). Both directives require biofuels to meet European sustainability criteria in order to count towards targets. In May 2011 the two directives were implemented in Dutch national legislation in the form of the Decree on Renewable Energy for Transport (implementing the RED) and the Fuels and Air Pollution Decree (implementing the FQD). These decrees and related ministerial regulations were retroactively brought into effect from January 1, 2011.

In order to address the wider environmental impacts of biomass production, the European Commission reports every two years on the macro-aspects of biofuels, such as shifts in land use and impact on food prices. The first report is expected in 2012 (2009/28/EC, Article 23). The European Commission is preparing a proposal for the development of a European directive in the field of ‘indirect land use change’ by biofuels [ENDS 2012].

Recognition of sustainability systems

Biofuels must satisfy European sustainability requirements in order to count towards the target for renewable energy in transport. Dutch biofuels legislation states that in order to demonstrate the sustainability of biofuels, only voluntary sustainability systems that are recognised by the European Commission or accepted by the Dutch government may be used. Until July 1, 2012, in expectation of acceptance, temporarily accepted systems may still be used.
After that date systems may only be used if they are accepted based on the ‘Dutch test protocol for sustainability systems for biofuels’ [NEa 2011a]. Only systems that have not yet been recognised by the European Commission and have not yet been submitted to the Commission for approval are eligible for national acceptance.

On July 19 2011 the European Commission officially recognised seven voluntary sustainability systems for a period of five years [EU 2011], namely:

1. **ISCC** (International Sustainability and Carbon Certification).
2. **Bonsucro EU**.
3. **EU RED RTRS** (Round Table on Responsible Soy EU RED).
4. **EU RED RSB** (Roundtable of Sustainable Biofuels EU RED).
5. **2BSvs** (Biomass Biofuels voluntary scheme).
6. **RBSA** (Abengoa RED Bioenergy Sustainability Assurance).
7. **Greenergy** (Greenergy Brazilian Bioethanol verification programme).

The NTA8080/8081 sustainability system developed in the Netherlands has been submitted to the European Commission for recognition and has been temporarily accepted in the Netherlands until July 1 2012. In an international context, the ISO 13065 standard for the sustainability of bioenergy is also being developed. The development of the European standard CEN TC 383 is in its final stage [CEN 2012]. The most recent survey currently available relates to voluntary reporting to the NEa regarding 2010 [NEa 2011]. This study reported on approximately 2/3 of the marketed biofuels, stating the origin of the raw materials, and whether they were certified. As from 2011, companies with an annual obligation for renewable energy in transport must submit a biofuels balance to the NEa, in which certain sustainable attributes must be listed. An overview of these reports will be published during 2012.
**Sustainability of biomass for energy purposes**

The development and implementation of sustainability criteria for the use of solid and gaseous biomass for energy purposes (electricity, heat and gas) is being worked on at several levels. In order to prevent biofuels that do not meet sustainability criteria from being used for electricity generation or heat production, SDE applicants using liquid biomass must, as from 2011, have this certified using a sustainability system accepted by the European Commission. There are no such legal requirements for solid and gaseous biomass used to produce electricity or heat. There is now a debate about enshrining sustainability criteria for solid and gaseous biomass in laws and regulations. There are also several national and international market initiatives to intensify the use of sustainable biomass. The European Commission is preparing a new communication on the application of sustainability criteria to solid biomass, but this has currently not yet been made public.

Of relevance to the co-firing of wood is a European regulation setting out the obligations of traders who put wood and wood products on the market (2010/995/EC). This regulation was published in late 2010 and will come into effect on March 3, 2013. The regulation prohibits the selling of illegal timber and requires traders to make the origin of their products traceable. In order to prevent illegal trade, the US has, since 2009, required wood to be certified before it is put on the market.
Biomass plays an important role in the renewable energy supply: it accounts for the production of about three-quarters of all renewable energy in the Netherlands. European demand for biomass is expected to increase significantly in order to achieve the RED targets, and that demand will be enhanced even further if Europe adopts a bio-based economy. The question is, where will this biomass come from? A recent PBL study estimates that by 2030, Europe could have an economy that is 10-20% based on biomass. In that case however, a scarcity of renewable biomass may occur (see also Chapter 5), and there may be competition between different biomass applications [PBL 2012].

Part of the biomass that is used in the Netherlands for the production of bioenergy comes from the Netherlands, and part of it is imported. In the Netherlands in 2009, 113 PJ of biomass was used for energy purposes [CBS Statline 2010]. About 55 PJ\textsuperscript{17} of the biomass used came from biomass streams produced in the Netherlands [Koppejan 2009]. The remainder was imported, mainly for combustion in power plants and (the production of) biofuels.

Figure 9 shows the different types of biomass streams used for energy purposes in the Netherlands in 2009. In line with the large share of renewable energy produced by waste incineration, the biomass fraction of municipal and industrial waste is the most important biomass stream, followed by waste wood fired in bioenergy power plants. Bonemeal is co-fired in coal-fired power plants. Furthermore, a broad mix of plant and animal residues are used, eg in digesters. Only a very small percentage of the electricity generated in the Netherlands involves the production of energy crops such as rapeseed and corn.

\textsuperscript{17} For this figure, a biomass share of 51% was assumed for waste incinerated in waste incineration plants [NL Agency 2011d].
The Dutch consumption of biomass for co-firing in coal-fired power plants is largely based on (imported) wood pellets. Figure 10 gives an overview of the production, consumption and trade of wood pellets in the Netherlands in 2010 [Eurostat 2012]. In 2010 about 1 Mton of wood pellets was imported, of which over three-quarters came from Canada and the US. In particular, imports from the US increased sharply in 2011, while those from Canada dropped significantly.

**Highlights: Co-firing of biomass by Essent**
The largest party in terms of the co-firing of biomass in the Netherlands is Essent. In 2010 the Amercentrale power plant in Geertruidenberg burned about 1 Mton of biomass [Essent 2011]. Three quarters of this consisted of wood pellets, largely imported from North America. In 2010, 92% of imported wood pellets (80% of the total biomass input) were certified under the Green Gold Label system (but see also [Greenpeace, 2011] for a critical view of this certification). The goal is that, by 2015, all imported wood pellets will be certified according to this system. In 2011, RWE opened a factory in Georgia, Oregon, which can produce 750 kton of wood pellets on a yearly basis, largely destined for the Dutch market. Other parties are also working on the development of torrefaction, with a contract for bio-coal from Stramproy Green, and another plant currently under construction in Duiven, run by Topell Energy.
Figure 11 gives an overview of the production, consumption and trade of biodiesel between 2005 and 2010 [CBS Statline 2011]. Until mid-2009, a lot of biodiesel was imported from the US because of low price created by US subsidy programmes. Following anti-dumping measures implemented by the EU in July 2009, this flow of trade decreased significantly. At the same time, domestic production increased sharply, turning the Netherlands from a net importer into a net exporter of biodiesel. Domestic consumption in 2010 rose sharply compared to 2009 - see also Chapter 4.

Figure 12 gives an overview of the production, consumption and trade of biopetrol between 2005 and 2010 [CBS Statline 2011]. Domestic production of biopetrol has been very limited for several years. As from 2010, production figures have been confidential and may not be reported by Statistics Netherlands, because it could be traced back to individual companies.

As from the 2011 reporting year, obligated registered suppliers of transport biofuels must specify the origin of the biofuels they place on the market, and with which system they were certified (see Chapter 5). The most recent survey currently available relates to voluntary reporting to the NEa regarding 2010 [NEa 2011]. This study reported on approximately 2/3 of the marketed biofuels, stating the origin of the raw materials, and whether they were certified.
Based on the previous chapters, the following trends and developments can be seen:

• The rising trend in the amount of renewable energy generated in the Netherlands in 2011 appears to be levelling out. This is mainly due to a decrease in the physical supply of biofuels in 2010. Moreover, a large amount of SDE subsidy has been granted, but much of the subsidised capacity has not yet been realised. Energy from biomass makes an important contribution to the production of renewable energy, with a share of more than 70%.

• According to the latest estimates (PBL/ECN, 2011) biomass will remain the largest source of renewable energy in the Netherlands until 2020, but the share is decreasing. These estimates also show that the 2020 target (14% renewables) will not be achieved with the current government policy. The estimates vary between 9 and 12%.

• The blending obligation for biofuels was set at 4.25% in 2011 and will increase to 5.5% by 2014. In recent years an increasing share of this obligation has been satisfied 'administratively' using the double counting of biofuels from waste. This share is relatively high in the Netherlands compared to other EU countries due to the current administrative double counting. When double counting is introduced in other Member States this share is expected to decrease.

• The largest growth in renewable energy in 2011 came from waste incineration. Wind energy and biogas production also grew strongly.

• The SDE+ scheme opened in 2011. € 1.5 billion in subsidies has been granted to several projects, including an allocation of € 248 million to 20 electricity from biomass projects, producing 2.4 TWh or 8.8 PJ and € 1 billion to 30 renewable gas projects, in which 2.1 billion Nm3 of renewable gas will be produced. These projects are not yet reflected in the data for 2011.
Evaluation of the SDE scheme shows that, including 2010, a total of almost €450 million in subsidies was granted to renewable gas production. The €1 billion allocated in 2011 is therefore expected to result in a strong growth of renewable gas in 2012 and beyond.

In anticipation of a supplier obligation for the share of renewable energy, the minister has agreed with the major producers to continue the co-firing of biomass.
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The division NL Energy and Climate change strengthens society by working on energy and climate solutions for the future.
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<td>Biopetrol</td>
<td>Transport</td>
<td>6.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>Transport</td>
<td>4.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total (PJ)</td>
<td></td>
<td>64.4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

* The renewable energy output is calculated by correcting the total energy output for the biogenic fraction in the deployed waste (51%: Agentschap NL, 2011d).
**TABLE 2 OVERVIEW OF BIOENERGY PLANTS COMMISSIONED IN 2011**

### WASTE INCINERATION

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.ON Energy from waste, Delfzijl</td>
<td>42.2 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td>REC Harlingen</td>
<td>17 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td>Sita ReEnergy</td>
<td>Expanded by 105.4 MW&lt;sub&gt;th&lt;/sub&gt; / 32 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>105.4 MW&lt;sub&gt;th&lt;/sub&gt; / 91.2 MW&lt;sub&gt;e&lt;/sub&gt;</strong></td>
</tr>
</tbody>
</table>

### ORGANIC WASTE

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twence Hengelo organic waste digestion</td>
<td>2.4 MW&lt;sub&gt;e&lt;/sub&gt; en 2.4 MW&lt;sub&gt;th&lt;/sub&gt;</td>
</tr>
<tr>
<td>VAR Wilp, cogeneration expansion</td>
<td>0.2 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2.6 MW&lt;sub&gt;e&lt;/sub&gt; en 2.4 MW&lt;sub&gt;th&lt;/sub&gt;</strong></td>
</tr>
</tbody>
</table>

### DIGESTERS

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecoson in Son, cogeneration expansion</td>
<td>1.56 MW&lt;sub&gt;e&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

### CO-DIGESTERS

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogast Beverwijk wastewater treatment expansion</td>
<td>175 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</td>
</tr>
<tr>
<td>SuikerUnie Dinteloord organic waste digester</td>
<td>1.100 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</td>
</tr>
<tr>
<td>Ecofuels Well organic waste digester</td>
<td>300 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</td>
</tr>
<tr>
<td>De Meerlanden BV Rijssenhout organic waste</td>
<td>600 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</td>
</tr>
<tr>
<td>Mts. Schaap Tirns co-digester</td>
<td>206 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2.381 Nm&lt;sup&gt;3&lt;/sup&gt;/hr</strong></td>
</tr>
</tbody>
</table>

(Equivalent to approximately 19 million Nm<sup>3</sup>/year)

### SMALL-SCALE WASTE INCINERATION PLANTS

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martens Bio WKK Venray (untreated wood)</td>
<td>2 MW&lt;sub&gt;e&lt;/sub&gt; / 8 MW&lt;sub&gt;th&lt;/sub&gt;</td>
</tr>
<tr>
<td>Gemeente (Municipality of) Eindhoven, ir. Ottenbad (prunings)</td>
<td>0.75 MW&lt;sub&gt;th&lt;/sub&gt;</td>
</tr>
<tr>
<td>Gemeente (Municipality of) Eindhoven, Meerhoven district (prunings)</td>
<td>1.2 MW&lt;sub&gt;e&lt;/sub&gt; / 5.6 MW&lt;sub&gt;th&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2.2 MW&lt;sub&gt;e&lt;/sub&gt; / 14.35 MW&lt;sub&gt;th&lt;/sub&gt;</strong></td>
</tr>
</tbody>
</table>

### BIOFUELS

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neste oil Rotterdam, HVO</td>
<td>900 mln. litres</td>
</tr>
<tr>
<td>Cargill Bergen op Zoom, Bioethanol</td>
<td>40 mln. litres</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>940 mln. litres</strong></td>
</tr>
</tbody>
</table>

### PETROL STATIONS OFFERING ALTERNATIVE FUELS

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Number of Filling Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green gas</td>
<td>37</td>
</tr>
<tr>
<td>E85 (bioethanol)</td>
<td>33</td>
</tr>
<tr>
<td>B30 (biodiesel)</td>
<td>12</td>
</tr>
</tbody>
</table>

FIGURE 1 RENEWABLE ENERGY IN THE NETHERLANDS 2000-2011
FIGURE 2 GROSS FINAL END USE PER SECTOR
### Table 3: Use of Bioenergy in Gross Final End Use (PJ) in the Electricity, Heat and Transport Sectors in the Period 2005–2011

<table>
<thead>
<tr>
<th>Category</th>
<th>Sector</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste incineration plants</td>
<td>Electricity</td>
<td>4.6</td>
<td>4.7</td>
<td>5.0</td>
<td>5.1</td>
<td>5.7</td>
<td>6.4</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>Heat</td>
<td>3.5</td>
<td>3.9</td>
<td>3.8</td>
<td>4.1</td>
<td>5.0</td>
<td>5.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Co-firing</td>
<td>Electricity</td>
<td>12.4</td>
<td>11.7</td>
<td>6.5</td>
<td>8.1</td>
<td>9.4</td>
<td>11.7</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Heat</td>
<td>0.7</td>
<td>0.6</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Wood-burning stoves in households</td>
<td>Heat</td>
<td>11.1</td>
<td>11.6</td>
<td>12.1</td>
<td>12.2</td>
<td>12.2</td>
<td>12.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Wood-burning stoves in industry</td>
<td>Heat</td>
<td>2.1</td>
<td>2.3</td>
<td>2.6</td>
<td>2.7</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Other combustion</td>
<td>Electricity</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
<td>2.8</td>
<td>3.6</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>Heat</td>
<td>2.8</td>
<td>3.8</td>
<td>4.0</td>
<td>4.1</td>
<td>4.0</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Biogas</td>
<td>Electricity</td>
<td>1.1</td>
<td>1.4</td>
<td>1.9</td>
<td>2.7</td>
<td>3.4</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>Heat excl. biogas</td>
<td>1.3</td>
<td>1.5</td>
<td>1.9</td>
<td>2.7</td>
<td>3.2</td>
<td>3.9</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>Raw biogas</td>
<td>1.4</td>
<td>1.3</td>
<td>1.1</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Biopetrol</td>
<td>Transport</td>
<td>0.1</td>
<td>1.0</td>
<td>9.3</td>
<td>7.5</td>
<td>9.8</td>
<td>4.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (PJ)</strong></td>
<td></td>
<td>42.0</td>
<td>45.4</td>
<td>53.8</td>
<td>58.1</td>
<td>67.0</td>
<td>64.2</td>
<td>64.4</td>
</tr>
</tbody>
</table>
**FIGURE 3** GROSS FINAL ELECTRICITY PRODUCTION FROM BIOENERGY IN 2011 (PJ)

- **Waste Incineration Plants**: 6.9 PJ
- **Other Combustion**: 11.3 PJ
- **Other firing**: 2.9 PJ
- **Biogas**: 3.8 PJ

**Legend:**
- Blue: Waste Incineration Plants
- Green: Co-firing
- Light Green: Other Combustion
- Black: Biogas
FIGURE 4 GROSS FINAL HEAT PRODUCTION (INCLUDING BIOGAS) FROM BIOENERGY IN 2011 (PJ)
FIGURE 5 PRODUCTION OF BIOGAS FOR USEFUL FINAL END USE IN 2010 (PJ)
FIGURE 6 BIOFUELS IN DE TRANSPORT SECTOR IN 2010; ADMINISTRATIVE SUPPLY (PJ)

Certain biofuels may, according to Article 21, paragraph 2 of the RED, be double counted towards the transport targets. The values in this figure refer to the double-counted volumes. Data for 2011 are not yet available.
**TABLE 4 OVERVIEW OF WASTE INCINERATION PLANTS IN 2010**

<table>
<thead>
<tr>
<th>PLANT</th>
<th>TOTAL WASTE USED</th>
<th>RENEWABLE ELECTRICITY</th>
<th>RENEWABLE HEAT (PJ)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.ON Delfzijl</td>
<td>115</td>
<td>0,08</td>
<td>0,02</td>
</tr>
<tr>
<td>Attero Noord BV GAVI Wijster</td>
<td>598</td>
<td>0,64</td>
<td>0,00</td>
</tr>
<tr>
<td>Twence Afval en energie</td>
<td>588</td>
<td>0,71</td>
<td>0,00</td>
</tr>
<tr>
<td>ARN B.V.</td>
<td>281</td>
<td>0,35</td>
<td>0,33</td>
</tr>
<tr>
<td>AVR Afvalverwerking Duiven</td>
<td>365</td>
<td>0,25</td>
<td>0,34</td>
</tr>
<tr>
<td>HVC Afvalcentrale Alkmaar</td>
<td>664</td>
<td>0,87</td>
<td>0,03</td>
</tr>
<tr>
<td>Afval Energie Bedrijf, Amsterdam</td>
<td>1.401</td>
<td>1,88</td>
<td>0,21</td>
</tr>
<tr>
<td>AVR Afvalverwerking Rijnmond</td>
<td>1.186</td>
<td>1,05</td>
<td>0,42</td>
</tr>
<tr>
<td>HVC Afvalcentrale Dordrecht</td>
<td>233</td>
<td>0,16</td>
<td>0,00</td>
</tr>
<tr>
<td>ZAVIN CV</td>
<td>9</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>AEC Moerdijk</td>
<td>960</td>
<td>0,17</td>
<td>4,43</td>
</tr>
<tr>
<td>SITA ReEnergy</td>
<td>59</td>
<td>0,19</td>
<td>0,06</td>
</tr>
<tr>
<td><strong>Total (PJ)</strong></td>
<td><strong>6.459</strong></td>
<td><strong>6,35</strong></td>
<td><strong>5,84</strong></td>
</tr>
</tbody>
</table>

* The renewable energy output is calculated by correcting the total energy output for the biogenic fraction in the deployed waste (51%: Agentschap NL, 2011d)
FIGURE 7 SHARE OF RENEWABLE ENERGY IN GROSS FINAL END USE
Figure 8: Blending Obligation and Administrative Blending of Biofuels
FIGURE 9 ORIGIN OF BIOMASS FOR ENERGY PURPOSES IN 2009
**FIGURE 10** OVERVIEW OF THE PRODUCTION, CONSUMPTION AND TRADE IN WOOD PELLETS
FIGURE 11 OVERVIEW OF THE PRODUCTION, CONSUMPTION AND TRADE OF BIODIESEL
FIGURE 12 OVERVIEW OF THE PRODUCTION, CONSUMPTION AND TRADE OF BIOPETROL