

## NETHERLANDS

### The energy sector

The Netherlands has the second largest natural gas reserves in IEA Europe, closely following Norway. A large part of this resource is concentrated in the huge Groningen gas field, which is the largest gas field in IEA Europe. The country also has (much smaller) oil reserves. The fuels used for energy supply in the Netherlands are mainly natural gas, coal imported from several countries and oil from the North Sea and from the world market. The coal is burnt in large power plants, in some cases providing heat for cities and towns. The market share for natural gas is large, on the one hand because gas is an indigenous resource, on the other hand because of its ecological impact (low CO<sub>2</sub> and NO<sub>x</sub> emissions).

### Energy balances in The Netherlands (Source: Energy Policies of IEA Countries, 2001)

| 1999                                  |              | %      |  | 1999                                   |             | %    |  |
|---------------------------------------|--------------|--------|--|--|-------------|------|--|
| <b>Population (millions)</b>          | <b>15.81</b> |        |  | <b>Total final consumption</b>         | <b>57.9</b> |      |  |
| <b>Energy consumption/capita</b>      | <b>3.66</b>  |        |  | <b>Coal</b>                            | 1.5         | 2.6  |  |
| <b>Total energy production (Mtoe)</b> | <b>59.1</b>  |        |  | <b>Oil</b>                             | 23.3        | 40.2 |  |
| <b>Coal</b>                           | -            | -      |  | <b>Gas</b>                             | 22.5        | 38.9 |  |
| <b>Oil</b>                            | 2.6          | 4.4    |  | <b>Biomass &amp; Wastes</b>            | 0.3         | 0.5  |  |
| <b>Gas</b>                            | 54.1         | 91.5   |  | <b>Geothermal</b>                      | -           | -    |  |
| <b>Biomass &amp; Wastes</b>           | 1.2          | 2.0    |  | <b>Solar/Wind/Other</b>                | 0.0         | 0.0  |  |
| <b>Nuclear</b>                        | 1.0          | 1.7    |  | <b>Electricity</b>                     | 8.1         | 14.0 |  |
| <b>Hydro</b>                          | 0.0          | 0.0    |  | <b>Heat</b>                            | 2.1         | 3.6  |  |
| <b>Geothermal</b>                     | -            | -      |  | <b>Total industry consumption</b>      | <b>21.8</b> |      |  |
| <b>Solar/Wind/Other</b>               | 0.1          | 0.2    |  | <b>Coal</b>                            | 1.4         | 6.4  |  |
| <b>Net energy imports (Mtoe)</b>      | <b>13.3</b>  |        |  | <b>Oil</b>                             | 7.7         | 35.3 |  |
| <b>Coal</b>                           | 7.2          | 54.1   |  | <b>Gas</b>                             | 8.2         | 37.6 |  |
| <b>Oil</b>                            | 24.1         | 181.2  |  | <b>Biomass &amp; Wastes</b>            | 0.1         | 0.5  |  |
| <b>Gas</b>                            | -19.5        | -146.6 |  | <b>Geothermal</b>                      | -           | -    |  |
| <b>Electricity</b>                    | 1.6          | 12.0   |  | <b>Solar/Wind/Other</b>                | -           | -    |  |
| <b>Total supply - TPES (Mtoe)</b>     | <b>74.1</b>  |        |  | <b>Electricity</b>                     | 3.4         | 15.6 |  |
| <b>Coal</b>                           | 7.5          | 10.1   |  | <b>Heat</b>                            | 0.9         | 4.1  |  |
| <b>Oil</b>                            | 28.1         | 37.9   |  | <b>Transport consumption</b>           | <b>14.1</b> |      |  |
| <b>Gas</b>                            | 34.6         | 46.7   |  | <b>Total other sectors consumption</b> | <b>21.9</b> |      |  |
| <b>Biomass &amp; Wastes</b>           | 1.2          | 1.6    |  | <b>Coal</b>                            | 0.0         | 0.0  |  |
| <b>Nuclear</b>                        | 1.0          | 1.3    |  | <b>Oil</b>                             | 1.6         | 7.3  |  |
| <b>Hydro</b>                          | 0.0          | 0.0    |  | <b>Gas</b>                             | 14.3        | 65.3 |  |
| <b>Geothermal</b>                     | -            | -      |  | <b>Biomass &amp; Wastes</b>            | 0.2         | 0.9  |  |
| <b>Solar/Wind/Other</b>               | 0.1          | 0.1    |  | <b>Geothermal</b>                      | -           | -    |  |
| <b>Electricity Trade</b>              | 1.6          | 2.2    |  | <b>Solar/Wind/Other</b>                | 0.0         | 0.0  |  |
| <b>Electricity generation</b>         | <b>7.5</b>   |        |  | <b>Electricity</b>                     | 4.6         | 21.0 |  |
| <b>Electricity generation (TWh)</b>   | <b>86.7</b>  |        |  | <b>Heat</b>                            | 1.2         | 5.5  |  |

In the Netherlands energy distribution is taken care of by the public service boards in the large cities and by local corporations for regions. At the beginning of 1998 there are 35 energy distributing companies in the Netherlands, distributing gas, electricity and/or heat. The generation of electricity is done by four co-operating generating companies.

Energy demand in the Netherlands shows a long-term increasing trend and is not expected to level off in the coming 15 years. Natural gas penetration is the highest in the world.

Practically every office, factory and dwelling is connected to the gas grid, and the average share of gas in power generation is 60 per cent.

The share of industrial energy consumption is relatively high at about 40 per cent. There is also a comparatively large share of 'other' consumption. This category includes agriculture and is larger than usual due to the scale on which horticulture is carried out in heated greenhouses in the Netherlands. They account for a significant amount of CHP production using natural gas.

Electricity accounts for an increasing share in TFC and currently stands at 13.8 per cent. Power generation from natural gas is particularly high: about 51.7 TWh or 56.7 per cent of total generation in 1998. This is the highest share in the IEA, and perhaps the highest share in the world. Other energy inputs followed with 27.3 TWh (29.9 per cent) from coal, 3.8 TWh (4.2 per cent) from nuclear, 3.6 TWh (3.9 per cent) from oil and 4.6 TWh (5 per cent) from renewables. Renewable generation derived mainly from biomass, especially waste incineration, and wind. Hydro power has only negligible potential in the Netherlands and contributed only 0.1 per cent to total generation.

### **Policy for renewables and CHP**

Energy conservation and the use of renewable energy sources will continue to remain among the best opportunities for CO<sub>2</sub> emissions reduction. The expansion of the use of CHP and district heating is seen as an important opportunity to improve overall energy efficiency.

The White Paper foresaw a total CHP generation capacity of 15,000 MW in 2010. At the end of 1997, more than half of this capacity (7,800 MW) was already in place, largely due to strong government support programmes and joint ventures between industry and public utilities. This is already a very large amount of CHP capacity and contributed significantly to overcapacity in the electricity market. Consequently, recent assessments revised the expectations downwards to less, and more realistic CHP expansion by 2010.

The share of renewables in TPES had doubled from 1995 to about 2 per cent in 1998, but further efforts will have to be made to reach the goal of 10 per cent by 2020, or even the interim goal of 5 per cent in 2010. The government is aware of the enormous costs and inelasticity of renewables supply that limit their potential in the short run, unless its competitiveness is enhanced through measures such as taxation or subsidies. It is currently developing mechanisms to improve the elasticity of renewables supply. These include developing financial support schemes for more expensive but more acceptable projects. Other support mechanisms include a "green certificates" trading system.

The third update of the 'Environmental Action Plan of the Energy Distribution Sector 2000' has been issued. In this Plan Combined Heat and Power and District Heating play a major role. The results up until 1995 show that the CO<sub>2</sub> – reduction reached in the heat market is 52% of the goal that is set for the year 2000. Since this plan was started in 1991 this means that the energy sector is in this field ahead of schedule. In the update of the Plan extra attention will be paid to the possibilities of heat storage and the delivery of cooling energy to hospitals and offices, and the delivery of CO<sub>2</sub> to greenhouse horticulture areas from cogeneration and district heating systems.

A list of the various measures existing for the promotion of CHP and renewables is given below:

- **VAMIL**

**Contact organization:** Bureau investeringsregelingen en willekeurige afschrijvingen  
**Short description:** Government stimulation of market introduction at companies of environmental friendly business equipment by accelerated financial depreciation of these investments

- **REB, Regulerende Energie Belasting**

**Contact organization:** Ministry of finance (Netherlands)

**Short description:** Energy taxation of households and small and medium-sized enterprises.

- **Regeling Groen Projecten**

**Contact organization:** Ministry of Housing, Spatial Planning and the Environment DGM, afd. EFL

**Short description:** Renewable energy projects are granted capital from so-called Green Funds at a reduced interest rate.

- **Groene Energie**

**Contact organization:** EnergieNed

**Short description:** Electricity consumers pay voluntarily higher prices for renewable electricity. The funds raised are used for investments in renewable energy.

- **AAPS, Arable Area Payment Scheme**

**Contact organization:** Ministry of Agriculture, Nature and Fisheries

**Short description:** Set-aside is meant to reduce agricultural overproduction. Under conditions, non-food/non-feed crops, like energy crops, may be grown on set-aside land.

- **EPR**

**Contact organization:** Senter Zwolle

**Short description:** Subsidy for Solar Hot Water Systems, heatpumps and photo voltaic panels. The subsidy is dependent on the yearly energy fixation.

- **BSE, Besluit Subsidies Energieprogramma's**

**Contact organization:** NOVEM

**Short description:** This arrangement stimulates a scale of energy projects. Focus of the program is on feasibility studies, R&D, practice, knowledge spreading, demonstration and market introduction.

- **EET, Besluit subsidies Economie, Ecologie en Technologie**

**Contact organization:** Programmabureau EET

**Short description:** Subsidies for cooperative R&D-projects in which Economy, Ecology and Technology are integrated. One of the specific themes of this programme is renewable energy.

- **EIA, Energie Investerings Aftrek (Energy Investment Deduction)**

**Contact organization;** Senter Zwolle

**Short description:** At least 40% of investments in energy equipment stated in a specific yearly reviewed list can be subtracted from company taxes.

- **EINP, Subsidierегeling Energie-Investeringen Non-Profitsector**

**Contact organization:** Senter Zwolle

**Short description:** The dutch government subsidizes energy investments done by non-profit organisations. The same "Energielijst" mentioned in NL0012 is used as a limitative list of equipment which can be subsidized.

- **Groen certificaten systeem (Renewable energy label system)**

**Contact organization:** EnergieNed

**Short description:** Januari 1, 1998 a new mechanism for pricing of renewable electricity has come into force. Renewable electricity fed into the grid is granted a "Green label", which can be sold to the highest bidder.

- **CO2 Reductieplan**

**Contact organization:** Projectbureau CO2-reductieplan (NOVEM / SENTER)

**Short description:** Subsidy to encourage the purchase of machinery to structurally drive back CO<sub>2</sub> discharges. The arrangement is part of the drive back policy for greenhouse gasses according to the Kyoto protocol.

### **CHP and biomass-CHP**

Generation is very often divided into a “centralised” and a “decentralised” segment. The “centralised” segment comprises what is generally known as the public generation market. The “decentralised” segment essentially refers to the market for combined heat and power production. This market is comparatively large and still growing. This growth is to a considerable degree due to government intervention aimed at improving transformation efficiency for environmental and energy security reasons. The four public generators together have about 14.8 GW of capacity installed and generate some 61 per cent of total power supplied to the Dutch market. About 2,000 MW of the centralised capacity is CHP capacity. The “decentralised” segment comprised some 7,800 MW of CHP capacity at the end of 1997 (52 per cent of this was industrial CHP, 16 per cent was used in greenhouse horticulture and 32 per cent was used for district heating), amounting to 34 per cent of installed capacity. Decentralised CHP capacity is expected to increase in the future. In addition, there is a small amount of renewable capacity. The most important in this respect are waste incinerators and wind turbines. Decentralised CHP producers supply about half of their generation to the public grid. Altogether, decentralised generation accounts for 26 per cent of total electricity supply.

Already in the early 1980s, almost 90 per cent of all industrial autoproduction was CHP. Whereas autoproduction has shown a long-term declining trend almost everywhere else in IEA Europe, both its total amount and its share in Dutch electricity supply continued to increase. This increase chiefly occurred in combined heat and power generation, due to a long standing tradition of government support. As a result, total installed CHP capacity today is nearly five times as high as in 1990.

- To demonstrate decentralized combined heat and power by means of biomass gasification at the TNO complex at Apeldoorn, with a part of the heat produced being delivered to a nearby swimming pool. The intention is that the demonstration at a practical level of a decentralized biomass gasification in the Netherlands will speed up the introduction of this technology in the Netherlands. This applies in particular to VINEX locations and industrial complexes. In addition to this being a demonstration, it is also intended that it will contribute to achieving energy saving at the TNO complex at Apeldoorn.

The starting points for the technology to be applied are: Bubbling Fluid Bed for the gasifier, reverse flow tar cracker for removing tar and the Heron gas turbine or a gas engine for generating electricity. The project will be executed in four phases: plan phase with basic engineering, construction preparation, building work and start-up.

The intended results of the project, per phase, can be described as follows: Phase 0: basic design of the BV-WKK (combined heat and power) plant - business plan

- **POKK**

BioMass Nederland bv produces a biofuel granulate which is used as co-firing in large coal-fired power stations. During production there is, naturally, the need for energy for in-house use. BioMass want to generate this by using bio fuel as the feed for an energy efficient combination, by using wood instead of gas. For the production of the biogranulate, there is the need for a number of types of energy: hot air for the drying process, electricity for, among other things, pressing the granulate and warm water for heating the offices and buildings. In the first instance, the generated heat will be used for the drying process. Later it will be seen if it can be used for generating electricity for own use. During the trial phase, a hot air heating fueled by propane is used for the drying process and the electricity required is taken from the mains. The main objective is to

(thermally) generate the entire energy requirement for the production process in house, by making use of biological residue products.

- **Sterksel**

Anaerobic digestion of pig and cow manure along with CHP is operating since 2001 in Sterkel. The capacity of CHP is 37 kW<sub>el</sub>.

- **Bladel**

A gasification plant of chicken manure started working on 2001. The disposal cost for manure still increases and in 2002 a new law comes into force, which oblige farmers for a sound disposal of the manure and bookkeeping of the minerals. Purpose of the work is therefore to develop a sustainable and economic gasification technology for the conversion of chicken manure to heat and power, which 1.) reduces the current expenses of farmers, 2)has a proper gas cleaning 3) provides at least sufficient energy for system operation and 4.) converts manure to non-manure material. The capacity of the plant is CHP 60 kW<sub>el</sub>.