INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

THE NETHERLANDS

2004 Review

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INTERNATIONAL ENERGY AGENCY
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The International Energy Agency (IEA) is an autonomous body which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

It carries out a comprehensive programme of energy co-operation among twenty-six* of the OECD's thirty member countries. The basic aims of the IEA are:

- to maintain and improve systems for coping with oil supply disruptions;
- to promote rational energy policies in a global context through co-operative relations with non-member countries, industry and international organisations;
- to operate a permanent information system on the international oil market;
- to improve the world's energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use;
- to assist in the integration of environmental and energy policies.

** IEA member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States. The European Commission also takes part in the work of the IEA.*

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), the Republic of Korea (12th December 1996) and Slovakia (28th September 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

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SUMMARY

Since the last IEA in-depth review in 2000, the Netherlands has made progress in most energy policy areas. Liberalisation of electricity and gas markets has advanced. The country has ratified the Kyoto Protocol and is pursuing active climate policies. Research and development (R&D) policy has been rationalised and the initiative towards a sustainable energy system has been launched. The Netherlands has shown great pragmatism in the attention it has accorded to cost-effectiveness while pursuing its energy policy targets, namely energy security, environmental protection and economic efficiency. Despite this progress, the Netherlands still faces challenges in all areas of energy policy as discussed hereunder.

Energy security is attracting increasing attention in the Netherlands. Whilst the most recent Energy Report 2002 concludes that no urgent problems are foreseen, the Netherlands recognises the need to stay alert, improve monitoring and create the necessary instruments to deal with future problems.

The Dutch government has made great efforts to meet its Kyoto target of a 6% reduction in **greenhouse gas (GHG) emissions** between 1990 and the first commitment period (2008-2012). While the government's analysis shows that the country is well on track to meet the target, with GHG emissions having almost stabilised, it is still a challenge. For example, curbing the rapid growth of energy demand in the transport sector will require strong policies and measures.

Cost-effectiveness of GHG emissions reductions has received a lot of attention. Extensive use of Kyoto flexible mechanisms, reduction of non-carbon dioxide emissions, streamlining subsidies for renewables and combined heat and power (CHP), and keeping the Borssele nuclear power plant open are such examples. However, there may be further room for improving cost-effectiveness, which should be looked for and pursued.

The decision to fill up to half of its GHG emissions gap through joint implementation (JI) and clean development mechanism (CDM) projects is ambitious. Given that there are few international examples, the Netherlands is in a forerunner position in creating and testing the methodologies. Finalising the preparations for the European Union carbon dioxide (CO_2)

trading scheme, scheduled to start at the beginning of 2005, is a challenge for the Netherlands as it is for all other EU member States.

The introduction of the reserve package to support the basic package of domestic climate change mitigation measures is a prudent and effective approach, because the Netherlands can immediately embark on the reserve package if it finds itself off track. A reserve package is no longer required for sectors that take part in the EU emissions trading; however for the other sectors it is important to develop new measures into the reserve package as most of the existing ones have already been used. This will be carried out within the so-called *Optiondocument*, which is expected in summer 2004.

The Netherlands has had an ambitious **energy efficiency** policy, which includes the use of benchmarking covenants and active monitoring and evaluation of policies to reduce policy "free riders". However, the targeted 1.3% annual improvement in energy efficiency will become more challenging if the momentum of energy efficiency policies is weakened by budget cuts. Moreover, it is important to ensure good co-ordination of policies within the government.

The principal energy efficiency measure in the industrial sectors is the Benchmarking Covenant which is a voluntary long-term agreement. Historically, voluntary long-term agreements have performed well in the Netherlands but the covenant needs to be adapted to the forthcoming CO_2 emissions trading. This reflects the increasing impact of EU legislation on energy efficiency policies at the national level. The current measures are inadequate to meet the energy efficiency goals in the transport sector, which appear to be overly optimistic. As more and stronger measures are necessary, road pricing would definitely merit more attention as would modification of vehicle taxation to take into account energy efficiency. In the residential and commercial sectors, efforts could be strengthened by, for example, stricter norms for the renovation of buildings. While streamlining the subsidies for energy efficiency in the residential sector to avoid "free riders", care should be taken not to abolish the investment subsidies, which improve energy efficiency in a cost-effective way and would not be implemented without subsidies.

Gasoline prices in the Netherlands are among the highest within IEA member countries. The reason appears to be inadequate competition in the retail market, which is dominated by few players. Auctioning of filling stations and other measures may help but the government should continue monitoring the market and take further measures as necessary, especially in encouraging new entrants.

Recognising the great contribution of the large domestic **natural gas** resources to security of supply both in the Netherlands and abroad and state revenues, the government has protected the resources by controlling

the depletion of the Groningen field via a national production cap, by maintaining the small fields policy and promoting imports. However, the gradual depletion of the Groningen field, declining small fields production and market liberalisation necessitate an upstream gas policy review. For example, the alternative mechanisms for capping the Groningen production need to be carefully evaluated and the small fields policy should be adapted to the liberalised markets. Stable and cost-effective fiscal incentives and streamlined regulatory procedures related to environment and spatial planning would encourage investment.

One of the major challenges is reorganising the gas market structure (*Gasgebouw*) to the present circumstances and EU legislation. This should occur in a manner that creates a compatible and open market, encourages competition and meets energy security objectives. The first step is to establish an independent transmission system operator (TSO), which will happen with implementation of the second EU Gas Directive. Although the second step, the split of Gasunie Trade and Supply into two competing companies, is a highly complex one, it could help to increase competition.

Access to import infrastructures, flexibility, short-term balancing and quality conversion facilities are essential for the effective functioning of the market. At present, available contractual capacity at interconnections is very small calling for better capacity management and new capacities. The EuroHub and Title Transfer Facility (TTF) are still at an early stage; however, they could help to increase liquidity in the market by facilitating a spot market and creating new possibilities to access gas. At present, Gasunie Trade and Supply, and Nederlandse Aardolie Maatschappij (NAM) have a dominant position in providing short-term balancing services. The Office for Energy Regulation (DTe) has taken an initiative to establish third party access (TPA) regulation to gas storage but the effectiveness of the rules remains to be demonstrated because there are very few practical access cases. Investments in new storage capacity should be encouraged and TTF could be further developed to include access to flexibility services. Furthermore, the Netherlands has opted for an hourly balancing regime, which is more stringent than the daily balancing option of most other countries. There are two gas markets in the Netherlands, high and low calorific gas markets, making conversion facilities absolutely essential for the consumers of low calorific gas to change suppliers. Access to conversion services should, therefore, be carefully monitored. In this context, it is helpful that one of the planned tasks for the new TSO will be to provide conversion services.

Competition has developed relatively well in the Dutch gas market, with two-thirds of the market being liberalised. It is commendable that the government has recognised the benefits of market liberalisation even though state revenues from gas may be negatively affected in the short term. However, the functioning of the market will be further enhanced through better

transparency via market restructuring and solving the existing switching, measurement data and billing problems. The special requirements of small consumers need to be addressed in the full market opening that is scheduled for 1 July 2004. Given their requirement for a very high reliability, effective and fairly priced access to flexibility services needs to be ensured. Adequate information will have to be provided for the small consumers and attention given to minimising the costs of switching.

Full liberalisation of the green electricity market and the ecotax exemption substantially increased demand for electricity generated from **renewable energy sources** but not for domestic generation. Instead, renewable electricity imports increased greatly, leading to congestion in the transmission system. The feed-in tariff system included in the new supply-oriented approach, Environmental Quality of Electricity Production (MEP), is likely to boost domestic renewable electricity generation, but its cost needs to be monitored. As with all incentive regimes, the incentives for cost reductions should be maximised. Moreover, whilst government support for renewables is a sound policy because the externalities of renewables and other competing fuels are not fully captured by the market, all such measures should be regularly assessed to ensure they are as cost-effective as possible.

The overall design of the Dutch **electricity market** is good with adequate unbundling, the necessary bodies for regulation, transmission and market operation in place and network use based on regulated TPA. Consequently, competition has developed relatively well in two-thirds of the market, which has been opened for competition. The Dutch government should be commended for its approach to market liberalisation.

However, the government still faces some challenges, including increasing interconnection capacity and its fair and transparent allocation, enhancement of network reliability and expanded operation of power exchange. Administrative problems with switching of supplier and billing need to be solved without delay. This is a prerequisite for effective full market opening on the planned date of 1 July 2004. Consumers need to be informed about the reasons for market opening, ways to access the market, possible risks and how to avoid them, and the cost of switching needs to be minimised.

Reinforcement of interconnection capacity is essential both for security of supply and more effective competition. This is an international problem that requires solutions at the international level. Therefore, it is very important that the Dutch government and TenneT (the electricity transmission system operator) continue to work closely with other European TSOs. It would also help to address these issues at governmental level in Memoranda of Understanding between the Netherlands and its neighbouring countries to create a single market among them, comparable to the Nordic and Iberian markets. The auctioning mechanism of interconnection may need to be

reviewed. Price-setting mechanisms for networks and interconnections should take into account the costs generated by increasing interruptible sources, notably wind power.

Security of electricity supply has received due attention. Nevertheless, it is a challenge to encourage adequate investment in generating capacity, particularly peak load capacity. Although there is abundant capacity at present, in the longer term, excess capacity will be absorbed and the decision by Belgium and Germany – at present important import sources – to phase out nuclear power can increase the need for domestic generating capacity. Allowing markets to signal the need for new investment means that prices will go high on occasion but better transparency could reduce such price peaks as would better information on the maintenance and outages of production capacity. The Dutch government considered different capacity mechanisms and better demand response. Capacity mechanisms are believed by the government to have negative effects such as being expensive. Consequently, the government concluded that optimising the wholesale market and improving demand response was a better approach, which can reduce the need for investment in peak load capacity.

The Dutch **energy R&D** framework has undergone several changes over the last three years, but overall, it has produced a coherent long-term R&D strategy addressing energy policy goals, with a clear regard for cost-effective policy and evaluation procedures. Despite a tightening government budget, the energy R&D budget has been relatively stable over the last ten years. The government initiative towards a sustainable energy system (energy transition management), which has a broad policy context, incorporating R&D discussions, is a good example of clear and systematic treatment of energy policy and priority setting.

RECOMMENDATIONS

The government of the Netherlands should:

General Energy Policy

- *Ensure a stable policy approach to encourage investments in the energy sector.*
- *Streamline the licensing procedures.*
- *Enhance local authorities' and the general public's understanding of national energy policy challenges and objectives.*

- *Further clarify the relations between the regulator and the Ministry of Economic Affairs. Ensure that the regulator has adequate powers and means to effectively carry out its tasks.*

- *Increase involvement of consumers in designing liberalised energy markets and introduce greater consumer protection, including ensuring smooth transition to full market opening.*

- *Strengthen the transition management process through clarifying targets for the transition projects, developing milestones and benchmarks to monitor their progress.*

- *Deepen collaboration with neighbouring countries in order to increase the effectiveness of energy policy. This includes continuing the efforts to create a real single energy market with the neighbouring countries via Memoranda of Understanding, and eventually the EU market.*

Energy and the Environment

- *Continue the approach in which both national and international policies are implemented and monitor these in order to be able to prioritise according to cost-effectiveness.*

- *Make greater use of economic instruments, including tax differentials based on external cost.*

- *Ensure that other climate policies and measures are streamlined with respect to the emissions trading scheme. In particular, clarify the relationship between the benchmarking covenants and the emissions trading.*

- *Continue the projects for flexible mechanisms to give a concrete example of how they can be used as a tool to supplement domestic measures.*

- *Consider promoting natural gas and other alternative transport fuels to contribute to achieving EU biofuel and national GHG targets.*

Energy Efficiency

- *Enhance the role of energy efficiency in the energy policy, including securing adequate budget but continuing to pay attention to cost-effectiveness.*

- *Take stronger measures in the transport sector, including road pricing, modification of vehicle taxation, extension of eco-driving and the promotion of on-board technologies.*

- *Introduce further measures in the existing buildings such as stricter building standards for renovated buildings.*

Fossil Fuels

- *Continue to monitor the development of competition in oil retailing and take additional measures as necessary.*
- *Promote a stable regulatory and fiscal framework for domestic gas production by:*
  - *Revising the tax and fiscal incentives, including the reintroduction of "depreciation at will" or other incentives.*
  - *Reviewing and streamlining regulatory procedures related to environment and spatial planning, including searching for an environmentally sustainable solution for using the gas deposits in environmentally sensitive areas.*
- *Review the cap mechanism on national gas production with a view to securing production from the small fields.*
- *Adapt the small fields policy to be compatible with an open and competitive market as long as it makes a positive contribution to energy security. Make this a continuous process.*
- *Restructure the* Gasgebouw *as soon as possible, including promptly establishing a legally independent TSO.*
- *Monitor and facilitate the development of EuroHub and Title Transfer Facility.*
- *Create a framework that encourages investment in infrastructures, including interconnectors, gas storage and quality conversion facilities, which is compatible with market mechanisms.*
- *Set a clear plan to tackle gas market bottlenecks in order to facilitate new market entry and to avoid excessive market power. This should address access to flexibility (including storage) services, quality conversion, inadequate import capacity and the balancing regime but without endangering investments.*

Renewables

- *Monitor closely the costs of the Environmental Quality of Electricity Production (MEP) scheme and incorporate strong incentives for cost reduction and competition, recognising that global learning will be the principal driver of cost reduction.*
- *Monitor closely the long-term economic impacts and the impact on international biomass markets of expanding domestic biomass production and importing biomass.*
- *Place caution on promoting technologies not necessarily suited to the climate conditions in the Netherlands, such as photovoltaic energy.*

- *Assess progress towards a competitive renewable energy sector with a view to ensuring a stable investment environment until targets are met. Phase out the subsidies in the longer term when the different positive and negative externalities of renewables and other energy forms have been internalised.*
- *Investigate the requirements for the reliability and stability of the future electricity network, given the indicative goal of connecting large amounts of wind power to the grid.*
- *Study the possibilities to increase the use of renewables in heat production.*

Electricity, Heat and Nuclear Power

- *Evaluate the different market mechanisms for ensuring security of supply and adequate peak load capacity. Pay attention to the possibilities of improving demand response as an alternative to capacity increases. Avoid the introduction of maximum levels for consumer prices.*
- *Improve the monitoring of the generating capacity and publish the data to increase transparency. Publish maintenance outages of production capacity.*
- *Continue to increase interconnection capacity and improve its operation in co-operation with neighbouring countries, for example through Memoranda of Understanding.*
- *Facilitate the further development and broadening of the power exchange. Enhance co-operation with other power exchanges in Europe.*
- *Ensure that full market opening will be implemented effectively and without further delays.*
- *Ensure a stable and predictable policy framework for nuclear power.*

Research and Development

- *Stabilise the R&D programme framework and avoid disruptions to long-term R&D planning.*
- *Ensure that there is clear multisectoral communication regarding R&D programmes and policy priorities across ministries.*
- *Extend to all relevant stakeholders the current approach for discussing the development of specific R&D programmes.*
- *Ensure that all government departments consider creating new international research networks, or using those of the IEA, to bring in international partners from both the public and private sectors to support the work on the new R&D priorities.*

ORGANISATION OF THE REVIEW

REVIEW TEAM

The International Energy Agency (IEA) 2004 in-depth review of the energy policies of the Netherlands was undertaken by a team of energy policy specialists drawn from IEA member countries. The IEA review team visited the Netherlands in November 2003 for discussions with the Energy Administration, energy industries and non-governmental organisations.

Members of the team were:

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Lea Gynther managed the review and drafted most of the report. Tom Howes drafted the Research and Development chapter and contributed to all transport issues. Monica Petit and Bertrand Sadin prepared the figures.

ORGANISATIONS VISITED

The team consulted with the following organisations:

- Consumentenbond (a consumer association)

- Energy Research Centre of the Netherlands (ECN)
- E.On Benelux
- Federation of Energy Companies in the Netherlands (EnergieNed)
- Free Trade Association for Electricity and Gas (VOEG)
- Gasunie
- International Policy Research Institute (CIEP)
- Ministry of Economic Affairs
- Ministry of Housing, Spatial Planning and the Environment (VROM)
- Ministry of Transport, Public Works and Water Management (VenW)
- Nederlandse Aardolie Maatschappij (NAM)
- Nuon
- Office for Energy Regulation (DTe)
- Shell Nederland
- Stichting Natuur en Milieu (an environmental NGO)
- TenneT
- The Amsterdam Power Exchange (APX)
- The Dutch Employers' Association (VNO/NCW)

The assistance and co-operation of all participants in the review are gratefully acknowledged.

REVIEW CRITERIA

The IEA *Shared Goals*, which were adopted by IEA Ministers at their 4 June 1993 meeting in Paris, provide the evaluation criteria for in-depth reviews conducted by the Agency. The IEA *Shared Goals* are set out in Annex B.

GENERAL ENERGY POLICY

OVERVIEW

In 2002, the population of the Netherlands was 16.2 million. This is 8% over the 1990 level indicating much higher growth than on average in the EU (European Union) countries (2.9%). The country's surface area is 41 000 km^2. In 2002, GDP per capita in the Netherlands, measured using current purchasing power parities, was US$ 29 400[1], which is higher than the average (US$ 25 000) in the OECD. Average GDP growth was 2.6% per year in 1992 to 2002 but the rates were much lower towards the end of the period, dropping to 1.3% between 2000 and 2001 and only 0.2% between 2001 and 2002. Inflation was 3% in 2002. The total unemployment rate, 2.7% in 2002, is very low by international comparison.

ENERGY MARKET

In year 2002, total primary energy supply (TPES) in the Netherlands was 77.9 Mtoe, up by 17% from the 1990 level. GDP growth over the same period was 35%. In 2002, natural gas accounted for 46%, followed by oil (38.2%), coal (10.8%), combustible renewables and wastes (1.7%), nuclear (1.3%) and non-combustible renewables (0.1%); 1.8% of TPES comes from electricity imports. The Netherlands' oil dependence has increased from 36.6% in 1990. The share of gas has remained relatively steady at 45% to 46% of TPES for the last three decades.

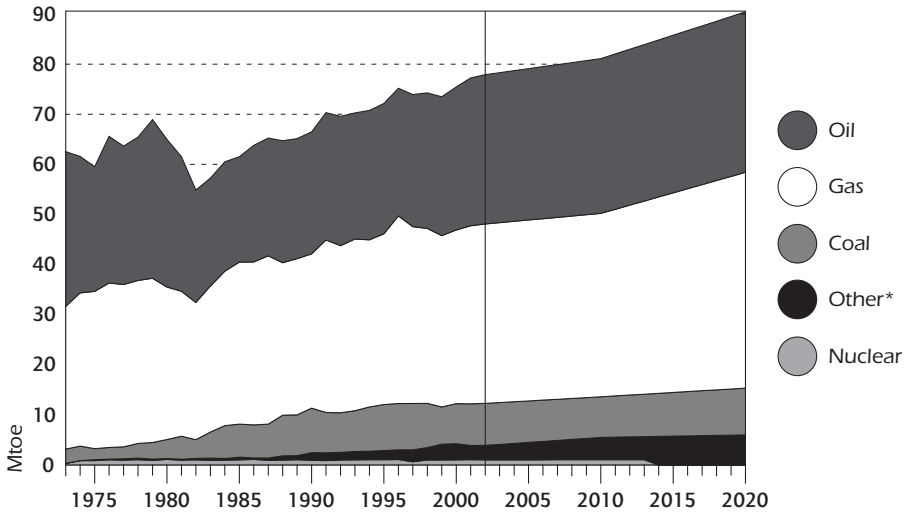
Domestic energy production was 59.9 Mtoe accounting for 77% of TPES in 2002. The most important domestic energy source is natural gas, accounting for 91% of domestic energy production.

Total final consumption of energy (TFC) was 60 Mtoe in 2002, up by 17% from the 1990 level. Industry is the largest energy-consuming sector (38%), followed by the residential, services and agricultural (37%) and transport (25%) sectors (see Figure 4). In 2002, oil accounted for 42% of TFC, natural gas 38.1%, electricity 14.3%, heat 4.1%, coal 1.1% and renewables and wastes 0.4% as shown in Figure 5. Between 1990 and 2002, the share of gas in TFC decreased from 44.9% and the proportion of coal from 2.4%, while the share of oil increased from 38.9%, electricity from 12.4% and heat from 0.9%.

1. On average in 2003, €1 = US$ 1.126.

Figure 2

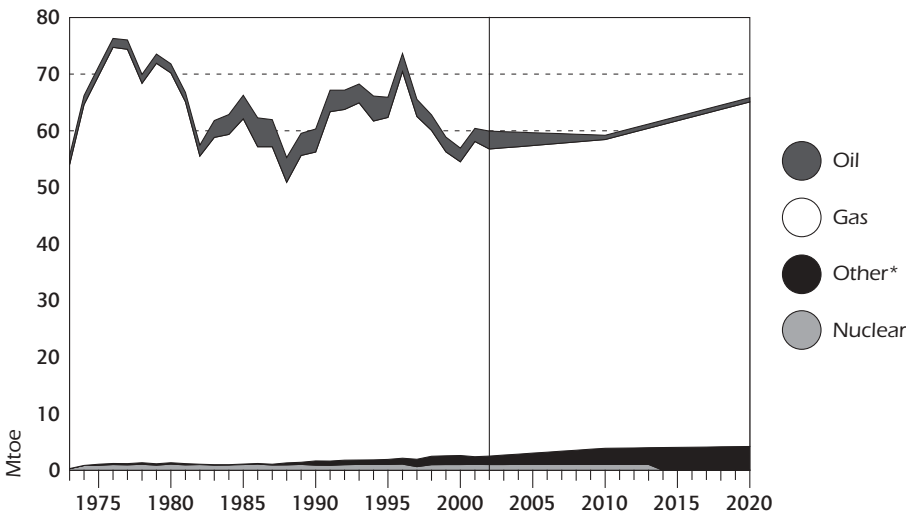
Total Primary Energy Supply, 1973 to 2020



* includes solar, wind, combustible renewables and wastes and electricity and heat trade.
Sources: *Energy Balances of OECD Countries,* IEA/OECD Paris, 2003; and country submission.

Figure 3

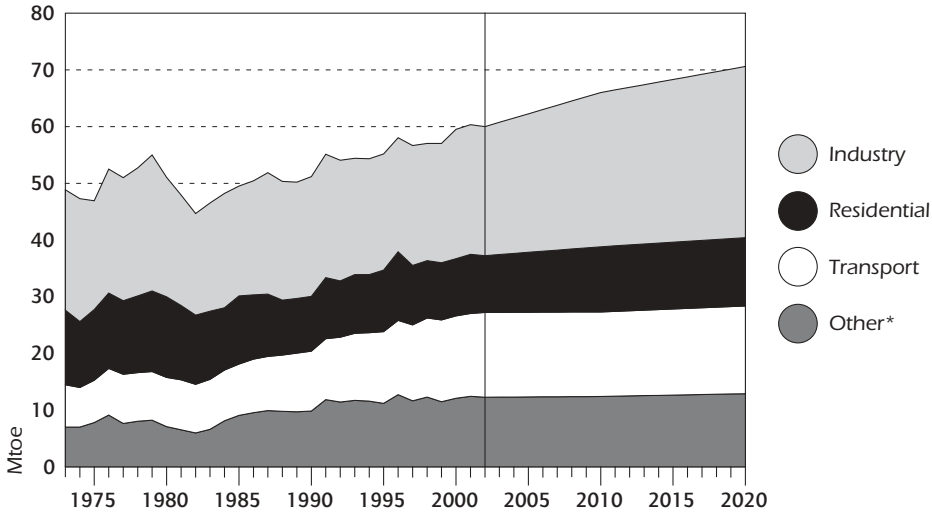
Energy Production by Source, 1973 to 2020



* includes hydro, solar, wind, combustible renewables and wastes.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Figure 4

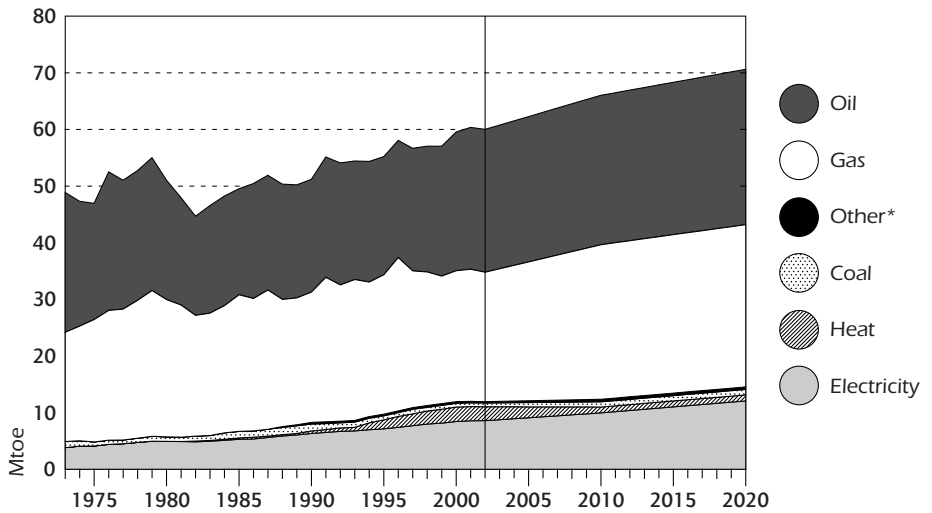
Total Final Consumption by Sector, 1973 to 2020



* includes commercial, public and agricultural sectors.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Figure 5

Total Final Consumption by Source, 1973 to 2020



* includes solar, wind, combustible renewables and wastes.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

ENERGY POLICY ADMINISTRATION

The Ministry of Economic Affairs is responsible for energy policy. One of its key tasks is ensuring a reliable, affordable and clean supply of energy. It also encourages companies to develop and use environment-friendly technologies that use less energy. In the past, this included full responsibility for energy conservation policies but the responsibilities were reorganised between the different ministries in 2000 to 2002 (see Chapter 5).

Energy policy-making in the Netherlands is centralised. The role of the provinces is limited to executing environmental policy by issuing permits and monitoring licences, and spatial planning policy by issuing licences.

The Netherlands Agency for Energy and Environment (Novem) acts as the intermediary between the government and market forces, including the industry and end-users. Novem supports the government by managing energy and environmental programmes. Industry provides Novem with technical expertise and knowledge of the market.

The task of Senter, which is an agency of the Ministry of Economic Affairs, is to stimulate economic growth by providing subsidies for technological innovation and environmental and energy efficiency projects. A special division, Senter International, is responsible for subsidies and credits for Dutch companies operating internationally.

The government sees some synergy between the energy and/or environmental operations of Novem and Senter. It has decided to merge these operations of the two organisations into one large agency. Operations not related to energy and/or environment will be merged in another new agency.

The State Supervision of Mines is a governmental body, which ensures that the production of minerals in the Dutch continental shelf is carried out in a responsible and socially acceptable manner. It supervises issues relating to safety, health, environment and land disturbance.

The Energy Council (AER) is an independent advisory board for government and parliament. It consists of ten members that are appointed for their good knowledge of energy issues and related areas and broad social experience. AER advises on energy policy, especially on strategic problems. In practice, it works on both its own initiative and government initiative. Its recent reports include policy advice on energy R&D, security of supply, government roles in the liberalised energy markets, energy policy after the first Kyoto commitment period and the prospects of the European energy market.

The responsibility for implementing the Electricity Act and the Gas Act, as well as for supervising compliance with these acts, has been assigned to the Office for Energy Regulation (DTe), established in 1998. DTe is included as a

chamber within the Netherlands Competition Authority (NMa), which is under the Ministry of Economic Affairs. The ministry appoints DTe's senior staff. The total number of staff is 55 persons but is planned to increase to 70 to enable better market surveillance in respect to *e.g.* prices and market structure. Some 60% of its €7 million budget is collected in fees from the energy sector and the rest is provided by the ministry. DTe works independently but the Minister of Economic Affairs can give it instructions on a case-by-case basis but so far this has not occurred. General instructions of the ministry must be recorded in policy rules.

The three clusters of the DTe are *ex ante* regulation, *ex post* supervision and infrastructure. More specifically, DTe is responsible for the following tasks:

- Issuing supply licences for the supply of electricity and gas to captive customers.
- Supervision of compliance with the Electricity Act and the Gas Act and issuing exemptions.
- Determining the tariff structures and conditions for the transmission of electricity.
- Determining guidelines for tariffs and conditions with regard to access to gas transmission pipelines and gas storage installations and, if necessary, issuing binding instructions.
- Determining connection, transmission and supply tariffs for electricity and gas, including the discount (price cap) aimed at promoting the efficient operation of the electricity grid and gas network managers.
- Assessing whether there is adequate transmission capacity (once every two years).
- Assessing whether the licence-holders meet adequately and efficiently the captive customers' need for electricity (once every two years).
- Advising the Minister of Economic Affairs on applications for approval of the appointment of electricity grid managers and gas network managers.

The parliament is discussing a new law that would put NMa and DTe under a board of directors, fully separate from the ministry. NMa, and DTe as its part, will be given the status of an autonomous agency. This means that the minister will no longer be empowered to give NMa direct instructions to overrule its decisions, hence making NMa and DTe fully independent. Also the powers of DTe will be enhanced on 1 July 2004 when it will be given the possibility to impose fines on the parties in the electricity sector.

By law, DTe is entitled to access the information it needs to execute its duties. However, it has occasionally experienced difficulties acquiring information from the energy companies.

DTe's decisions are enforced by procedures set in the public administrative law. Parties concerned about its decisions can object to them, and as second instance, appeal to the DTe ruling at the administrative court. Some of DTe's decisions, *e.g.* regarding the level of third-party access (TPA) tariffs, have been taken to court.

The NMa implements the Competition Act by enforcing prohibition on cartels and abuse of dominant position and assessing mergers and acquisitions. NMa supervises the proper functioning of all markets for goods and services on the basis of the applicable legislation.

ENERGY POLICY OBJECTIVES

Objectives for Dutch energy policy were set out in the government's Energy Reports of 1999 and 2002. The Electricity and Gas Acts provide the legal basis for the periodical preparation of the Energy Reports. The Energy Report published in February 2002 establishes the following objectives:

- *Promoting competition in the energy sector.* Full market liberalisation will be implemented in July 2004 if the administrative problems in the second step of the electricity and gas market are adequately solved by March 2004 (see Chapters 6 and 8).

- *Promoting an efficient and sustainable energy system.* A sustainable energy system combines security of supply, economic efficiency and high ecological standards. The creation of such a system requires changes in technology, economy and social structures over a long period. As the government does not expect this to be delivered by market forces alone, it has launched a Transition Management process in which existing and new initiatives in society are identified on the basis of a shared concept of sustainability. The intention is that short- and long-term actions of the government and social partners should reinforce each other in such a way that those concerned get maximum incentives to produce system innovations. The more specific objectives for a sustainable energy system are:
  - Maintaining the present high level of security of supply for electricity and gas.
  - Achieving an annual CO_2 reduction of 9.4 Mt in 2008 to 2012 as part of the Kyoto obligations.
  - Improving energy efficiency by 1.3% per year. Effectiveness of energy conservation measures will be increased.
  - Increasing the share of renewables in electricity supply to 9% of TPES by 2010 and to 10% by 2020.

- Effective and efficient use of R&D resources aimed at a sustainable energy system in the long term.

- *Using national energy resources in a sustainable way.* The *Gasgebouw* (the Dutch gas structure) was instituted after the discovery of the vast Groningen gas field in the 1960s. National and international developments, including the liberalisation of the energy market, now make it necessary to modify the *Gasgebouw*. Attention will be paid to public interests and transparency in creating the new structure.

The government is reorienting its role in reaching these objectives and placing more significance on the market forces. This implies a shifting of policy instruments from the supply side to the demand side, except for the new scheme for renewable electricity (see Chapter 7).

ENERGY SECURITY

ENERGY SECURITY IN THE ENERGY REPORT 2002

The Energy Report 2002 makes the following conclusions about energy security in the near future and in the longer term in the Netherlands: "The world's reserves of oil and gas are still sufficient to satisfy global consumption for many decades to come. However, the worldwide distribution of these stocks is uneven and some are located in politically-sensitive regions. Because Europe, and the Netherlands, will increasingly have to import energy, we have an interest in maintaining good relations with energy-exporting countries. We work to achieve this at EU level, for instance under the auspices of the Energy Charter. To avoid becoming too dependent on other countries, Europe, and hence also the Netherlands, must use energy efficiently and utilise their own energy resources optimally."

"Independent energy production demands a good investment climate. For the Netherlands, gas production is very important. The 'small fields policy' will therefore be pursued vigorously. Recent consultation with all the parties involved in gas production with regard to environmental requirements offers the prospect of a new impulse for this policy. For gas production and wind energy, there will be a foresight study based on the government's Competition, Deregulation and Quality of Legislation (*Marktwerking, Deregulering en Wetgevingskwaliteit* – MDW) operation and a pilot project to investigate whether obstacles in the area of spatial planning procedures can be removed. The usefulness of and need for independent energy production must become self-evident."

"In response to the energy crisis in California, the government has taken a critical look at the security of supply in the Netherlands. The conclusion is that there are no acute problems either in production or in the networks. However,

we must closely monitor the capacity not only to provide the government with information it needs but also to highlight investment opportunities for market players. Possible improvements in the investment climate will be identified."

ENERGY SECURITY POLICY AFTER THE ENERGY REPORT 2002

The government has conducted several studies and taken action to accommodate the conclusions of the 2002 Energy Report. A study on the present and future reliability of electricity and gas networks in the Netherlands concluded that networks are sufficiently reliable but that regulation is needed to maintain their good quality also in the future. Investigations (both studies and expert consultations) on the investment climate for electricity generating capacity (both base and peak load) resulted in the conclusion that the regulatory and fiscal conditions need to be improved. Measures to be taken are streamlining of permit procedures for wind power projects and introducing incentives to maintain peak capacity. The government has recognised the need for better monitoring of electricity generating capacity and providing good quality information to the market parties to enhance timely and adequate investments. Consequently, the government is working together with TenneT to improve the availability of information on capacity.

The recently increased international attention for security of energy supply as well as the findings of the above-mentioned studies prompted the government to send a letter to the parliament on security of supply in September 2003. The letter concentrated mainly on short-term policy and national measures covering the above-mentioned aspects.

INTERNATIONAL ASPECTS

The Dutch government considers that security of oil and gas supply on a global and European levels is best achieved by close international co-operation and by a good international investment climate for private energy companies. Therefore, it puts high importance on co-operation with the IEA, the EU/Russia energy dialogue and the International Energy Forum (IEF). The Netherlands hosted the last IEF meeting held in Amsterdam in May 2004. The government proposes to enlarge the role of the IEF to gas dialogue in addition to oil producer/consumer dialogue. Being a member of the EU, the government contributes to the EU energy policy debate and has an ambitious agenda for its 2004 EU presidency. Being a major gas producer, the

government also recognises the impact of its policies on the security of energy supply at the European level. In the electricity sector, TenneT is closely co-operating with the TSOs in the neighbouring countries.

COST-BENEFIT ANALYSIS OF ENERGY SECURITY

The government has launched a project, in co-operation with the Netherlands Bureau for Economic Policy Analysis (CPB), to prepare a cost-benefit analysis of measures to improve security of supply. The objective is to define what is meant by security of supply from the economic point of view, to create a methodology to analyse whether a certain type of government intervention improves or worsens welfare and to compare policy options. The framework for analysis has been developed and tested on quite variable policies such as investing in new oil stocks to avoid temporary supply disruptions, maintaining flexibility in the natural gas market through the swing supply capabilities of the Groningen field, creating a capacity market to enhance the adequacy of peak capacity and reducing vulnerability of the energy mix by diversification supported by subsidies.

The methodology is based on the framework for the cost-benefit analysis of infrastructure projects. In this framework, investment projects are assessed by comparing a world with the project to a world without it. Economic scenarios are used to describe the world outside the project in both cases. First, risk scenarios are constructed, *i.e.* scenarios in which certain disturbances occur in one or more energy markets. The second step is to assess costs and benefits of policy options against that scenario. In some cases, like the option of encouraging fuel substitution within the power sector, only direct costs and benefits of the project are taken into account. In other cases, indirect effects play a significant role and are calculated using macroeconomic models. Next, the break-even frequency of the risk scenario and the policy option are calculated. The break-even frequency is defined as the minimal frequency at which the defined disturbance should occur in order to make the net benefits of the policy option zero. Finally, the break-even frequency of the disturbance with the probability of occurrence will be compared.

The results of the study indicate that the government should be careful with the introduction of extra policy measures with respect to security of supply. The analysis shows that in most selected policy options, there have to be frequent crises in order to make them cost-effective. The government will further study the implications of these results and plans to assess other possible security of supply measures. Furthermore, the CPB will present and discuss the methodology and results in different forums, including the International Energy Agency (IEA).

ENERGY STATISTICS AND FORECASTS

The government has experienced some difficulties in collecting statistics. The energy statistics will improve in the next years when the Central Bureau of Statistics will get access to the energy data of the distribution companies.

The so-called "reference outlook" of Dutch energy use and greenhouse gas (GHG) emissions is a projection of the developments until 2010 with respect to energy use, fuel mix, energy prices and CO_2 emissions. There will be a "reference outlook" every three to four years depending on the IPCC guidelines on the reporting of CO_2 emissions. The previous outlook was published at the beginning of 2002 and the next one will be published in 2004. The "reference outlook" is intended to give an indication on whether the Netherlands is on schedule in realising the Kyoto target. Consequently, if the outlook predicts a too high level of GHG emissions, the government has to introduce additional measures. The outlook is prepared by two independent institutes.

Table 1

Energy Forecasts 2010[1]

	2010	
Total primary energy supply	3 346 PJ	0.6% growth per year since 2000
Electricity use	447 PJ	1.6% growth per year since 2000
Energy efficiency improvement per year	1.3%	1.3% in 2000
Share of renewables in TPES[2]	3.8/4.5%[3]	1.2% in 2000
Share of renewable electricity in total generation	11%	2.7% in 2000

1. Slightly different from the previous review owing to new policy measures.

2. Renewable energy is counted as avoided fossil fuel use.

3. 4.5% if wind energy targets are met.

Source: The Ministry of Economic Affairs.

ENERGY TAXATION

Apart from value-added tax (VAT), 19% on energy, the energy taxes are the regulatory energy tax (REB), the environmental tax on fuels (so-called "ecotax"), excise taxes on mineral oils and the uranium tax.

The objective of the REB is to increase efficiency and to shift from taxing labour and profits to taxing the use of environment. More than 80% of the

revenues are recycled to taxpayers in the form of relief from other taxes. The rest is used to finance subsidy schemes for renewables and energy efficiency. The tax is degressive and large consumers (above a certain ceiling) are exempt, as they have agreed to the Benchmarking Covenant (see Chapter 5).

Table 2

Regulatory Energy Tax (REB) on Natural Gas[1]

(eurocents per m^3)

Consumption m^3/a	*2000*	*2001*	*2002*	*2003*	*2004*
0 – 5 000	9.45	12.03	12.40	12.85	14.29
5 000 – 170 000	5.19	5.62	5.79	6.00	7.27
170 000 – 1 000 000	0.70	1.04	1.07	1.11	2.27
1 000 000 – 10 000 000	-	-	-	-	1.13
Above 10 000 000	-	-	-	-	0.75

1. VAT excluded.

Source: The Ministry of Finance, 2003.

Table 3

Regulatory Energy Tax (REB) on Electricity[1]

(eurocents per kWh)

Consumption kWh/a	*2000*	*2001*	*2002*	*2003*	*2004*
0 – 10 000	3.72	5.83	6.01	6.39	6.54
10 000 – 50 000	1.61	1.94	2.00	2.07	2.12
50 000 – 10 000 000	0.22	0.59	0.61	0.63	0.65
Above 10 000 000	-	-	-	-	0.05

1. VAT excluded.

Source: The Ministry of Finance, 2003.

The REB revenue increased from about €1.5 billion per year to about €3.1 billion per year over the period from 1999 to 2001. Since 1999, all energy taxes and excise duties have been indexed to inflation. In 2002 and 2003 the only increases of REB were due to this indexing, but a 10% increase has been decided for 2005. The EU Directive on Energy Taxation (2003/96/EC of 27 October 2003) removes distortions to the treatment of different energy fuels and products, and increases the fiscal incentives for energy efficiency and undertakings to reduce emissions. In its

implementation, taxes are imposed also for many larger industries, which are now exempted from the taxes on electricity and gas.

The environmental fuel tax (ecotax) is levied on all fossil fuels. It is based 50% on the energy content of fuels and 50% on their carbon content. Its revenue is part of the general budget. For mineral oils, it is levied together with excise duties. For electricity producers, it is an input tax levied on coal and natural gas, but not on imported electricity. There is no refund for exported electricity. The uranium tax was introduced in 1997 to ensure that nuclear electricity is treated similarly to fossil generation.

A considerable part of the energy bill of households consists of taxes. For a household with average consumption, taxes make up nearly 50% of both its gas and electricity bills.

CRITIQUE

The Netherlands has made progress in most areas of energy policy since the last IEA in-depth review in 2000. Liberalisation of electricity and gas markets has advanced. The country has ratified the Kyoto Protocol and is pursuing active climate policies. R&D policy has been rationalised and the initiative towards a sustainable energy system has been launched. In pursuing its energy policy targets, namely energy security, environmental protection and economic efficiency, the Netherlands has shown great pragmatism when giving attention to cost-effectiveness.

Despite the progress, the country is also facing some challenges in all areas of energy policy. Energy security is attracting increasing attention in the Netherlands and in the world. Whilst the most recent Energy Report 2002 concludes that no urgent problems are foreseen, the Netherlands recognises the need to stay alert, improve monitoring and create the necessary instruments to deal with future problems. In the world energy market, the producer-consumer dialogue has to be promoted. In this respect, the organisation by the Netherlands of the last IEF meeting was welcomed. Its current evaluation of cost-effectiveness of energy security policies is innovative, very interesting and should provide a useful lesson to other IEA member countries. One challenge is encouraging investments. Abrupt changes of policies have hindered investment and these changes do not contribute to energy security in the long term. Sudden abolition of "depreciation at will" of investments in gas production is one example. Another example is the support scheme for renewable electricity that did not encourage domestic investment until recently. In addition, providing the right incentives for new power capacity also needs to be addressed.

The Netherlands is suffering from problems of local acceptance of energy projects, including the development of the small gas fields and wind power.

Part of the problem seems to come from the local authorities' and local residents' lack of understanding of the challenges of the national energy situation. One possibility to alleviate the situation is informing the public of all the aspects of national energy policy. Another is streamlining the licensing procedures by, for example, creating a "one-stop-shop" for permits and licences, which would substantially reduce the time for acquiring licences.

Full market opening has been delayed by the administrative and technical confusion in the second phase of market liberalisation (see Chapters 6 and 8). This causes regulatory uncertainties among many stakeholders. Concerted efforts are needed to achieve successful full market liberalisation in July 2004. Reorganisation of the complex gas structure (*Gasgebouw*) is slow. Common challenges for the electricity and gas sectors can be identified. The division of responsibilities between the regulator and the Ministry of Economic Affairs should be further clarified and the regulator should be strengthened. Consumers need to be involved in designing a liberalised energy market so that they can fully understand the implications of market reform and enjoy its benefits. This can be achieved through better consultation in the planning phase, prompt solving of any problems in the functioning of the markets and good information dissemination. Smooth transition to full market opening with sufficient consumer protection is also essential. Although the efficiency of the energy markets can be improved by domestic efforts, integration of the markets with other countries can bring further benefits. Co-operation with neighbouring countries in this field is an essential step towards the single EU market. It could be useful to introduce Memoranda of Understanding at the political level with Belgium and Germany to create a single market. Such a political agreement has been signed, for example, between Portugal and Spain to create the Iberian Market, while the Nordic market has been operating like a single market for several years. A decision has been made to create a working group to investigate the possibilities for a Memorandum of Understanding between Germany and the Netherlands.

In full market opening, small consumers should be protected in cases where the supplier has problems to deliver electricity to them. The importance of this was portrayed in the recent bankruptcy of a supplier company, which had not passed the TPA charges paid by the final consumers to the relevant network company, thus creating confusion whether the consumers should pay these charges again to the network company.

The Netherlands has launched an innovative long-term strategy towards sustainable energy systems, strongly linked with the research, development and demonstration strategy; it is called transition management. While its "learning by doing" approach without a rigid blueprint is pragmatic, developing milestones and benchmarks for monitoring progress could further improve the effectiveness of the programme management. The process would also benefit from international co-operation.

The Netherlands is already active in the international arena. However, international collaboration could be further intensified and many new challenges make it increasingly necessary. Some areas that would benefit from this are market reform, transition management and energy R&D. Also recent shifts in renewable energy promotion policy partly come from lack of sufficient international policy collaboration. In this context, broader and deeper collaboration with neighbouring countries is an important factor to augment the effectiveness of energy policy instruments.

RECOMMENDATIONS

The government of the Netherlands should:

- *Ensure a stable policy approach to encourage investments in the energy sector.*
- *Streamline the licensing procedures.*
- *Enhance local authorities' and the general public's understanding of national energy policy challenges and objectives.*
- *Further clarify the relations between the regulator and the Ministry of Economic Affairs. Ensure that the regulator has adequate powers and means to effectively carry out its tasks.*
- *Increase involvement of consumers in designing liberalised energy markets and introduce greater consumer protection, including ensuring smooth transition to full market opening.*
- *Strengthen the transition management process through clarifying targets for the transition projects, developing milestones and benchmarks to monitor their progress.*
- *Deepen collaboration with neighbouring countries in order to increase the effectiveness of energy policy. This includes continuing the efforts to create a real single energy market with the neighbouring countries via Memoranda of Understanding, and eventually the EU market.*

The Fourth National Environmental Policy Plan (2001) outlines the strategies the Netherlands has chosen in order to resolve several long-standing environmental problems. These include external safety, climate change and the adverse effects on biodiversity. A main conclusion is that CO_2 is a key challenge for environmental policy. One of the implications is that a different energy system is needed and this should be achieved through a process called transition management.

CLIMATE CHANGE

GREENHOUSE GAS EMISSIONS

Dutch total greenhouse gas (GHG) emissions increased by the mid-1990s but declined thereafter, mainly owing to a substantial decrease in non-CO_2 GHG emissions. In 2002, total GHG[2] emissions were 1.2% higher than in 1990 according to the Ministry of Housing, Spatial Planning and the Environment (VROM).

CO_2 emissions represented 82% of Dutch GHG emissions in 2001. According to IEA statistics, Dutch energy-related CO_2 emissions increased by 13.2%[3] between 1990 and 2002. By fuel, 46% of the emissions stemmed from the use of natural gas, 35% from oil, 18% from coal and 0.8% from other fuels in 2002 (see Figure 6). Public electricity and heat production accounted for 28% of the energy-related CO_2 emissions, followed by industry (19%), transport (19%), the residential sector (10%), other energy industries (8%) and other sectors (15%) (see Figure 7). CO_2 emissions from public electricity production grew fastest, by 29.7% over the period. Increases could be observed also in the transport sector (28.5%), manufacturing industries and construction (1.3%) and other sectors (8.8%). However, emissions from the residential sector declined by 3.7% and from other energy industries by 0.9%. The growth in electricity and heat production was driven by the growth of energy demand, defined by economic growth. The impact of increasing electricity generation from gas-fired power plants was partly offset by the increase in efficiency in some units. The growth of emissions from transport

2. The Burden-sharing Agreement covers CO_2 (carbon dioxide), CH_4 (methane) and N_2O (nitrous oxide) for which the base year is 1990, and PFCs (perfluorocarbons), HFCs (hydrofluorocarbons) and SF_6 (sulphur hexafluoride) for which the base year is 1995.
3. This statistic is based on the IPCC Sectoral Approach.

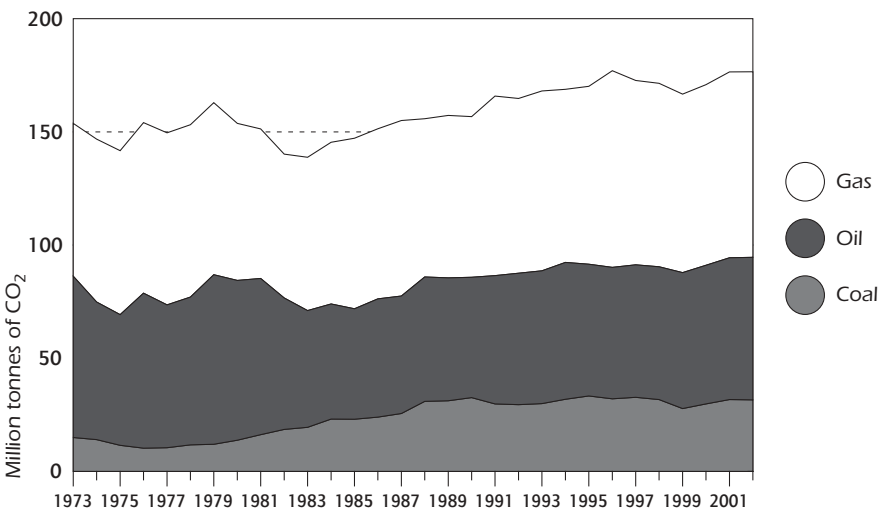
was driven by the increase of transport activity and the constantly growing number of cars. The growth of emissions from energy use in industry has been well below the growth of industrial output.

Dutch energy-related CO_2 emission intensity, measured as CO_2 emissions per TPES decreased by 2.7% in the period from 1990 to 2001. In 2001, the energy-related CO_2 emissions per GDP were 0.44 kg of CO_2 per US$ (using 1995 prices and purchasing power parities) – improving by 17% after 1990 – whereas the IEA Europe average was 0.39 kg of CO_2 per US$. CO_2 emissions per capita increased by 5.2% between 1990 and 2001 reaching 11.06 tonnes, which is significantly above the IEA Europe average of 7.6 tonnes, reflecting the high degree of industrialisation with a heavy reliance on energy-intensive industries.

According to the inventories of the European Environmental Agency, CH_4 emissions accounted for 9%, N_2O for 7% and other GHGs for about 2% of the Netherlands' total GHG emissions in 2001. While CO_2 emissions have increased, there was a 25% reduction in CH_4 emissions and a 2.9% reduction in N_2O emissions between 1990 and 2001; 17% of the total CH_4 emissions arise from the energy sector where the main sources are gas distribution and production. In the energy sector, CH_4 emissions have declined by 21% between 1990 and 2001.

Figure 6

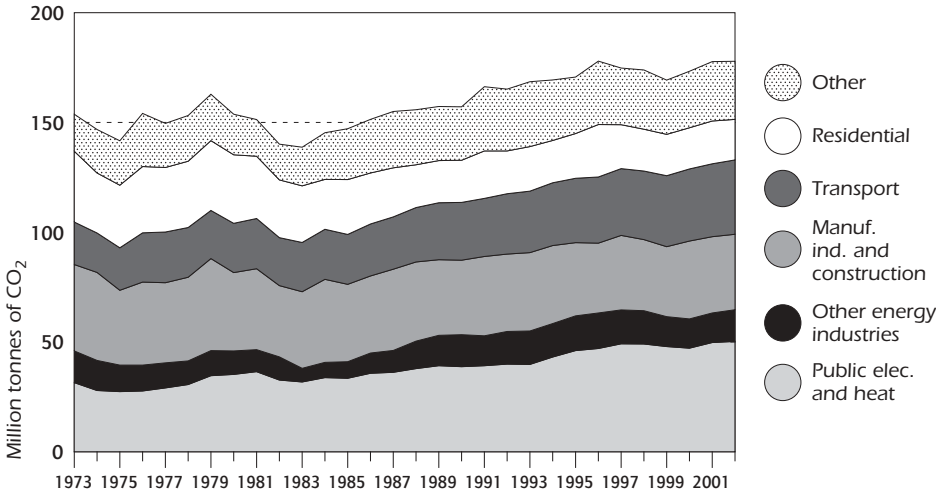
CO_2 Emissions by Fuel*, 1973 to 2002



* estimated using the IPCC Sectoral Approach.
Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2003.

Figure 7

CO_2 Emissions by Sector*, 1973 to 2002

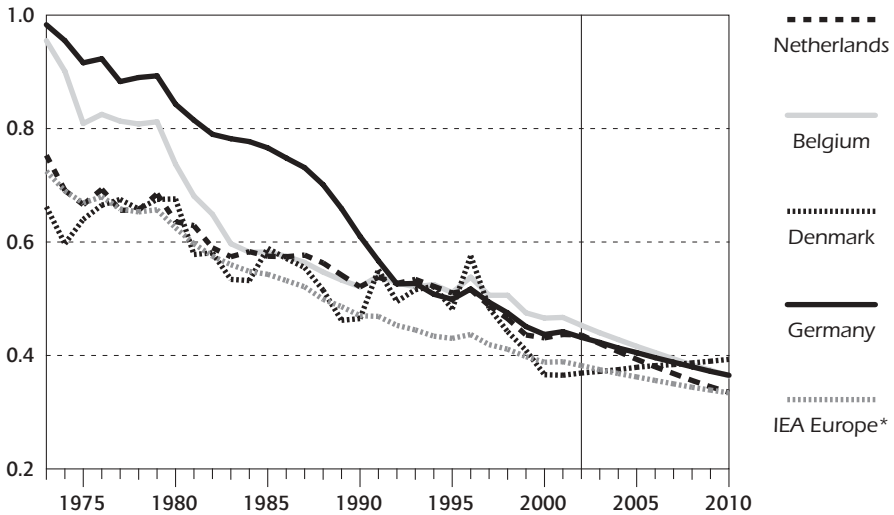


* estimated using the IPCC Sectoral Approach.
Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2003.

Figure 8

Energy-related CO_2 Emissions per GDP in the Netherlands and in Other Selected IEA Countries, 1973 to 2010

(CO_2 emissions/GDP using 1995 prices and purchasing power parities)



* excluding Norway from 2002 to 2010.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; *National Accounts of OECD Countries*, OECD Paris, 2003; and country submissions.

The Netherlands ratified the Kyoto Protocol on 31 May 2002. The Dutch target, within the EU Burden-sharing Agreement under the Kyoto Protocol, is 6% reduction in its GHG emissions between 1990 and the first commitment period (2008-2012). The Energy Research Centre of the Netherlands (ECN) and the Netherlands Institute of Public Health and the Environment (RIVM) regularly study the shortfall between the target and the development of emissions in the reference scenario (business-as-usual). The initial analysis identified an annual shortfall of 50 Mt in 2010 (about 20% of the expected emission level in 2010) but the 2002 evaluation concluded that the shortfall was only 40 Mt. The next evaluation will take place in the summer of 2005 and, therefore, a new reference scenario is being developed by summer 2004 to take into account the most recent economic, social and technological developments. VROM does not expect the next evaluation to show a larger shortfall than 40 Mt.

In the Climate Change Implementation Plan, the Cabinet stated that a reduction of 25 Mt, 50% of the initial total policy shortfall, should be achieved with domestic measures and the remainder with Kyoto flexible mechanisms. Though the shortfall has been estimated lower, at 40 Mt, the 50-50 split has been kept and the objective is to attain 20 Mt reductions through domestic measures.

Domestic Policies and Measures

In choosing domestic policies and measures, the primary criterion has been cost-effectiveness. Another important criterion was the distribution of the effort across various GHGs. CO_2 emissions are the core of the problem. A balance was sought between policies and measures that contribute to reducing CO_2 emissions and those that relatively inexpensively reduce large amounts of non-CO_2 GHG emissions. In order to get society to commit to the measures, the government tried to balance the measures across target groups. The chosen measures were then divided into three packages: the basic package, the reserve package and the innovation package.

The *basic package* contains a wide range of policies and measures, which were ready to implement and were considered reliable in terms of emissions reduction. Those related to energy efficiency are discussed in Chapter 5 and those related to renewable energies in Chapter 7. The basic package is expected to reduce emissions by 25 Mt by 2008 to 2012. The split between CO_2 reductions and reductions in emissions of other GHGs is roughly 70-30, closely reflecting the current split in emissions.

Large CO_2 reductions, as compared to the reference scenario, are expected from a more intensive energy conservation policy, giving subsidies for substitution of coal by biomass in power plants and other ways to increase the

use of renewable energy. The contribution of power companies is high compared to other sectors mainly because all reductions from renewable energy are attributed to this group. The package contains measures intended to reduce emissions of non-CO_2 GHGs, primarily from industrial sources, making their share fairly large. The traffic sector policies involve mainly tax measures aimed at encouraging consumers to purchase more fuel-efficient cars, drive more efficiently and use their cars more selectively. In addition, enforcement of speed limits will be stepped up. In the agricultural sector, crop-specific norms have been established for energy consumption in greenhouse horticulture. Furthermore, the sector emits a large amount of non-CO_2 GHGs for which reduction techniques are not yet available. Table 4 shows the planned actual emissions as well as targets for each sector in 2010. The allocation, which has been prepared in co-operation with the stakeholders, is currently under discussion in parliament.

Table 4

Dutch Emissions and Domestic Target in 2010

(Mt of CO_2-equivalent)

Sector	*Emissions 1990*	*Emissions 2000*	*Estimate 2005*	*Target level 2010*
Industry (incl. energy)	96.0	101.2	109.0	112.0
Agriculture	9.8	8.1	7.7	6.5
Transport	29.4	35.2	36.8	38.3
Households	31.2	31.7	30.1	29.0
Subtotal	*166.4*	*176.1*	*183.6*	*186.0*
Non-CO_2 gases	51	43	38	33
Total	**217.4**	**219.1**	**221.6**	**219.0**

Source: The Ministry of Housing, Spatial Planning and the Environment.

The cost-effectiveness of the policies and measures is analysed as part of a package. The environmental balance sheets of 2003 estimate the welfare cost of CO_2 measures in industry and agriculture at minus €20 per tCO_2, in the transport sector under €0, for renewables about €30, in buildings about €200, for non-CO_2 GHGs under €5 and for joint implementation (JI) and clean development mechanism (CDM) projects under €10. The government is in the process of calculating the cost-effectiveness of individual measures for climate change mitigation as well as acidification and small particles, and the results are expected by summer 2004 (so-called "*Optiondocument*").

The *reserve package* contains policies and measures that can be taken if things go awry during the run-up to the 2008-2012 period. The measures are being prepared to make them ready for implementation following the periodical evaluations. Whether deployment is necessary will be assessed and decided after the periodical evaluations. At present, there is only one measure left in the reserve package, a reduction of 5 Mt of N_2O in the chemical industry. This could be implemented from 2008 and negotiations with the chemical industry have started. Two measures proposed in the package are either obsolete or premature; increases in the regulatory energy tax (REB) have been implemented and CO_2 sequestration is not likely to be available by the target period. However, a new increase of 10% of the REB is foreseen from the beginning of 2005. New measures are being developed for the reserve package before the next evaluation in 2005.

The government expects that further GHG reductions will be needed after 2008 to 2012. The *innovation package* mainly aims at developing new technology and new policy instruments that the government can use to achieve the necessary reductions in the longer term. Some of the package has become outdated by the introduction of CO_2 emissions trading while some of it is implemented through the "transition management". Possible measures include CO_2 capture and storage and more extensive use of renewables. Reduction targets of GHG emissions beyond the Kyoto target are currently being considered.

The CO_2 Reduction Scheme is a fund established in 1997 to support investments in GHG emissions reduction. The main programme consists of a tender system in which projects are selected on the basis of their cost-effectiveness. Projects chosen include a near-shore wind power plant, CO_2-storage project (CRUST) and subsidising several small projects in the transport and housing sectors. The almost €300 million that has been used has resulted in 5.5 Mt reduction of CO_2 emissions.

Joint Implementation and Clean Development Mechanism

The Ministry of Economic Affairs is responsible for JI projects whereas the VROM is responsible for CDM projects.

In April 2001, VROM set up a special CDM Division to purchase Certified Emissions Reductions (CERs). The VROM intends to purchase CERs via multilateral international financial institutions, Senter International, private financial institutions and bilateral purchase agreements with host countries. Under the guidance of VROM, these intermediaries select sustainable projects in developing countries to purchase the resulting CERs. Investors from all countries may submit CDM project proposals to these intermediaries that will judge these projects, including the compliance with the requirements. The main selection criteria for the projects are consistency with international

agreements, environmental and social impacts, cost-effectiveness and sustainability (*e.g.* nuclear energy is excluded), location of the project, type of technology (renewables are preferred over sequestration) and risks (*e.g.* political, environmental and project risks).

The government has a substantial budget of €400 million for 2002 to 2012 (excluding transaction costs), available for the purchase of 67 $MtCO_2$-eq. of CDM credits which equates to 13.4 $MtCO_2$-eq. per year for the Kyoto commitment period. As of November 2003, 52 $MtCO_2$-eq. had been contracted at an average cost of €6 per tonne. Projects focus on renewable energy sources, such as hydropower, but other project types, such as a methane capture project, have also been chosen for implementation.

The Netherlands has signed Memoranda of Understanding (MoUs) with Romania, Bulgaria, the Slovak Republic and Croatia to develop JI projects. The MoUs express political commitment and intention for bilateral co-operation in the field of JI. Although a MoU is not a precondition for co-operation, it facilitates investments in JI projects. Regardless of the MoUs, the host countries need to approve all individual projects and by August 2003, 9 $MtCO_2$-eq. emissions had been committed. The Ministry of Economic Affairs contracted Senter to implement a public procurement procedure, the Emissions Reduction Unit Procurement Tender (ERUPT). The selection criteria are made transparent to the participants and the emphasis is on cost-effectiveness and financial considerations. In the first two phases, ERUPT-I and II, 5.6 $MtCO_2$-eq. were contracted with a price of €5 per tonne. In an attempt to diversify the JI portfolio and to maximise the potential JI projects, the ministry organised ERUPT-III to sign contracts for more JI credits with both multilateral and private financial institutions. ERUPT-IV was opened in October 2003. The total budget for JI projects is €340 million.

In 1999, the World Bank (WB) initiated the Prototype Carbon Fund (PCF) together with six countries and seventeen companies. The participants allocated US$180 million to the PCF with US$15 million coming from the Dutch Ministry of Economic Affairs. The objectives of the PCF are CO_2 emissions reductions by the development of JI and CDM projects, sharing experiences between the investors and host countries, and collecting information on the obstacles for JI and CDM projects.

The PCF has led to the development of Carbon Funds with WB and the European Bank for Reconstruction and Development (EBRD). The EBRD contract was finalised in October 2003 with a budget of €31 million. The budget will be used by the EBRD to acquire carbon credits for the account of the Netherlands under the JI mechanisms. A typical project in the EBRD member countries will be the modernisation of district heating systems. Emissions reductions from nuclear projects, land use change and forestry projects are not eligible. A similar contract with the WB is expected in 2004.

CO_2 Emissions Trading

The government has welcomed the EU emissions trading directive, including the link with JI and CDM. The Ministry of Economic Affairs has finalised the draft National Allocation Plan (NAP) and the VROM is working on revising the environmental legislation, which should be completed by April 2004. A national emissions authority will be established to implement the trading. Trading will start in January 2005.

The trading scheme will cover 95 $MtCO_2$-eq. of emissions (about 45% of total emissions) from about 300 installations. As the schedule is very demanding, the government has decided to keep the scheme as simple as possible by, for example, refraining from using the opt-in or opt-out possibilities provided by the EU directive. For emissions from production processes, the allocation is based on historic emissions in 2001 to 2002. *Ex post* allocation based on real historic production will not be allowed once trading has started, but the initial allocation takes into account expected changes in production volumes in each economic sector. For emissions from combustion processes, the allocation takes into account how well the companies perform in respect to their international energy efficiency benchmarks. As about 250 of the installations are under voluntary agreements and have already worked to improve their energy efficiency, the government rewarded early action of the industry by the allocation of emission rights. It gave a bonus to companies that perform better than their benchmark and a reduction of allowances to those that perform worse than their benchmark. A reserve of 4 Mt was set aside to take into account new entrants after the trading has started.

AIR POLLUTION

The very high densities of both population and economic activities have led to very intense pressures on the Netherlands' environment. These pressures have made environmental protection a matter of serious public concern.

The Netherlands has successfully decoupled emissions of most traditional pollutants from economic growth, improving urban air quality and reducing the Dutch contribution to transboundary air pollution. The country meets the EU air quality standards introduced in 1999 for SO_2 and lead. In 2002, SO_2 emissions totalled 89 000 tonnes and NO_x emissions 410 000 tonnes. Reduction of emissions from traffic has brought about a decrease in NO_2 concentrations. However, air quality standards for NO_2 are still exceeded, especially where there is high traffic intensity. The annual threshold for particulate matter (PM_{10}) is still slightly exceeded in some urban and highly industrialised areas. High background concentrations of particulates mean that a slight increase in emissions from local sources in large cities or around large industrial complexes is sufficient to raise concentrations above the air

quality standard. Further action is needed to reduce emissions of ozone precursors in the transport and energy sectors as ozone exposure targets are sometimes exceeded.

Because current policy does not sufficiently reduce NO_x emissions, the government has decided to introduce NO_x emissions trading. The national emission target, based on the Netherlands' international commitments, is 231 000 tonnes of NO_x in 2010. The companies participating in NO_x trading will be approximately the same as those that participate in CO_2 emissions trading. All participants are allocated the same annually declining performance standard rate. The level will be 40 g/GJ at the beginning of trading in 2004. The scheme is expected to increase investments in emissions control technologies because low-NO_X technologies are not yet used extensively in the Netherlands. The independent emission agency to be established for CO_2 trading will also supervise NO_x trading.

ALTERNATIVE TRANSPORT FUELS

The government sees the use of biofuels as one way to reduce the environmental impact of transport. At present, policy options are being developed to implement the EU Directive on Biofuels, paying attention to the possible impact of biofuels on environment, climate and economy. Recently, a study has been carried out to determine the direct and indirect costs of transport fuels, namely diesel, gasoline and liquefied petroleum gas (LPG). The results of this study will be used to develop policy concerning the ideal fuel mix. Furthermore, a study on the regulated and non-regulated emissions of diesel, gasoline, LPG and natural gas vehicles is being undertaken in co-operation with France, the United Kingdom, Germany and Italy. The results will be used as a basis for the Dutch position on the use of natural gas and LPG in transport.

CRITIQUE

The government has made a big effort to meet its Kyoto target. As GDP grew by 35% and population by 8% from 1990 to 2002 but GHG emissions only by 1.2% from the 1990 levels, progress has clearly been made. While the government's analysis shows that the country is well on track to meet the Kyoto target, it is still a challenge. Especially, curbing the growth of energy demand in the transport sector will require strong policies and measures. Even though the Netherlands has followed an active climate policy for several years and has introduced many effective measures, CO_2 emissions have increased. There are also some uncertainties in the analysis, such as assumptions about fuel prices and sectoral growth.

The Netherlands' flexibility and determination to reach the targets is reflected in the design of the climate change mitigation programme consisting of the basic, reserve and innovation packages. The basic domestic package contains a wide range of measures and GHG emissions reduction targets for different sectors. The development of the reserve package is a prudent and effective approach because the country can immediately embark on the package if it finds itself off the track. However, it is important to develop new measures into the reserve package as most existing ones have been taken into use.

Cost-effectiveness of GHG emissions reductions has received a lot of attention. Use of JI and CDM up to 50% out of the necessary reductions, reduction of non-CO_2 emissions, streamlining subsidies for renewables and CHP and keeping the Borssele nuclear power plant open are such examples (see Chapters 7 and 8 for details). However, the reduction costs per tonne of CO_2 substantially differ between sectors. For example, renewable energy policies seem to receive higher priority compared with energy efficiency policies while the latter are, in general, less costly but this may change in the future owing to the steeper learning curves of renewable energy technologies. Also the further reduction of non-CO_2 emissions, such as fugitive CH_4 emissions, by continuing the modernisation of the distribution network and preventing venting of natural gas during production could merit more attention. It is essential to prioritise various policies and measures on the basis of their cost-effectiveness with a view to securing the least-cost allocation of the reduction target. In this respect, it is positive that the government has initiated a detailed analysis of the cost-effectiveness of different measures and a new reference outlook, including an estimate of the emission levels without the climate policy, and plans to share the results with all the stakeholders.

Making use of economic instruments could increase the cost-effectiveness in achieving policy objectives. For example, in the transport sector, tax differentials based on environmental impacts could be implemented and road pricing be considered (see Chapter 5). In the large emitting sectors, the EU emissions trading scheme will be an important new policy instrument with impacts on many of the proposed climate change programmes, and provides an opportunity for the Netherlands to streamline its policies. It needs to be clarified how the CO_2 emissions trading scheme works with other policy instruments such as the Benchmarking Covenant. While the covenants set targets on energy intensity allowing the growth of energy consumption owing to economic growth, the emissions trading scheme caps CO_2 emissions. The Netherlands allocated allowances to participants in the trading scheme based on their performance in reaching the benchmark targets. This seems to be a sensible way to incorporate the Benchmarking Covenant within the trading scheme. In the longer term, in the post-Kyoto period, the Dutch experience of operating a benchmarking approach would be useful should future climate change mitigation be based on dynamic targets.

The Netherlands has taken a political decision to fill half of its GHG emission gap through JI and CDM projects. Its early and very tangible financial commitment to these projects is rather exceptional among the European countries, which tend to put heavy emphasis on domestic policies and measures, giving only a marginal role to the Kyoto flexible mechanisms. It is also unique to establish quantitative objectives for the use of flexible mechanisms. This reflects the Netherlands' high interest in cost-effectiveness of climate change mitigation policies. The decision to significantly use JI and CDM is ambitious in its own right given that there are few international examples. This puts the Netherlands in a forerunner position in creating and testing baseline and additionality methodologies. Other countries can benefit of this work and the experience gained.

The Netherlands is following active policy also in abating NO_x emissions. The introduction of NO_x trading with an annually decreasing cap for all electricity generation installations is a potentially effective tool to reduce the absolute levels of NO_x emissions in a cost-effective way.

The government has several studies under way investigating a range of alternative motor fuels prior to developing a policy. Such policies should be developed as soon as possible and the precise contribution that alternative motor fuels are expected to bring in energy efficiency and GHG targets should be made clearer. Alternative-fuelled and hybrid vehicles could contribute towards solving environmental problems in the transport sector. However, the government considers that promoting them is not worthwhile because it expects cleaner (*i.e.* with lower NO_x and particulate emissions) conventional vehicles to be economically feasible within the next ten years and hydrogen vehicles to be competitive in a longer time frame. It has also been considering the introduction of demand restraint measures, principally road pricing, but has not been able to implement them owing to public opposition. Nevertheless, some alternative fuel technologies are readily available and could play at least a transitional role before cleaner conventional technologies and hydrogen technology become competitive. The implementation of the EU Biofuel Directive, with an obligation to increase the use of these fuels to 2% of transport energy use in 2005 and to 5.75% in 2010, will work to this end.

RECOMMENDATIONS

The government of the Netherlands should:

- *Continue the approach in which both national and international policies are implemented and monitor these in order to be able to prioritise according to cost-effectiveness.*

- *Make greater use of economic instruments, including tax differentials based on external cost.*
- *Ensure that other climate policies and measures are streamlined with respect to the emissions trading scheme. In particular, clarify the relationship between the benchmarking covenants and the emissions trading.*
- *Continue the projects for flexible mechanisms to give a concrete example of how they can be used as a tool to supplement domestic measures.*
- *Consider promoting natural gas and other alternative transport fuels to contribute to achieving EU biofuel and national GHG targets.*

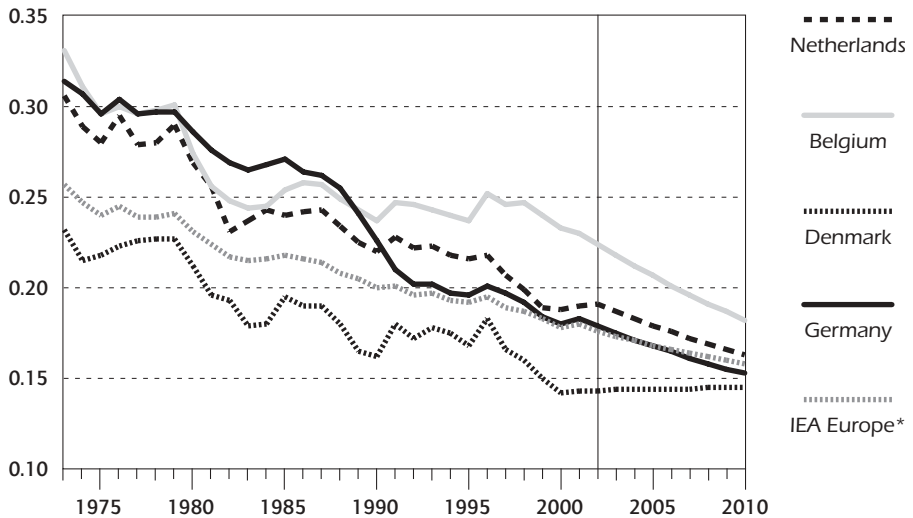
END-USE TRENDS

Total primary energy supply (TPES) in the Netherlands was 77.9 Mtoe in 2002, up by 17% from the 1990 level. Although the Netherlands' energy intensity (TPES per unit of GDP) declined over the period slightly faster than in IEA Europe on average, it is still slightly higher than the average (see Figure 9).

Figure 9

Energy Intensity in the Netherlands and in Other Selected IEA Countries, 1973 to 2010

(toe per thousand US$ at 1995 prices and purchasing power parities)



* excluding Norway from 2002 to 2010.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; *National Accounts of OECD Countries*, OECD Paris, 2003; and country submissions.

Total final consumption of energy (TFC) was 60 Mtoe in 2002, up by 17% from the 1990 level. The industry (including non-energy use[4]) is the largest

4. Including non-energy use of fuels of 1 Mtoe.

energy-consuming sector (38%), followed by the transport sector (24%), the residential sector (17%), the services sector (13%) and the agricultural and other sectors (7%).

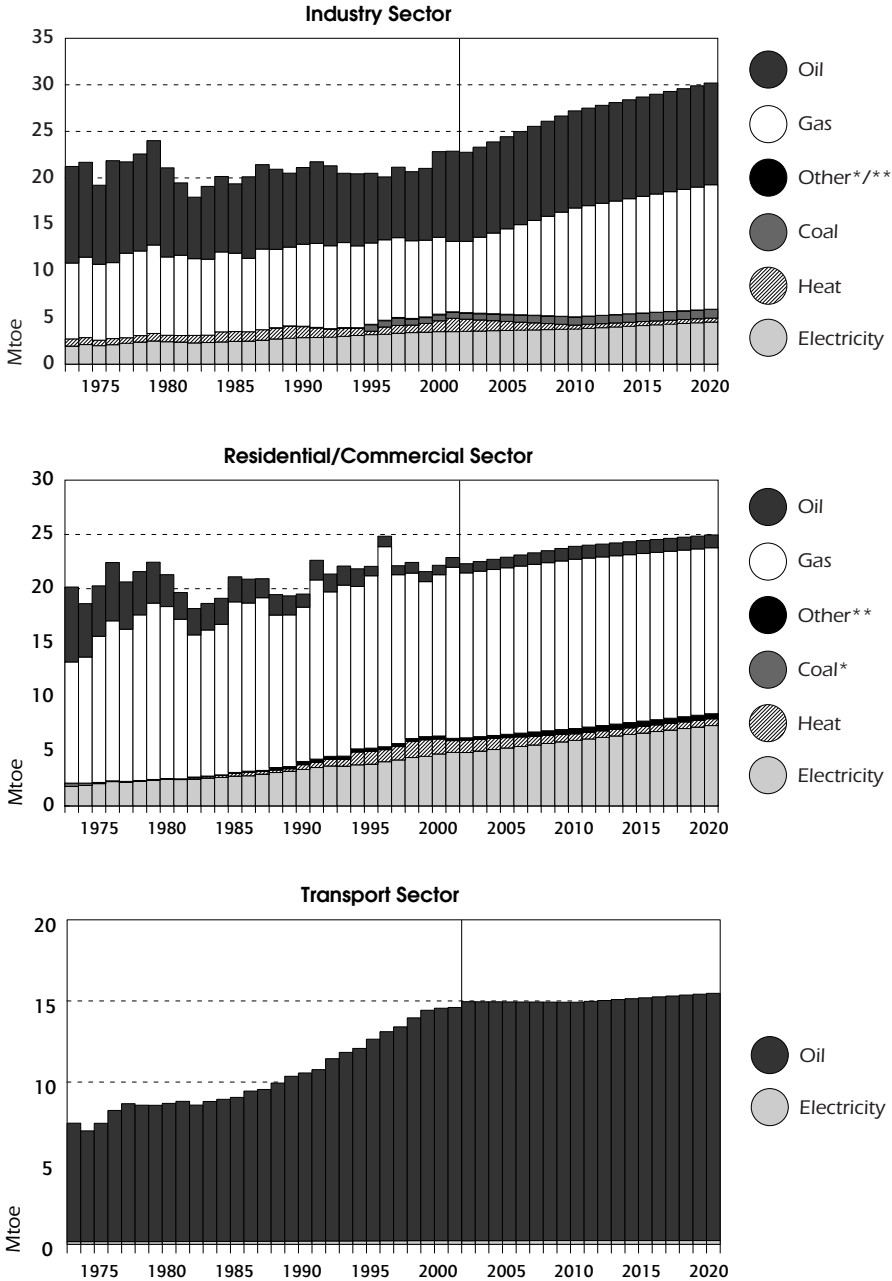
Industrial energy consumption (including non-energy use) increased moderately, by 8% between 1990 and 2002, reaching 22.8 Mtoe. Growth in industrial production over the same period was about 20%. The government estimates energy consumption in this sector to increase by 20% by 2010, driven by growing production volumes which exceed the improvements in efficiency. The largest energy-consuming industries were the chemical and petrochemical industries (which represented two-thirds of all industrial consumption, excluding non-energy use), the food and tobacco industries (with a 10% share) and the iron and steel industries (with a 5% share). The remainder is distributed between many different industries.

Energy consumption in the residential sector increased moderately, only by 4%, between 1990 and 2002, reaching 10 Mtoe. Gas dominates the heating market with almost 95% market share, followed by small amounts of district heat, electricity and oil. While the consumption of natural gas per household has stabilised, electricity consumption in this sector is increasing owing to increased ownership and hours of use of appliances. Energy demand in the services sector was 8 Mtoe and in the agricultural sector 4.1 Mtoe in 2002, 36% and 17% over the 1990 levels, respectively. Increased office equipment and air-conditioning equipment have increased electricity demand in the services sector. Energy consumption in greenhouse horticulture, which is the main energy-consuming sector within agriculture (80% of sectoral TFC), has been increasing together with sectoral growth and the use of more energy-intensive cultivation methods. The government expects energy consumption to grow by 7% in the residential, services and agricultural sectors by 2010.

Consumption in the transport sector grew rapidly, by 42% between 1990 and 2002. Growth in energy demand in road transport was 28% over the same period. In 2001, 141.6 billion passenger-km were travelled in private cars and 14.4 billion on rail. In 2001, freight transport volume was 83.1 billion tonne-km of which approximately 41.9 billion tonne-km was carried on inland waterways and 31 billion tonne-km on rail. The Ministry of Transport, Public Works and Water Management expects freight transport to double and passenger-km to grow by 2% per year by 2010. Owing to increased weight, specific fuel consumption of new cars is almost equal to the average consumption of all passenger cars, hence not bringing energy savings. Despite these trends, the official projections of only a 5% increase in road transport energy consumption by 2010 are based on the fact that energy efficiency efforts in the transport sector were stepped up only a few years ago and on the projected slowing growth in the number of vehicles.

Figure 10

Total Final Consumption by Sector and by Source, 1973 to 2020



* negligible.

** includes solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

ENERGY EFFICIENCY ADMINISTRATION

In the past, the Ministry of Economic Affairs has been responsible for all energy efficiency and conservation policies. In 2000, the primary responsibility for the policy in specific sectors was transferred to the ministries responsible for these sectors in other policy areas. Consequently, the Ministry of Agriculture, Nature Management and Fisheries became responsible for conservation in the agricultural sector and food industry, and the Ministry of Housing, Spatial Planning and the Environment (VROM) in buildings. Since 2002, the Ministry of Transport, Public Works and Water Management (VenW) has been responsible for energy conservation policy in the transport sector. The responsibility for overall energy conservation policy, the generic instruments and the energy conservation policy in the industrial, services, education and health care sectors remained with the Ministry of Economic Affairs. The work of the different ministries is co-ordinated and monitored in a director-level meeting every six weeks.

GENERAL ENERGY EFFICIENCY POLICY

Energy efficiency means achieving the same level of output with less energy. So, if energy use increases and national output increases more, energy efficiency has improved. The current energy efficiency policy is to aim at an improvement of 1.3%. In addition to a national target, there is a target for each sector (see Table 5). Although the government recognises that energy conservation improves economic efficiency and security of supply, the target has been set in the context of the climate change policy and is part of the basic package of climate change mitigation measures.

A broad mix of instruments is applied to meet the annual energy efficiency target, ranging from covenants (*e.g.* long-term agreements with industry) to financial incentives (*e.g.* investment subsidies and energy taxes) and legislation (*e.g.* energy efficiency standards and energy efficiency requirements in environmental permits). An important role is given to R&D in providing new technology options. The focus of the design of energy efficiency instruments is shifting from a reduction of energy consumption to a reduction of CO_2 emissions; for example, in 2004, subsidies for combined heat and power production (CHP) will become dependent on CO_2 emissions reduction.

SECTORAL ENERGY EFFICIENCY POLICY

INDUSTRY

The Dutch Long-term Agreements on Energy Efficiency (LTAs) are covenants between companies and the government. The first generation of LTAs covered

both large and small industries and extended over the period 1990 to 2000. The target of the LTAs was to improve energy efficiency in the participating companies by 20% and these were very successful as the eventual energy efficiency improvement was 22.3%.

At present, LTAs are the main measures for industry but different types of LTAs have been developed for small and large energy users. The Energy Efficiency Benchmarking Covenant is a LTA for large industries, whereas the second-generation Long-term Agreements (LTA2) have been developed for smaller industries, services and agriculture. Another measure implemented in the industry is the promotion of CHP (see Chapter 8).

Energy Efficiency Benchmarking Covenant

For industry using at least 0.5 PJ of energy per year, the main instrument is the Energy Efficiency Benchmarking Covenant, which was established on 6 July 1999. Joining the covenant is optional but once signed it becomes legally binding; non-compliance can lead to *e.g.* tightening of the company's environmental licence. The covenant is expected to reduce industrial CO_2 emissions by over 5 Mt by 2012 compared to "frozen" energy efficiency. For the power generating sector, this will be nearly 2 Mt of CO_2 (excluding the impact of new power plants). The government evaluated the effectiveness of the covenant in 2003. Some changes to the covenant are expected owing to the introduction of the EU emissions trading, which will make the covenant obsolete for the reduction of CO_2 emissions.

The government is a party to the covenant and agreed not to impose additional energy efficiency or CO_2 reduction measures for the participants. However, the covenant does not lift the possibility of the government imposing more general measures, such as legislation about sustainable energy or generic energy taxes. Nevertheless, when making new legislation, the government will take into account the efforts that have been made by these companies. Other incentives for the participants are simplified environmental permit procedures, fiscal incentives from the government and technical assistance from Novem. Industry is represented by industrial associations and individual enterprises affiliated to the covenant through a Declaration of Participation. The participating companies pledge to be among the world leaders in terms of energy efficiency as soon as possible, but no later than in 2012.

Virtually all companies qualifying for participation have joined the Benchmarking Covenant. At present, they total 97 industrial and six power generating companies, representing a total of 232 plants with an aggregate energy consumption of 1 060 PJ (February 2002). This is equivalent to 94% of total energy consumption of the qualifying industrial enterprises. The entire power generation industry has joined the covenant. Nearly all the companies

have identified the benchmark in their sector with the help of an independent consultant. The benchmark is the top 10% of the most energy-efficient installations worldwide. When defining world leaders, anticipated energy efficiency improvements by 2012 are taken into account. Moreover, the top performers must be redefined every four years. In order to meet the benchmark, members of the covenant must prepare energy efficiency plans and file them with the Benchmarking Verification Agency, which is an independent bureau established to monitor the practical aspects of the covenant. To date, 215 energy efficiency plans have been submitted. Once a plan has been approved by the agency, it will be incorporated into the environmental licence. The plan must be reviewed every four years, when the world lead is redefined. The covenant contains criteria governing the rate of return; companies must begin by taking the most cost-effective measure, followed by measures that are less cost-effective. To reach the target level, the companies can start using flexible instruments, such as emissions trading.

Long-term Agreements (LTA2)

The incentives to join LTA2 are the same as those for the large industries to join the Benchmarking Covenant. The new LTA2 was signed in December 2001 for the period running up to 2010 and is aimed at medium-sized and occasionally small businesses, which cannot join the Benchmarking Covenant. Small companies can collectively join LTA2 if they have a total energy consumption of at least 1 PJ per year. Each participating company has to draw up an Energy Conservation Plan, which sets an energy efficiency target, proposes specific measures and establishes a schedule for their implementation. The plans have to be updated twice, by October 2004 for the 2005-2008 period and by October 2008 for the 2009-2012 period. Principally, the participants agree to make energy efficiency investments with payback times of maximum five years or with positive net present value calculated at 15% of internal rate of return. Novem monitors the progress of LTA2 and receives annual progress reports from the participants. As of 30 June 2002, about 520 companies had applied to join LTA2.

The voluntary covenants cover most of industrial energy consumption. The benchmark companies account for about 80% of the total energy consumption of the industry whereas those who have joined the LTA2 account for over 15% of the total.

TRANSPORT SECTOR

The main measures in the transport sector are energy and vehicle taxation, information dissemination, spatial planning, and promotion of sustainable passenger and freight transport via intermodal changes.

Vehicles are taxed on the basis of use and ownership. Vehicle use is taxed through taxes on fuels (see Chapter 3) and a vehicle tax, which is collected every month. Private cars are taxed according to the province the vehicle has been registered in, its weight and fuel, whereas other cars are only taxed according to their weight. Private car ownership may be discouraged through high taxes. However, until January 2005 these taxes do not reflect weight or fuel efficiency and only to a limited extent reflect the emissions. Hybrid and electrical vehicles, which use considerably less energy, are exempt from these taxes. A tax exemption was also provided for on-board technology, such as computer and cruise controls, which supports efficient "eco-driving" styles. This led to 75% of new vehicles possessing such equipment. However, the high cost of the subsidy led to the complete abolition of the programme.

The Netherlands has implemented EU Directive 1999/94/EG about consumer information on fuel economy and CO_2 emissions of new passenger cars. An energy label provides information about the relative fuel economy and CO_2 emissions of cars of the same size with a distinction between diesel and gasoline vehicles. From 2002 to 2003, sales of efficient passenger cars were stimulated by premiums of €500 (B-label cars) to €1 000 (A-label cars); however, in 2003 the premium ceased for budgetary reasons. The government analysis implies that the labelling slightly increased the sales of more efficient cars but that the premium increased their sales much more than the label itself.

An extensive programme has been launched to educate drivers about eco-driving when they join driving schools. The programme also draws attention to correct tyre pressure and to stimulation of in-car devices, such as the on-board computer and cruise control. The potential reduction in energy consumption of eco-driving is 10% to 15%.

Spatial planning includes attuning infrastructure, housing and economic activities. The process started in the early 1990s, driven principally by the scarcity of investment capital. One focus area is the stimulation of nodal points like stations and urban centres. A programme, including financial support, has been put in place to help local authorities to design new urban areas and to find ways to reduce energy consumption in transport.

The government has delegated most of the modal shift policy in passenger transport to local authorities. The role of the government is to regulate, steer and facilitate. To improve access to urban areas and to reduce transport emissions, the government helps the local authorities in several ways, such as information exchange, provision of rules and regulations, development of alternatives such as cycling, public transport and walking. The local authorities decide which alternative and to which degree modal shift is suitable for their region.

The main instruments of freight transport policy to facilitate sustainable transport growth are better use of the existing road infrastructure, rail and waterways, and investment in new infrastructure. Attention will also be given to designing a more sophisticated pricing policy but it remains to be defined what this would mean in practice, possibly differentiation according to time and place of transport. The objective is a "transport-efficient economy", meaning a positive balance between the economic benefits of freight transport and its environmental externalities. This is expected to be achieved through reduction of transport trips, stimulation of innovations in transport and logistics and intermodal transport policy.

At present, the intermodal policy is integrated in the freight transport policy, which has two objectives, namely improvement and integration of the different links in the transport chain and the promotion of a modal shift from road transport to railways, inland waterways and short sea transport if this leads to better economic and safety performance of the whole transport chain. Further development of intermodal transport requires development of the public and private infrastructure network and raising awareness and knowledge of the possibilities of intermodal change.

Alternative transport fuels are discussed in Chapter 4 as they are principally not a means to improve energy efficiency but rather to reduce the environmental impacts.

RESIDENTIAL AND SERVICES SECTORS

For residential and services sectors, the principal measures are improving energy efficiency in new and existing buildings, labelling and minimum efficiency standards for appliances, and voluntary agreements. Furthermore, the energy taxes are naturally relevant in considering the trends in energy demand and energy efficiency in the residential and services sector (see Chapter 3).

The government objective is to reduce CO_2 emissions by 3 Mt in the built environment, of which 2 Mt in existing residential buildings and 1 Mt in utility buildings. Half of the improvement comes from technological improvements, which will happen in any case without specific policy but the government needs to develop specific measures to reach the other half.

There are different policies for new and existing buildings. The instruments for new buildings are the Energy Performance Norm (EPN), the Optimal Energy Infrastructure Programme (OEI) and the Energy Performance of the Location (EPL). New residential buildings and utility buildings are legally obliged to fulfil the EPN. The EPN establishes a binding performance level but builders are free to choose the measures to reach it. EPN has been tightened twice since its introduction and as from 2000, residential buildings must be

designed in such a way that no more than 1 000 m^3 of natural gas per year will be needed for heating, hot water and cooking in an average-sized dwelling.

Further tightening of EPN faces practical limits arising from technical possibilities, higher costs and impacts on the interior environment. Therefore, energy savings at housing estate level, instead of building level, are increasingly being looked at. OEI responds to this need. The objective of OEI, established in 1997, is that energy savings and sustainable energy issues will be integrated into the decision-making on energy systems at the district level in major building development areas. The programme aims at increasing collaboration among the participants and integrating energy efficiency considerations into all stages of a building project. OEI involves many activities such as a model for cost-benefit analysis of different options in CO_2 reduction terms, subsidies for energy studies, information dissemination, a helpdesk and a nationwide benchmark of the EPL, which enables participants to see the results of their efforts. EPL is a voluntary instrument by which residential buildings are given a "report mark" of one to ten based on their energy performance. A higher EPL score can be achieved by energy-saving measures when building houses, by improving the efficiency of the energy infrastructure or by using renewables.

The instruments for existing buildings are Energy Premium Regulation (EPR), Energy Performance Advice (EPA) and OEI, which is being extended to existing buildings. Under EPR, €54 million of subsidies are given each year to help the consumers buy energy-efficient household appliances (A-labels in accordance with EU guidelines), and to promote the use of energy-saving technologies and renewable energy in homes for which the building permit was issued before January 1998. Subsidies are financed from the revenues of the regulatory energy tax and can be given to both tenants and landlords. EPR was first implemented in 1999 by giving tax incentives but was converted into a subsidy scheme in January 2003. Later in 2003, EPR for energy efficiency activities was suppressed because part of the budget was given to measures which would be implemented even without the subsidy, and because a majority of the appliances in shops already have an A-label. Also the implementation cost of the policy was regarded high (24% of the subsidies). Activities in renewable energy continue. The EPR was over-subscribed for 2003, which needs to be tackled in the forthcoming budgets. However, further budget cuts in 2004 are not excluded.

The EPA is a voluntary measure whereby the energy performance of a building clearly is calculated with a model, and advice is given to support energy-saving measures. The EPA for residential buildings was introduced in 2000 and for utility buildings in 2003. When one or more measures are applied based on the advice from EPA, the owner of the building can apply for the EPR

with a 10% bonus. Despite the possible reductions in EPR, EPA will continue until 2006 when the EU Directive on Energy Certificates takes force.

EU energy labels have been introduced to a wide range of electric appliances. Minimum efficiency standards are applied to hot water boilers and were introduced in 1999 for refrigerators and freezers. A voluntary agreement has been approved by the European Commission for a reduction of standby energy in televisions and video-cassette recorders.

There is no national legislation for individual energy metering but individual metering is used rather widely. All electricity and gas consumers are metered individually. For district heat, individual meters have not been installed in all households.

Many service sector businesses have joined the Long-term Agreements on Energy Efficiency (LTAs). As of June 2002, the LTA participants accounted for 17% of total energy consumption in the services sector. The LTAs are discussed in detail above under Industry.

MONITORING AND ASSESSMENT

The government occasionally proceeds to the evaluation of subsidies and fiscal measures in order to reduce the number of the so-called "free riders". In the 2001 evaluation it was concluded that the number of free riders can vary a lot and can amount to up to 50% of total subsidies. The government revised several subsidy programmes such as the EPR described above. Consequently, the cost-effectiveness of subsidies was increased. It concluded that cost-effectiveness can be improved by more frequent *ex ante* and *ex post* evaluations but free riders cannot be totally avoided.

The Ministry of Economic Affairs requested five Dutch institutes[5] to create a "Protocol Monitoring Energy Savings", a method and a database to calculate the amount of energy savings realised. The institutes agreed upon a definition of energy use and energy savings. The demarcation with renewable energy, the saving effects of substitution between energy carriers and the role of import and export of energy were elaborated. The changes in energy use are split into a number of effects at both national and sectoral levels, which include the impact of growth, structural changes in production and consumption activities, and savings in end-use or from more efficient conversion processes. To calculate these effects, total energy use is

5. The institutes concerned are the Central Bureau of Statistics (CBS), the Netherlands Bureau for Economic Policy Analysis (CPB), the Energy Research Centre of the Netherlands (ECN), the National Agency for Energy and Environment (Novem) and the Netherlands Institute of Public Health and the Environment (RIVM).

disaggregated as much as possible. Reference energy use is calculated for each segment assuming that savings are not made. The difference between this reference use and actual energy use indicates the amount of realised savings. Past and expected future energy efficiency improvement by sector is shown in Table 5.

Table 5

Energy Efficiency Improvement[1] in 1990 to 2000 and 2010

(% per year)

	1990-2000	*2010 forecast*
National	1.2	1.3
Industry	1.4	1.1
Transport	0.4	1.1
Households	1.5	2.0
Services	0.6	1.1
Agriculture	1.8	1.9
Energy	0.8	0.3

1. Calculated as the "net" energy efficiency improvement after setting aside the impact of *e.g.* structural changes and outside temperature.

Source: The Ministry of Economic Affairs.

CRITIQUE

The Netherlands has implemented an ambitious energy efficiency policy. It includes the early introduction of voluntary agreements, use of innovative measures such as the Benchmarking Covenants, and active monitoring and evaluation of the measures to reduce policy "free riders". However, the target of 1.3% annual improvement in energy efficiency requires further efforts to be achieved. In particular, the government expects energy efficiencies in the transport, household and services sectors to improve much faster in this decade than in the 1990s, which is rather challenging. On the other hand, the momentum of energy efficiency policies has been weakened, partly owing to budget cuts. Noting its contribution to energy security, environmental protection and economic efficiency, more emphasis should be placed on the energy efficiency policies. However, it should be noted that energy efficiency policy at the national level is increasingly driven by EU directives on energy efficiency.

For several sectors, the overall contribution of each sector to the achievement of energy efficiency targets or emissions reduction targets is provided, but the

link between such contribution and individual policy measures is not clear. Whether it is heating and building standards for houses, transport fiscal instruments or voluntary agreements, it is both important and useful to evaluate the contribution of individual measures to energy efficiency goals.

The Long-term Agreements were a very successful instrument to increase energy efficiency in the Netherlands. Encouraged by the good results in the past, and to avoid regulatory and tax measures, Benchmarking Covenants and LTA2 have attracted wide industry participation. However, the average industrial facility participating in the Benchmarking Covenants already belongs to the world top 10% in its sector. This means that energy efficiency improvements in large industries may not be very big during the life of the covenant. Nevertheless, some companies that are not yet among the top 10% are likely to improve and some that already are have announced plans to make further investments in energy efficiency. This leaves some room for improvement as do possible advances in technology. The forthcoming EU emissions trading system has encouraged such efforts because the initial allocation will be made on the basis of the performance of the covenant. In LTA2, the investment criteria have been clearly defined. Both the Benchmarking Covenants and LTA2 appear to be well managed and carefully monitored.

The energy efficiency gains in the transport sector planned by the Ministry of Economic Affairs seem optimistic. The change from a historical trend of 28% growth in road transport's energy demand between 1990 and 2002 to a modest increase of 5% over the next eight years would require major policy measures that are not in evidence. The recently abolished measures of promoting on-board technologies for eco-driving and some fiscal instruments were admirable policies and should be reinstated in some form. The effectiveness of current measures may also be lowered by any petrol price reductions following improvements in retail petrol competition. Other means may also be needed to meet current transport energy efficiency goals. The possibility to introduce road pricing has been expressed by the government in a rather vague way owing to the past difficulties in introducing this policy in the Netherlands. With a view to securing the credibility of the challenging energy efficiency improvement goal in the transport sector, more and stronger measures are needed. In this respect, road pricing would definitely merit more attention as would modification of vehicle taxation to take into account energy efficiency. The eco-driving measure, which has so far covered mainly professional and new drivers, could be extended to all drivers by raising awareness.

Additional policies and measures are also needed in the residential and commercial sectors. While energy efficiency of new buildings is strictly regulated, stronger norms could be put in place for the renovation of existing buildings. The government has made a thorough analysis of the market

impact of the EPR and plans to streamline the subsidies to avoid free riders. While this can improve the cost-effectiveness of the measure, care should be taken not to abolish the subsidies for investments that would not be implemented without subsidies and which can make a good contribution towards energy efficiency. The government is prudent in its approach of maintaining the infrastructure for subsidies because it expects them to be reintroduced in 2006 with the new EU legislation. While demand response can be increased by financial and fiscal incentives, energy efficiency information, training and appropriate price signals to small consumers are also essential to increase the demand responsiveness.

RECOMMENDATIONS

The government of the Netherlands should:

- *Enhance the role of energy efficiency in the energy policy, including securing adequate budget but continuing to pay attention to cost-effectiveness.*
- *Take stronger measures in the transport sector, including road pricing, modification of vehicle taxation, extension of eco-driving and the promotion of on-board technologies.*
- *Introduce further measures in the existing buildings such as stricter building standards for renovated buildings.*

OIL

INDUSTRY STRUCTURE

The Netherlands has no special policies for upstream oil development, import or export of crude oil or oil products, or for the refining industry. The refining industry is treated like any other Dutch industry.

The five Dutch oil refineries are owned by Kuwait Petroleum, Total, Exxon, a joint-venture BP-Texaco and a joint-venture Shell-Statoil. In recent years, no changes in industry structure have taken place.

There are about 4 000 filling stations in the Netherlands, implying a higher density than on average in Europe. Oil retailing is in the hands of Shell, BP, Texaco, Exxon, Q8, Total and the independent companies, of which the bigger are Avia, Gulf, van der Sluijs and Tango. The market shares of each company are not known, but Shell appears to lead the market with a 26% market share. Tango is a new company operating non-manned stations and has recently been bought by Kuwait Petroleum. It has increased its market share by aggressive price competition. Tango has set up 62 such stations and intends to increase the number to 100. Other players are also entering this business model. Other market players have responded to this competition but it is too early to draw conclusions on the impacts on market structure.

A few years ago, the government established a special working party to investigate how to improve economic efficiency in oil retailing. The working party made several suggestions which the government has implemented. Licensing procedure for filling stations along motorways has been altered. Whereas concessions were for unlimited time in the past, now all licences will be terminated and new licences given only for 15 years. One new criterion for providing licences is that within 25 km there may not be another filling station of the same brand. Until January 2004, a filling station was not allowed to sell food and beverages and a restaurant could not sell fuels. As the restriction was lifted, many motorway restaurants can now set up pumps. All filling stations on motorways will be reallocated by auctioning, ten each year. The four biggest oil companies have agreed to reduce the number of their motorway stations from 200 to 150 by the beginning of 2005. In the 2002 and 2003 auctions of a total of 19 stations, eleven changed ownership and six or seven were purchased by new market entrants. Local authorities are responsible for the policy for the non-motorway filling stations in their area.

To help them in this task, the government has provided a toolbox on the various policy aspects. Another new mechanism in place is the monitoring of pump prices, which the government started only in 2002.

OIL PRODUCTION AND EXPLORATION

In 2002, total indigenous oil production (including crude oil, natural gas liquids and other products) was 3.1 mcm, down by 22% from the 1990 level. Average crude oil production was approximately 46 100 barrels per day. In 2002, producing oilfields totalled 13, most of which were located in the Dutch sector of the North Sea. Table 6 summarises the Dutch oil reserves.

The oil and gas producers are co-operating through the Netherlands Oil and Gas Exploration and Production Association (Nogepa). There are many exploration licenses (for oil and gas) but no oil exploration took place in 2002. The government constantly monitors the activity levels and the attractiveness of the exploration and production business climate. At present, an independent consultant is carrying out a benchmark study of the Dutch exploration and production climate compared to that of the other countries around the North Sea.

Table 6

Dutch Oil Reserves in January 2003 (bcm)

Area	*Remaining proven reserves*	*Remaining expected reserves*
North-eastern Netherlands	0	0
Western Netherlands	1	5
Continental shelf	8	21
Total	**9**	**26**

Source: The Ministry of Economic Affairs.

The Mining Act and the accompanying Mining Decree and Mining Regulations took force in January 2003. The act replaced over two centuries of legislation on mineral production. There were no major changes to the system of exploration and production licences. The main provisions of the Mining Act for the oil sector are:

- A new storage licence for underground storage.
- A mining environmental licence for cases not covered by the Environmental Protection Act.

- The production and storage plan, dealing with proper planning and management of resources.
- The possibility for the Minister of Economic Affairs to request financial security for the compensation of potential damages resulting from ground movement.
- Payments to the provinces and state participation in exploration and production licences.
- Enforcement and supervision by the State Supervision of Mines.
- Establishment of advisory bodies, the Mining Board and the Technical Commission for Ground Movement (TCBB). TCBB was established in 2000 as an independent commission to advise about the damage when citizen and production companies do not agree.

The financial regime for oil exploration and development is the same as for natural gas. The main difference is that Energie Beheer Nederland (EBN) does not usually participate on behalf of the State in oil exploration and development while it does for natural gas (see section on Natural Gas Production and Exploration).

SUPPLY, DEMAND AND TRADE

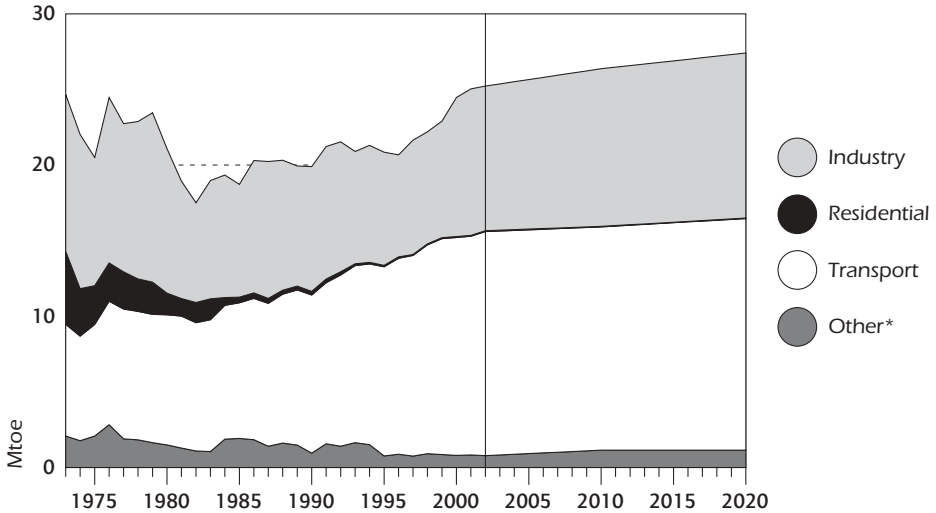
Oil supply increased from 24.3 Mtoe in 1990 to 29.8 Mtoe in 2002. The share of oil in TPES decreased between 1973 and 1990, from 49.5% to 36.6% but increased slightly to 38.2% by 2002. This is very close to the average for OECD Europe. The share of oil is projected to stay at the present level at least until 2010.

The Netherlands depends for 89% of its oil demand on imports as domestic production amounted to 3.2 Mtoe (2.2 Mt) in 2002. Crude oil imports totalled 46.8 Mt and product imports 51.2 Mt. Crude oil exports were 0.9 Mt and product exports 65.4 Mt. Crude oil imports came from diverse sources, the largest being the UK (24%). Oil product sources were even more diversified; the share of OECD countries was 41%. The majority of oil product exports were sold to the OECD markets.

The use of diesel in transport is increasing much faster than the use of gasoline. Total diesel consumption climbed by 50% between 1990 and 2002 whereas gasoline consumption grew by 20%. The government policy is to limit the use of diesel in transport to commercial vehicles and to a maximum of 20% of private vehicles to avoid certain emissions. However, the government is ready to change its policy together with technological improvements of diesel vehicles.

Figure 11

Final Consumption of Oil by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

PRICES

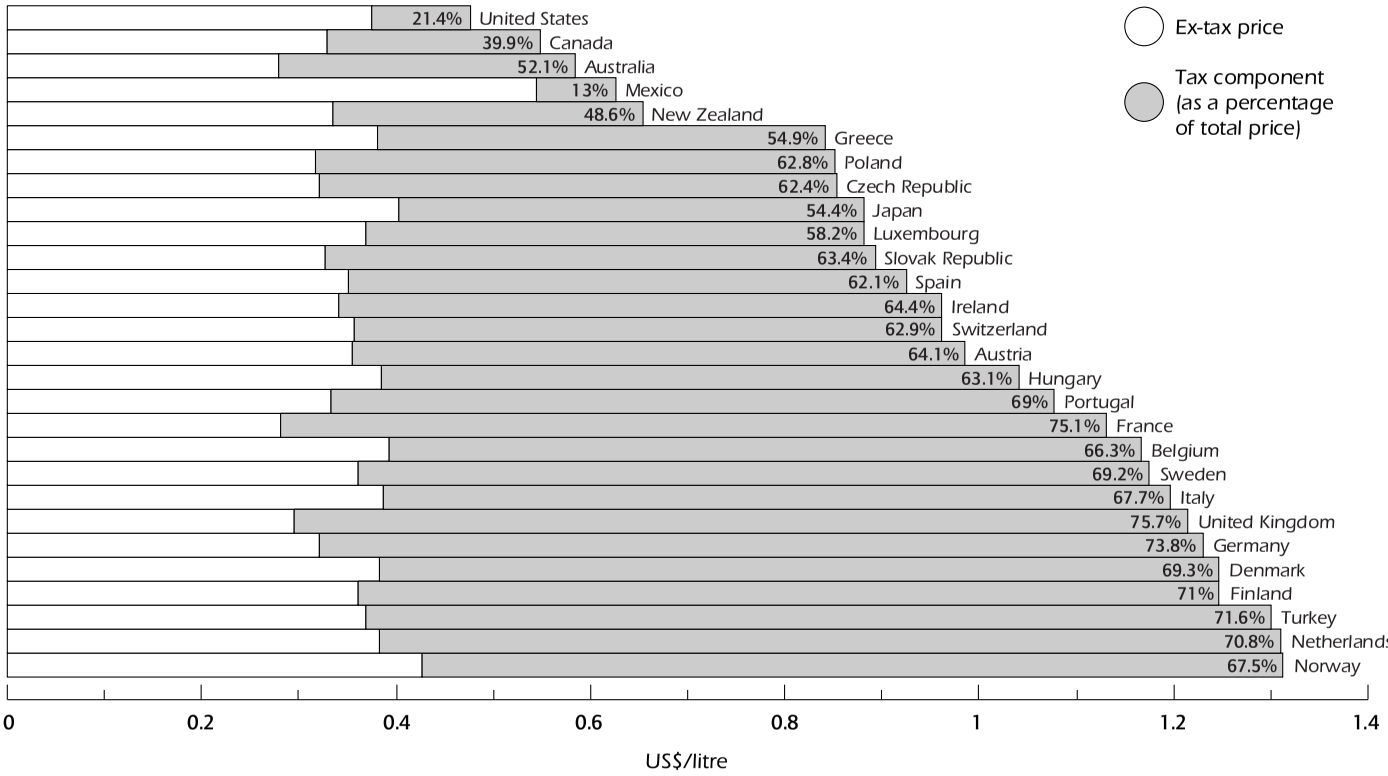
In 2003, gasoline prices in the Netherlands were the second-highest in the OECD and there is a clear difference compared to the neighbouring countries (see Figure 12). This is not fully explained by the taxes levied on gasoline (70.8% of retail price in the third quarter of 2003) because many countries levy a similar or even higher level of taxes. Diesel prices are close to the OECD average (see Figure 13). Compared to the nearby countries, they are lower than in Germany but higher than in Belgium and Luxembourg. For households, owing to its lighter taxation, natural gas is cheaper for heating than light fuel oil (see Figure 14).

EMERGENCY RESPONSE MEASURES

Although Dutch legislation conformed with IEA rules, the Netherlands revised its stockpiling legislation in part to be more in line with the changes to EC stockholding obligations under Directive 68/414/EC as amended by Directive 98/93/EC. The new law is known as the Stockpiling Act of 2001 and came into effect in April 2001. Under this law the government has the authority to impose stockholding obligations through compulsory industry stockholding operating in the Dutch oil sector, and through a stockholding

Figure 12

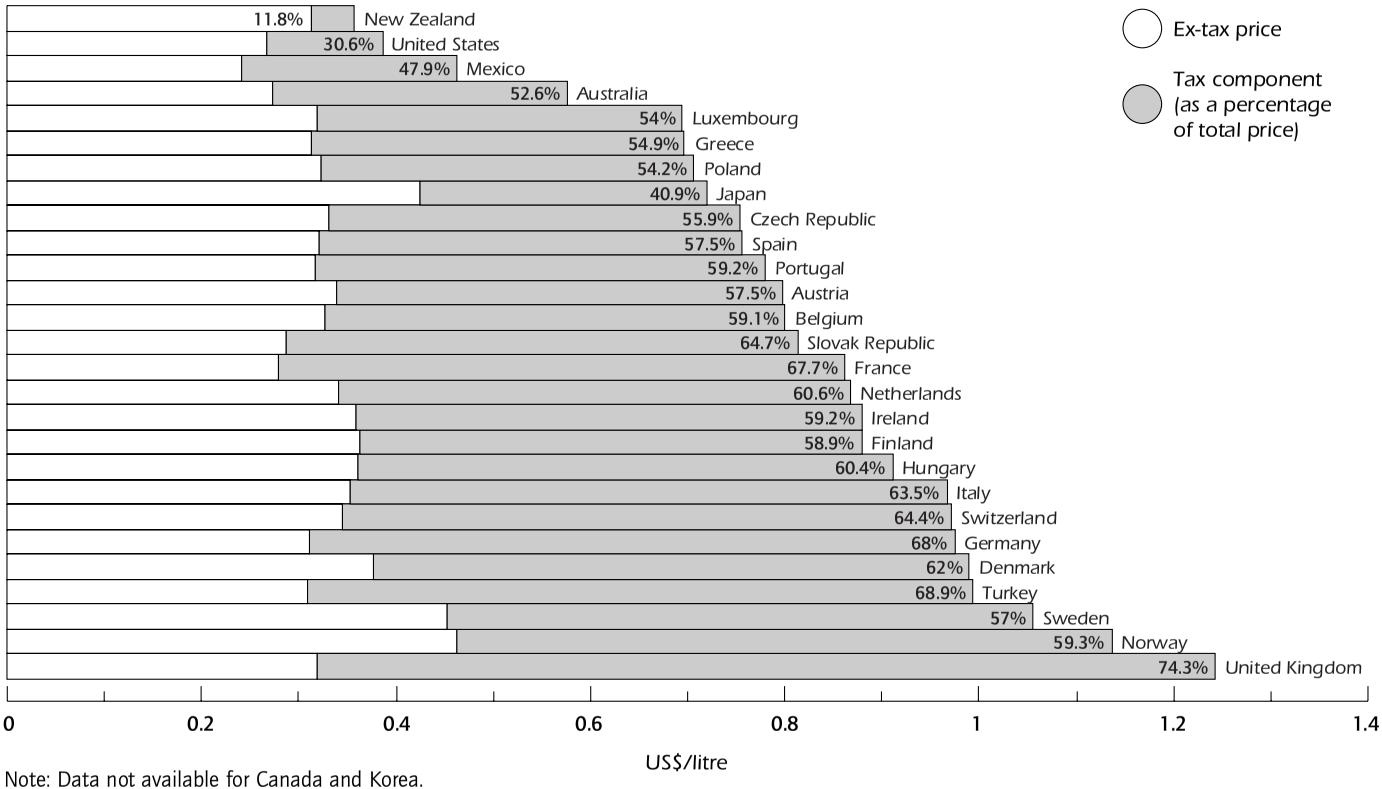
OECD Unleaded Gasoline Prices and Taxes, Third Quarter 2003



Note: Data not available for Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 13

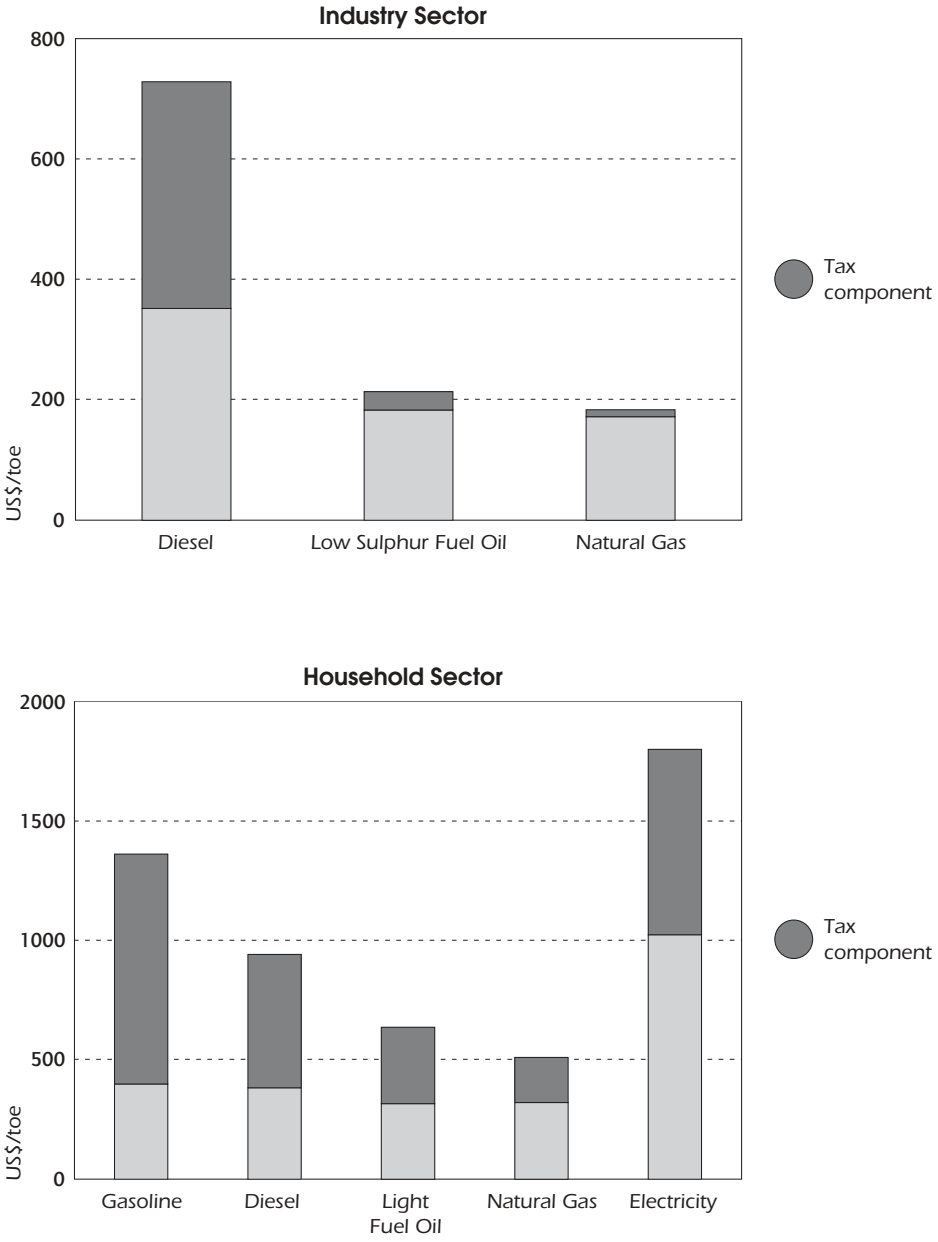
OECD Automotive Diesel Prices and Taxes, Third Quarter 2003



Note: Data not available for Canada and Korea.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 14

Fuel Prices, 2002



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

agency called the Central Organisation of Oil Stockholding (COVA). COVA is an independent body acting on behalf of the Ministry of Economic Affairs. Under the previous legislation, COVA held 65% of national stockholding obligations in physical crude oil and products. Under the new law, COVA holds 85% of Dutch obligations. COVA now has the choice of storing oil stocks itself and/or, for the first time, to reserve physical oil stocks held by industry through the purchase of "ticket" contracts. COVA only uses long-term ticket contracts of one year. After the new law was established, COVA has fully covered the increase of its stock obligations for the first year using oil stock tickets.

Moreover, the conditions for the further use of tickets are set yearly with a fixed price in euros per tonne, at fixed locations in the Netherlands. The ticket-holder has the obligation to deliver quality finished products of gasoline or diesel in the Netherlands to COVA within a month of the request. These stocks must be stored in a location where other oil is already stored, so that infrastructure exists to distribute products when required. These stocks are maintained in the Netherlands and not abroad. The Ministry of Economic Affairs issues an annual statement on tickets and developments within the market. Initially, a 25% cost reduction was achieved by using tickets.

Also under the new law, oil companies are not restricted on the amount of their stocks, required to cover their obligation, that are outside the Netherlands. However, in order for these stocks to be counted towards a company meeting its stockholding obligations, such foreign stocks have to be held in a country with which the Netherlands has entered into a bilateral governmental agreement on oil stockholding matters and with a minimum 90-day contract. Most bilateral stockholding contracts (tickets) are commercial contracts between companies for mutually held bilateral reserved stocks.

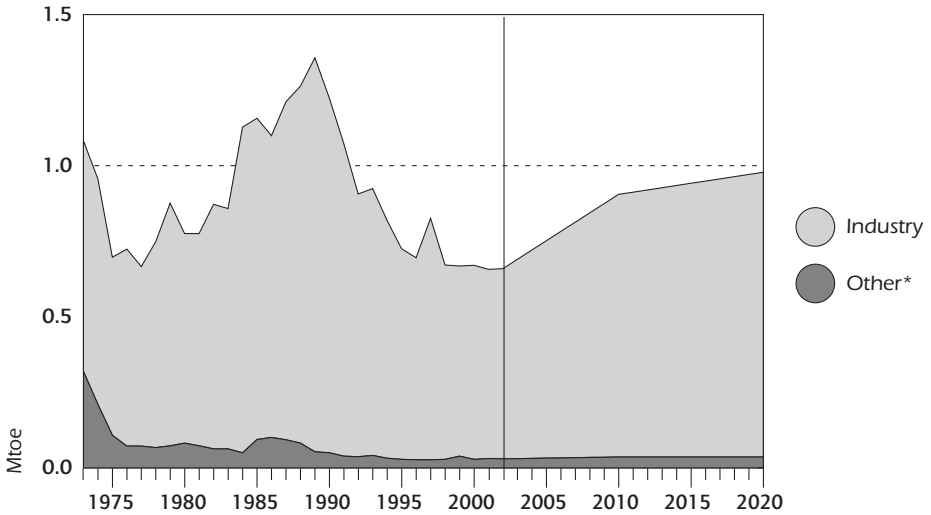
Government bilateral agreements provide an assurance that any oil stored abroad under a ticket contract will be allowed to be repatriated to the Netherlands by a company if required by the Dutch government. Only oil stocks stored under such bilateral agreements will be counted as Dutch stocks. Moreover, the EU has developed a framework for monitoring these stocks.

COAL

In 2002, coal demand was 8.4 Mtoe, 6% less than in 1990. Coal's contribution to the TPES was 10.8%, somewhat less than the 13.4% share in 1990. About 70% of coal used was steam coal for power generation and the remaining was mainly coking coal; 28% of electricity was generated from coal in 2002. The government estimates coal demand to continue approximately at the current level until 2010 and slightly increase thereafter.

Figure 15

Final Consumption of Coal by Sector, 1973 to 2020



* includes commercial, residential, public service and agricultural sectors.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Coal is imported from diverse sources. Coking coal comes mainly from Canada, Australia, the US and Venezuela and steam coal from South Africa, Colombia, Indonesia, the US and Australia.

The so-called coal covenant is an agreement between the Dutch government and the six electricity production companies which operate coal-fired power plants. In this agreement, the companies are committed to reduce the CO_2 emissions from coal by 5.8 Mt per year in the period 2008 to 2012. More than half of this target, 3.2 Mt, will be realised by the substitution of coal by biomass. This corresponds to an installed biomass power capacity of 508 MW. Subsidies are given to support the activity.

Reduction of CO_2 emissions from coal by carbon sequestration and storage is being addressed by two R&D projects. These are discussed in more detail in Chapter 9.

NATURAL GAS

INDUSTRY STRUCTURE

The Dutch gas market structure, *Gasgebouw*, was developed after the discovery of the large Groningen gas field (see Figure 16). It is a partnership

between the State and the private companies and is based on a set of agreements, including the Agreement of Co-operation from 1963, which is the most important one. The parties to the agreement were Shell, ExxonMobil, NAM[6] and Dutch State Mines (DSM)[7]. The purpose of the agreement was the co-ordination of production, transport and sales of Groningen gas, as well as transport and sales of gas produced elsewhere in the Netherlands. The Maatschap (partnership) Groningen and Gasunie were formed under the agreement. The concession for the Groningen field is held by NAM, which is also the operator, but gas extraction is managed under the authority of the Maatschap Groningen.

Gasunie was established in 1963 for gas transport and sales. Its ownership structure is 50% State, 25% Shell and 25% ExxonMobil. The Dutch State owns a 10% stake directly and a 40% stake through EBN. Gasunie owns and operates the entire onshore high-pressure pipeline grid, but not the offshore grid, which was developed later. Until the Gas Act of 2000, Gasunie purchased all gas sold in the Netherlands and supplied it to gas distribution companies or directly to large consumers.

In 1974 and 1975, production from other, much smaller fields came on stream. Many companies are active in developing the smaller gas fields. The largest ones are shown in Table 7. EBN and NAM are also active in the development of smaller gas fields. While gas from the small fields did not have to be sold to Gasunie, Gasunie has been obliged to buy gas from the small fields, if requested (see Natural Gas Production and Exploration). The prices paid by Gasunie are about the same as gas import prices with no government subsidy involved.

Table 7

Major Natural Gas Production Companies

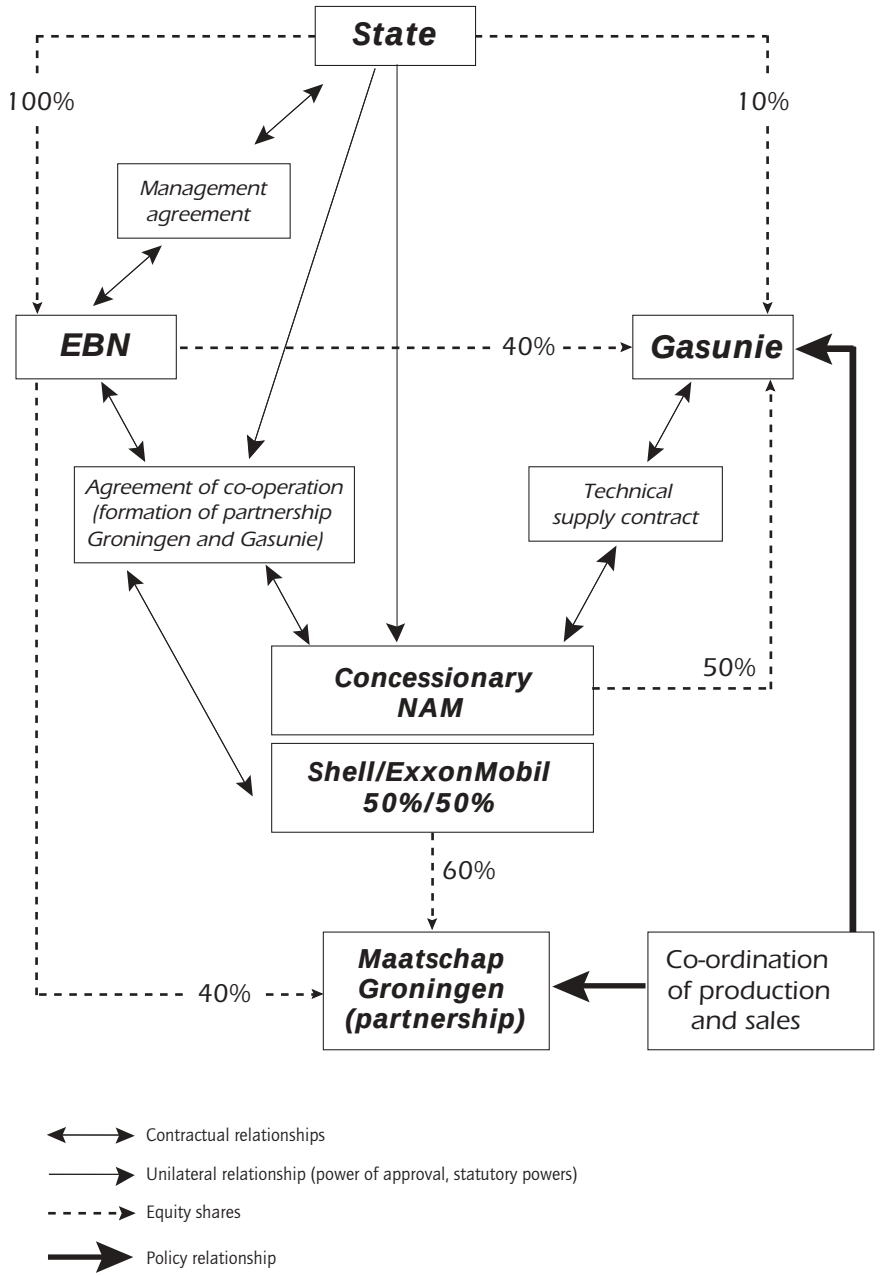
EBN (state-owned)	Unocal Netherlands Ltd
NAM	BP Nederland Energie BV
Wintershall Noordzee BV	Veba
Petro-Canada Nederland BV	Oranje-Nassau Energie BV
TotalFinaElf E&P Nederland BV	Dyas Nederland BV
GDF (Gaz de France) Participation Nederland BV	Conoco (UK) Limited
Lasmo Nederland BV	Lundin Netherlands BV
Clyde Petroleum Exploratie BV	Dana Petroleum (E&P) Limited

Source: The Ministry of Economic Affairs.

6. Nederlandse Aardolie Maatschappij (NAM) is a 50%/50% joint-venture of Shell and ExxonMobil.
7. Dutch State Mines (De StaatsMijnen, DSM) was a state-owned coal mining company. It was privatised in 1989 and the State's energy interests were transferred to the new state-owned Energie Beheer Nederland (EBN). DSM still manages EBN on behalf of the government for a fee.

Figure 16

The Structure of the Dutch Gas Industry (*Gasgebouw*)



Source: The Ministry of Economic Affairs.

There are about 30 gas distribution companies in the Netherlands. The largest ones are listed in Table 8. The distribution companies are the owners and operators of the local distribution networks. After the introduction of the Gas Act in 2000, their retailing activities have been legally separated into sales companies. Despite legal unbundling being implemented, ownership of the distribution and retailing companies has for the most part remained the same. All distribution companies are private-law joint stock companies, but in nearly all cases their shares are held by the municipalities. Most of the Dutch distribution companies also supply other forms of energy, especially electricity and/or heat, and often other services as well. Both electricity and gas distributors are organised in an association called EnergieNed (*Vereniging van Energiedistributiebedrijven in Nederland*). Before market liberalisation, EnergieNed negotiated gas purchase contracts with Gasunie collectively for its members.

Table 8

Major Natural Gas Distribution Companies

- Netbeheerder Centraal Overijssel BV
- DELTA Netwerkbedrijf BV
- Zebra Gasnetwerk BV
- ENECO (various subsidiaries)
- ESSENT (various subsidiaries)
- Netbeheer Haarlemmermeer BV
- Intergas Netbeheer BV
- InfraMosane NV
- GNET Eindhoven BV
- Continuon Netbeheer NV
- Obragas Net NV
- ONS Netbeheer BV
- ENBU BV
- RENDO Netbeheer BV
- Westland Energie Infrastructuur BV

Source: The Ministry of Economic Affairs.

There are two gas trading hubs in the Netherlands, a physical one called EuroHub and a virtual one called Title Transfer Facility (TTF). EuroHub, developed by Gasunie, is located in the north-east of the Netherlands and is operated by Gasunie's subsidiary, a private limited company. The EuroHub started to operate in February 2002 with the basic services for title transfer at the hub points Emden and Oude Statenzijl/Bunde. In September 2002, these services were expanded to include transportation between Flanges and a six-hour balancing service. EuroHub will facilitate a firm Title Transfer[8] Facility (TTF), similar to that of the National Balancing Point in the UK. TTF works as a virtual (*i.e.* booking of physical capacity is not necessary for trading) entry or exit point in the shipper's portfolio. As of November 2003,

8. Title transfer is the administrative processing of transfers of gas from one shipper to another. This process facilitates only the transfers of gas which is already present within a TSO's network.

there are around ten active players in the TTF with five to ten deals per day trading a volume equivalent to 5% of national consumption.

NATURAL GAS PRODUCTION AND EXPLORATION

In 2002, Dutch natural gas production totalled 75.3 bcm. Onshore gas production accounted for almost two-thirds and offshore fields one-third. The total number of producing gas fields, the majority of them being very small, is almost 200. Just over half of them are offshore.

As shown by Figure 17, production from Groningen rose exponentially between 1963 and 1972, but as of 1973 production from small fields grew significantly. Offshore production began in 1976. The development of small fields started as a consequence of the so-called "small fields policy", introduced in 1973. The purpose of the small fields policy is to encourage production of other, smaller fields to prolong the life of the Groningen field. The policy was facilitated by the fact that the Groningen field had unique flexibility, with deliverability ranging between zero and 500 mcm per day, enough to cope with the variations between summer and winter demand in the Netherlands and also in the wider European context. The flexibility allowed the use of Groningen as a swing field, which explains its production variations in Figure 17.

The government considers that the continuation of the small fields policy is important for security of supply, maintaining flexibility and good resource management. The industry views are somewhat different as it considers continuation of the small fields policy in its current formulation incompatible with the liberalised markets. The Second Chamber of parliament has stressed the importance of the small fields policy on several occasions and the Minister of Economic Affairs expressed the same view in letters to parliament concerning the restructuring of the *Gasgebouw*. Apart from this, the ministry constantly monitors the overall mining climate because it is important that the Netherlands remains an attractive country to start new exploration and exploitation activities.

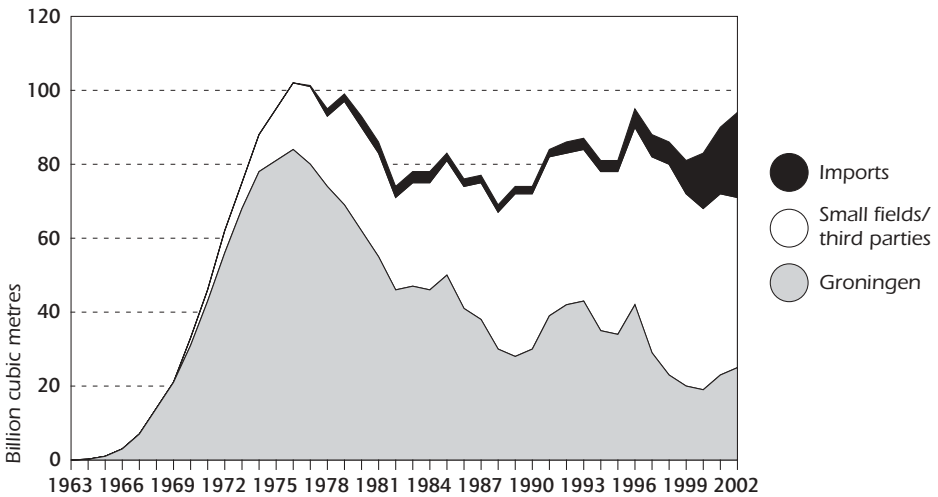
The industry calls for improvements in the mining climate. It considers that developing small fields is very sensitive to cost-overruns and, therefore, risky. It particularly criticises that the government abolished in 2002 the "depreciation at will" for investments in the continental shelf[9]. Nogepa

9. "Depreciation at will" for continental shelf assets was introduced in 1995 to stimulate investment in the exploration and production of small fields. It was a tax facility that allowed oil and gas companies to take the depreciation of investment in offshore wells, platforms and pipelines when convenient, for example directly after the assets were acquired.

estimates that this led to the cancellation of 27 projects and led to the re-evaluation of numerous other projects with a 39 bcm total volume of production. A recent consultant study by Gaffney, Cline & Associates for EBN at the request of the Ministry of Economic Affairs compared the investment climate in countries around the North Sea. One of the conclusions was that fiscal conditions in the Netherlands are relatively unfavourable. In addition to fiscal conditions, several uncertainties also hamper investment. These include uncertainty caused by changes in policy and legislation, market liberalisation and environmental requirements. A review of fiscal conditions is expected to take place in 2004 and the government is considering revising environmental licensing procedures, reviewing the possibilities to produce gas in sensitive natural areas and making the exploration and production licences conditional on actual activity (*i.e.* if those obtaining a licence do not show adequate activity they will lose the licence).

Figure 17

Production from Groningen and Small Fields, 1963 to 2002

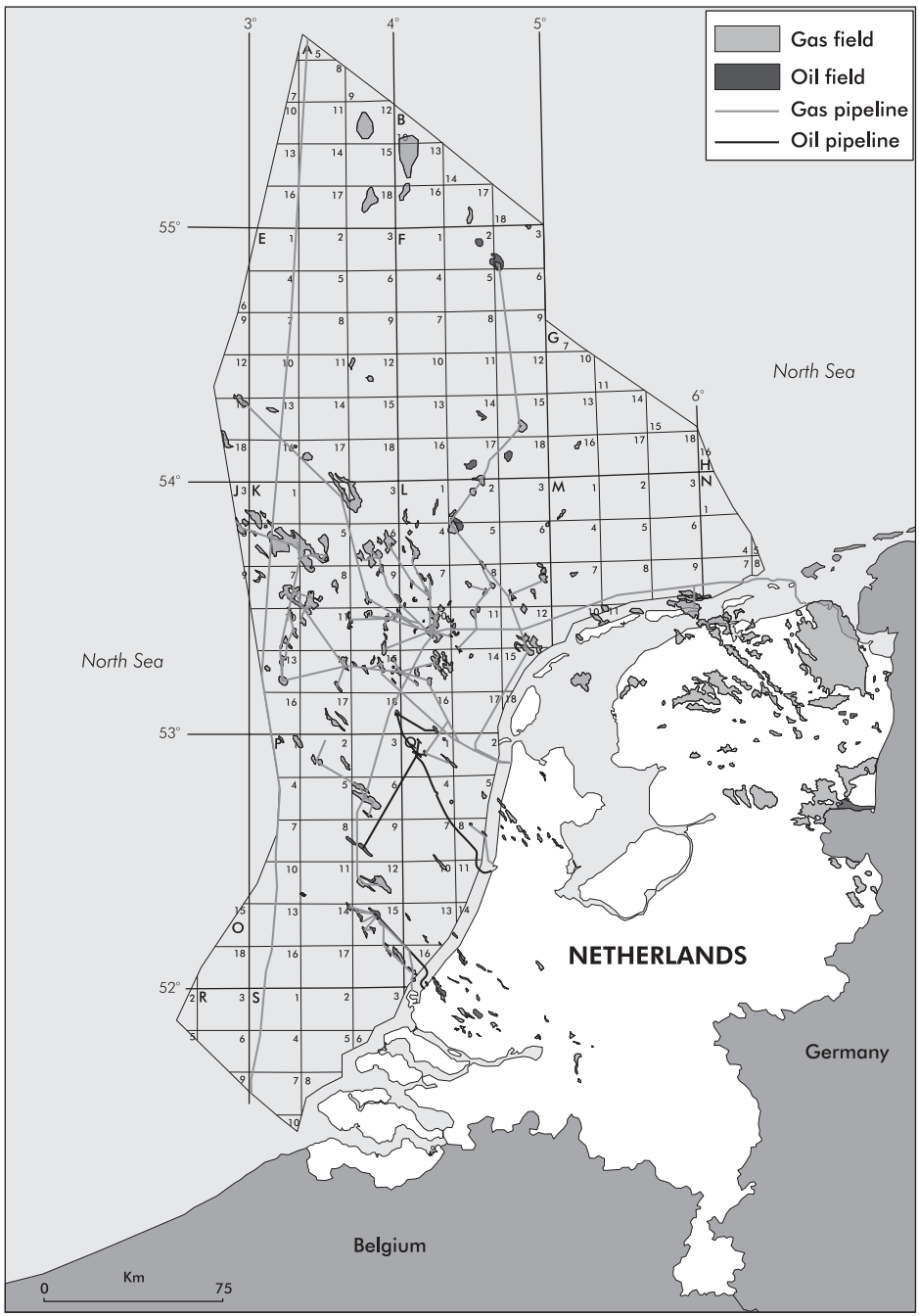


Source: Gasunie.

The State has the power to decide the annual production rate of the Groningen field. This is done in co-operation with the industry. Instead of capping the production from the Groningen field, a cap of 80 bcm has been set on total domestic production in the Third White Paper on Energy (1996). Because the Groningen field works as a swing supplier, it is the only field affected by the national production cap. The 2000 Gas Act states that the Minister of Economic Affairs assesses the situation every two to four years in the Energy Report and, if necessary, changes the national production level. In

Figure 18

Dutch Small Fields



Source: Gasunie.

the 1999 and 2002 Energy Reports, no adjustments were made but the situation is changing. Given that the amount of production from the small fields is declining and the production of the Groningen field is making up the difference, thus leading to its faster depletion, the minister proposed to the parliament to replace the national ceiling by a specific ceiling to the Groningen field.

The number of exploration wells declined from 28 in 1998 to 17 in 1999 and to 8 in 2000, partly driven by low oil prices in 1998 and 1999. The government introduced measures to boost exploration and development. Consequently, the number of exploration wells increased again to 18 in 2001 and in 2002, 42 wells were drilled: 20 for exploration, 4 for appraisal and 18 for development. It appears that 2003 is going to show a decline, which potentially will continue in 2004. Furthermore, areas under exploration and production licences are declining. The government will consider measures to counter this development. One alternative being considered is making licensing conditional on actual exploration and production activities because at present, some licence-holders are not active and are consequently blocking the development of their area from other possible developers.

The technical success rate of exploration wells in the Netherlands has been approximately 55% over the last five years. This figure is high in international comparison. However, it should be noted that not every gas discovery will be developed economically. Also the size of the discoveries has become smaller over time.

The Netherlands has the second-largest gas reserves in IEA Europe. The proven gas reserves are 1 545 bcm including the Groningen gas field and small fields. In addition, the expected reserves stand at 1 662 bcm (see Table 9). However, the development of many deposits is difficult because 25% of onshore futures[10] are underneath environmentally sensitive areas. In addition to

Table 9

Dutch Natural Gas Reserves in January 2003

(in bcm of Groningen gas equivalent)

Area	*Remaining proven reserves*	*Remaining expected reserves*
Groningen field	963	1 051
Other onshore territory	170	266
Continental shelf	195	345
Total Netherlands	**1 545**[1]	**1 662**

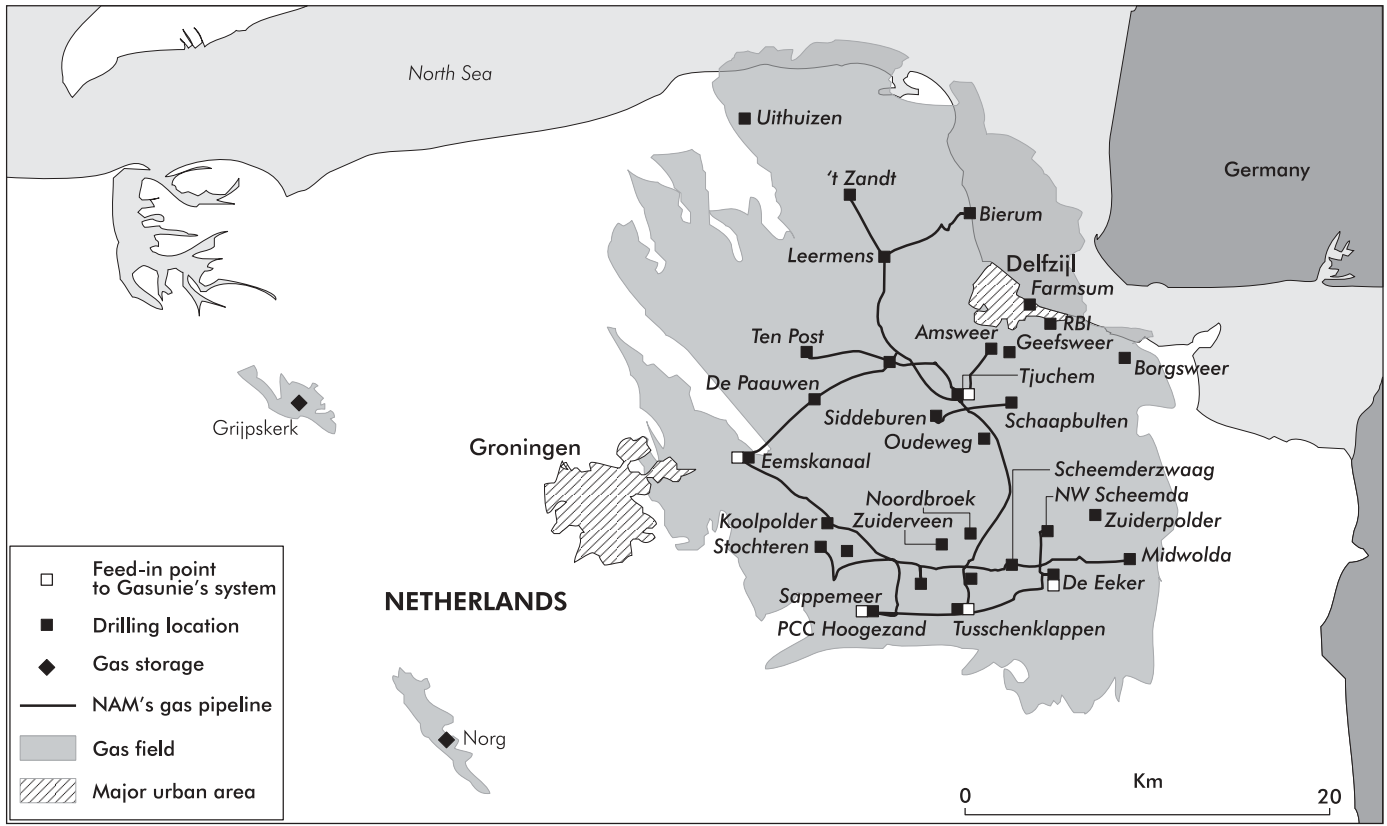
1. This figure was obtained by probabilistic summation of proven reserves in individual fields.

Source: The Ministry of Economic Affairs.

10. Potential gas reserves identified by seismic investigations but not yet drilled.

Figure 19

The Groningen System



Source: NAM.

political sensitivity, licensing and permitting procedures take a long time, which delay the projects and add to the investment risks.

On behalf of the State, EBN participates in all stages of offshore gas exploration and development. Gas revenues still represent a significant part of the government income. Gas production is subject to a State Profit Share (SPS). The payments to the State amount to some 70% of the profits of offshore fields and 40% to 95% of onshore fields. Since January 2003, royalties have only been levied on onshore projects, at rates that vary between 0% and 7%.

INFRASTRUCTURE

At present, Gastransport Services (GTS), Gasunie's transport department, manages the national gas transmission networks and international interconnections, and facilitates network access.

The length of the national high-pressure network is 11 600 km. Around 85 bcm of gas is transported annually through the transmission grid; this includes the transit of Norwegian gas to Belgium and France, and UK gas to Germany, amounting to 4.7 bcm in 2001. The main expansion option is a pipeline from Balgzand to the UK (Bacton), which is currently under consideration. The pipeline would deliver Dutch gas to Centrica (UK) following the contract for 8 bcm, which was signed in 2002.

The length of the gas distribution network is about 100 000 km and connecting virtually all homes, offices and factories. The density of networks in the Netherlands is the highest in Europe.

At the beginning of the 1990s, NAM and Gasunie concluded that additional gas production capacity was needed because they wanted to ensure security of supply then and in the future, and because the production capacity of the Groningen field was slowly declining. They considered two alternatives: injecting gas under high pressure in underground storages or installing compressors at the Groningen field. It was decided to start by turning suitable gas fields into underground storages but now it has become evident that new compression capacities are needed as 60% of Groningen reserves have been depleted. Other upgrading of facilities will also be necessary to meet with new environmental regulations as the production equipment is ageing. NAM estimates the investment needs altogether at €1 billion.

One objective of storage is to have enough production capacity in winter to support the slowly declining Groningen capacity (short-time security of supply). Another is that storage enables Gasunie to always take in the small fields gas in the summer, when production is high and consumption is usually

very low, for use in the next winter. There are three underground storage facilities, namely Grijpskerk, Norg and Alkmaar.

Uncertainty about the regulatory regime for gas storage has delayed investments in storage, such as a BP-project in a gas field. Nevertheless, recently GTS, Nuon and AKZO/Nobel have taken an initiative to build a 180 mcm storage facility in a salt cavern.

A peak-shaving installation for producing and storing liquefied natural gas (LNG) is in operation in Maasvlakte at the mouth of the River Maas. On very cold days, if the capacity of the normal system is insufficient to meet demand, gas can be withdrawn from this reserve supply. The installation was built in 1977, and underwent expansion in 1989. The maximum withdrawal capacity is 1.3 mcm of gas per hour and the total storage capacity is equivalent to 75 mcm of gas.

Access to international interconnections is congested because most of the capacity is booked on a long-term basis for Gasunie Trade and Supply or for transit. The available capacity represents only 10% of the physical capacity at the import points. GTS is obliged to publish available gas import and export capacities 15 months in advance. The Brattle Group[11] has estimated, on the basis of data from GTS, that the contractual availability in the interconnections is only about 2.3 bcm per year, which could only serve around 10% of small consumers.

DEMAND, SUPPLY AND TRADE

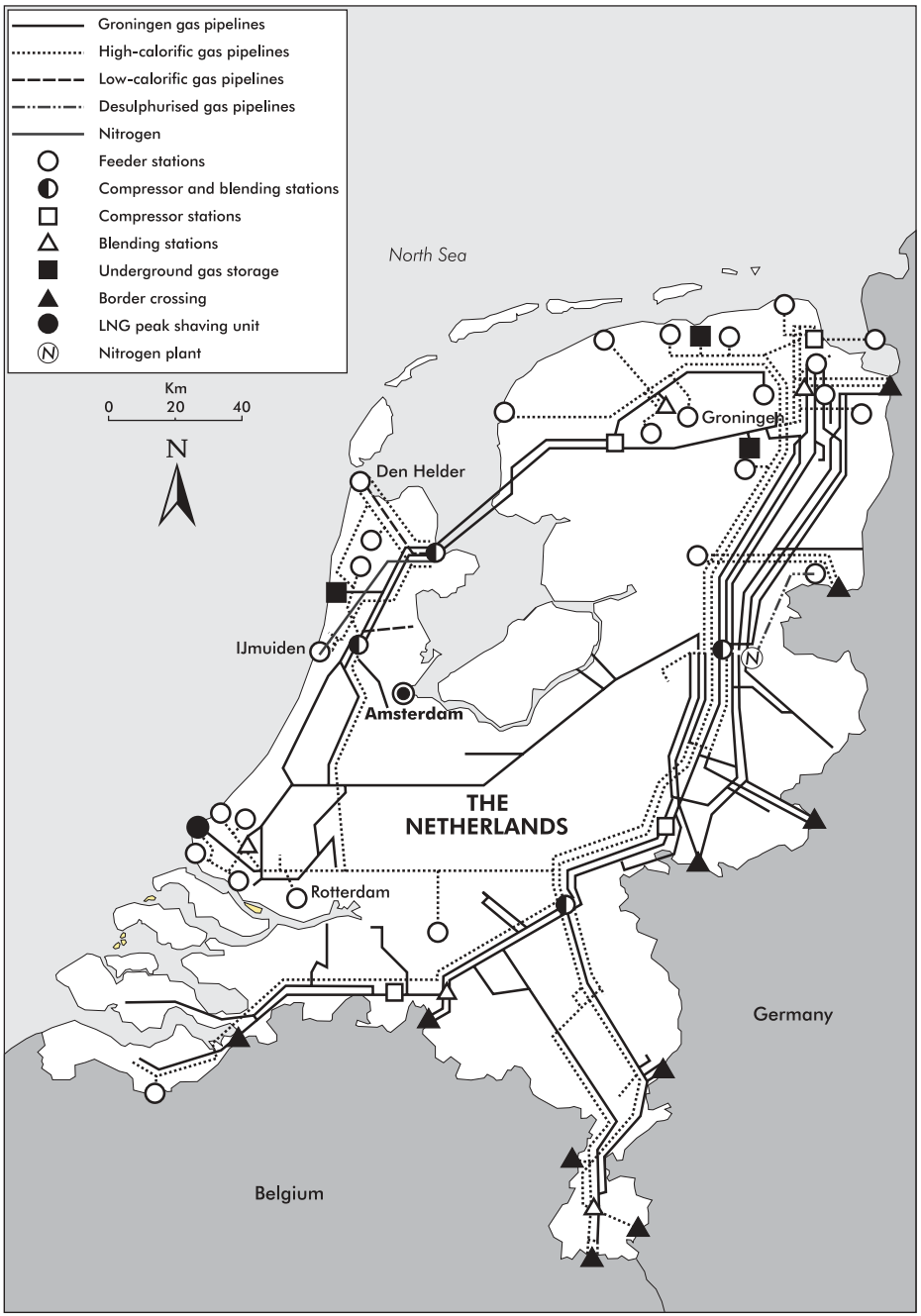
In 2002, the Netherlands produced 75.3 bcm of natural gas, of which 52.5 bcm was exported. While most of the exported gas was produced in the Groningen field, in some cases small fields gas has been exported. Gas imports have been rapidly increasing, from only 2.8 bcm in 1990 to 11 bcm in 1999, 17 bcm in 2000 and 26.8 bcm in 2002. All imported gas was transported via pipelines from the UK (41%), Norway (38%) and Germany (21%). Most of the exports went to Germany (45%), France (12%), Belgium (17%), Italy (17%) and the UK (7%).

The Netherlands has the highest level of gas penetration in the world. Natural gas demand increased by 16% between 1990 and 2002, reaching 35.8 Mtoe and representing 46% of TPES compared to the IEA average of 21%. The government forecasts an increase in total gas demand to 36.6 Mtoe in 2010

11. *Wholesale Gas Competition in the Netherlands and Implications for Phase III Customers*. The Brattle Group, Ltd. June 2003.

Figure 20

Natural Gas Infrastructure



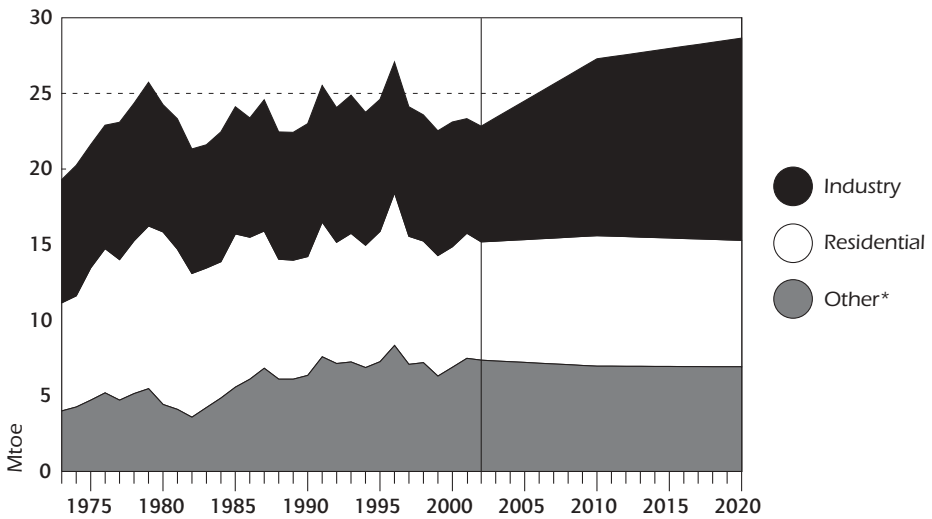
Source: *Natural Gas Information 2003*, IEA/OECD Paris, 2003.

(45% of TPES) and to 43.1 Mtoe in 2020 (48% of TPES). Natural gas use for public electricity generation and heat production accounts for 40% of total gas demand. In 2002, the final consumption of gas was 22.8 Mtoe, of which 66% was used in the residential and services sectors and 34% in the industry sector, largely in CHP plants. Average gas consumption in homes has been declining over the past ten years as a consequence of improved insulation and boiler efficiency, but the decline has been slowed down by an increased use for hot water production as, for comfort, smaller hot water boilers are being replaced by larger ones.

Two types of gas, low-calorific (L-gas, 43.8 to 46.5 MJ/m^3) and high-calorific (H-gas, 51.8 MJ/m^3), are used in the Netherlands. Whereas the power plants and industries use H-gas, L-gas is used in the greenhouses and households. The Groningen field accounts for approximately 60% of the Dutch L-gas production, with the remaining 40% coming from small fields H-gas that is converted to L-gas. GTS operates ten and Delta one blending stations, which mix different types of gas according to demand and use nitrogen to prepare L-gas. Most of GTS's blending capacity is contracted by Gasunie Trade and Supply on a long-term basis and the Delta facility is used to provide L-gas to its own consumers.

Figure 21

Final Consumption of Natural Gas by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

SECURITY OF GAS SUPPLY

There has been a major change in the general orientation of government policy for security of gas supply. Before the 2000 IEA in-depth review of Dutch Energy Policy, the government announced that it did not intend to take any steps to ensure long-term security of supply at the national level after 2007. Instead, it expected that such steps would be taken at the EU level. However, the need to restructure Gasunie and *Gasgebouw* led to reorientation of the policy. In effect, today security of gas supply is of major importance in the Dutch policy and has been incorporated in many policy instruments. Nevertheless, the government believes that security of supply on a global and European level is best achieved by close international co-operation and by a good international investment climate. For instance, an information exchange programme has been established between Gasunie and Gazprom.

Obligations have been or will be put in place for producers, network operators and suppliers on supply security and reliability. Special care is taken for small end-users, namely households and small companies. Nevertheless, the objective of the government is to limit regulation as much as possible so as not to deter the market and to ensure a sound climate for investment, while maintaining a high supply security level.

The 2002 Gas Act includes several provisions for security of gas supply. The network operators must prove that their network can handle future gas demand. The Ministry of Economic Affairs has obliged GTS to publish every year a Gas Capacity Plan for the transmission network analysing the bottlenecks and required future investments to address them.

As small consumers (with annual consumption less than 170 000 m^3) will be allowed to enter the market in July 2004, a new decree was introduced on 23 October 2003 to enhance their supply security. This decree sets the obligation of supply security for the national transmission system operator (TSO), which is yet to be appointed but is likely to be GTS. The implication of this is that the TSO will serve as a supplier of last resort in case the temperature drops below –9 °C. Supply to small consumers, both before and after liberalisation, is subject to a licence obliging suppliers to secure supply at reasonable tariffs. Furthermore, the government is planning new regulations to secure supply in the case of a supplier bankruptcy, and to guarantee gas availability during peak demand.

Safety and quality of the network are essential for avoiding supply interruptions. Government studies show that at present gas networks are sufficiently reliable. To ensure good reliability also in the future, the government, in co-operation with DTe, plans to introduce reliability standards paying attention to both the costs of gas supply failure and the costs of measures. Network operators fulfilling the quality criteria will receive quality certificates. The government recognises that long-term reliability must be

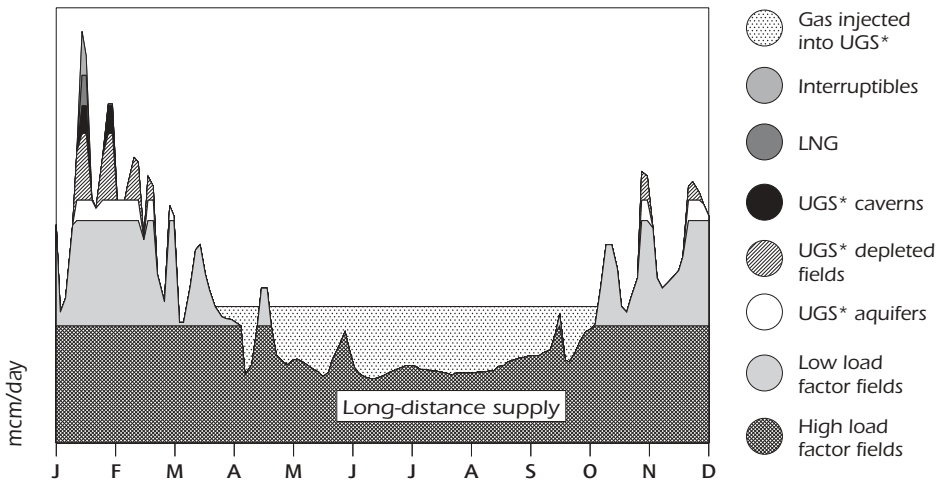
guaranteed through the right economic and regulatory incentives for maintenance and investments by network companies, and plans to revise the current regulatory framework for gas network companies but the details are not yet known.

Flexibility at the gas production phase improves the security of supply. New discoveries can quickly be brought onto production because of the swing capabilities of the Groningen field. It provides balancing, which enables other gas fields to produce at rather constant rates throughout the year. This adds value to the gas and also reduces price volatility.

Seasonal variations in total gas demand are less pronounced in the Netherlands than in other European States because households account for only 22% of total gas demand (2002) but significant variations can still be seen in their demand. Most Dutch small consumers do not have a hot water storage tank because Groningen can provide swing service more cheaply than a storage tank. In addition to the swing capacity of the Groningen system, bolstered by underground storage and LNG storage, the Dutch gas industry addresses the seasonality of the annual demand through interruptible contracts with the power industry. Recognising the importance of storage in enhancing security of gas supply, the government tries to balance the need for new entrants to access affordable storage and the need to encourage investment in new storage. Interruptible contracts foresee gas supply interruptions when the temperature falls below –5˚C. Figure 22 shows a

Figure 22

Annual Consumption Pattern and Capacity Measures in the Netherlands



* underground storage.
Source: NAM.

stylised annual consumption curve for the Dutch gas industry and the measures implemented to supply the required capacity.

MARKET REFORM

The path to gas market liberalisation was established in the Gas Act introduced in August 2000. All customers consuming 10 mcm of gas or more per year were allowed to choose their supplier immediately, corresponding to a 45% market opening. In January 2002, the threshold was lowered to 0.17 mcm, corresponding to a 65% market opening. The act set the date for full market opening at January 2007, the date was brought forward by the Ministry of Economic Affairs to 1 January 2004, and later postponed to 1 July 2004. The schedule of market opening laid down in the Gas Act is faster than required by the old EU Gas Directive as well as by the new one, which will come into force on 1 July 2004.

According to the EU second benchmarking report, 30% to 50% of the large eligible industrial users have switched supplier. Energiened's estimate is somewhat lower, just under 25%. For medium-sized consumers, it estimates a switching rate of about 20%. Nevertheless, these figures indicate that eligible Dutch gas consumers have changed suppliers more eagerly than the consumers in most other European countries. However, changing suppliers has been difficult in many cases as sometimes it has taken a long time to change[12] and administrative problems in, for example, billing have arisen. The principal reason for these problems was that the suppliers were not adequately prepared for market opening and, for example, their IT systems were not ready. However, the suppliers are making great efforts to solve the problems for the currently eligible consumers and to facilitate effective market access for the small consumers after 1 July 2004.

Some changes to the gas market structure have become necessary to facilitate market liberalisation. The most acute need is to establish an independent national TSO. While GTS now manages the national gas transmission networks and international interconnections and facilitates network access, the minimum requirement of the new EU Gas Directive is the creation of an independent TSO through legal unbundling. In fact, this is the only point where the Dutch gas market does not yet comply with the new directive. However, the government aims for ownership unbundling of the TSO to

12. By law, switching should be possible within five days. The allocation data provided by the distribution system operators were delivered much later than planned, which meant that some clients did not have adequate information on their balancing positions. It also meant that Gastransport Services was unable to provide some shippers with the required data and that the dispatch of financial invoices was delayed.

further increase transparency and ensure a fair playing ground. Furthermore, the government plans to create one new trading and supply company that will be owned by Shell and another that will be owned by ExxonMobil. After the separation, the two companies would still have exclusive access to the Groningen field, including the swing capacity that the field can provide. The deadline for the unbundling of the TSO was set for July 2004, followed by the creation of the two trading companies in six months or even later. The negotiations with the companies were foreseen to be difficult owing to various commercial and public interests, and to the need for new legislation and new contracts for certain aspects. An important precondition for the restructuring was financial neutrality for all parties concerned. Another was continuing the small fields policy. The negotiations paused in October 2003 because no agreement was reached on financial issues. However, both the government and the companies have an agreement about the new market structure. In any case, an independent TSO will be established in line with the new EU Gas Directive by 1 July 2004. The continuation of the negotiations for further reform are unlikely prior to this date but are expected thereafter.

While the establishment of an independent TSO was pending, steps have been taken to increase transparency in network operations through some unbundling measures. Following the introduction of the Gas Act, account unbundling of Gasunie's transport, storage and trading activities was implemented. In August 2000, the IT systems of GTS and Gasunie Trade and Supply were separated. In January 2002, Gasunie Trade and Supply moved to different offices.

The Netherlands is implementing the second EU Gas Directive, which means a move from hybrid[13] third-party access (TPA) to gas networks to a regime where both the conditions and method for computing tariffs are regulated. Since 2000, the Dutch Gas Act includes provisions which aim at non-discriminatory TPA. The act requires the gas companies to design and use non-discriminatory, reasonable and transparent tariffs for transportation, storage and ancillary services. Implementing the second Gas Directive results in adding specific regulation with respect to both conditions and method for computing tariffs. Pipeline access can be denied on the grounds of lack of capacity or unacceptable financial impact on the transportation company. However, the Ministry of Economic Affairs does not know of any cases where physical access to the network was denied. Third parties are entitled to construct their own pipelines. Extensions of the infrastructure can be awarded to third parties through public tendering. Cross-subsidies between different consumer groups are prohibited and companies are required to allocate costs according to the actual use of resources.

13. Negotiated TPA has been applied to the national gas networks and regulated TPA to regional networks.

Negotiated TPA existed already before the first wave of market opening in 2000 as Gasunie had time to prepare for competition. In January 1999, tariffs were based on point-to-point, distance-related pricing and standard contracts were developed. In January 2002, a zonal pricing system was introduced and in January 2003, it was replaced by an entry-exit system[14]. Regulated TPA is applied in regional distribution networks and the DTe sets the maximum limits of access tariffs. The Dutch TPA tariffs are among the lowest in Europe and the same prices are charged for domestic and foreign network users. However, the DTe still considers these to be excessive compared to real cost and has ordered Gasunie to reduce them by 5% per year in 2003 to 2006, following the 6.5% reduction which took place in 2001. Gasunie considers that the tariffs are already low in European comparison and that new reductions could distort gas flows in Europe and possibly threaten security of supply in the Netherlands.

In 2002, DTe issued Guidelines for Gas Storage, which stipulate that the companies, NAM and the Bergen Concessionaries, owning the three existing gas storage facilities must make a considerable part of their storage capacity available to third parties. They must base tariffs for their services on actual costs and relevant substitutes, such as storage facilities elsewhere. New storages will not be subjected to regulation because only the existing ones are deemed to have a dominant market position.

The current balancing regime is based on hourly balancing. GTS offers shippers a certain amount of hourly tolerance as part of standard transportation contracts and refrains from imposing penalties on hourly imbalances, if these stay below the tolerance. Shippers can buy tolerance from each other. However, this tolerance is not sufficient given the typical consumer off-take profiles. Therefore, the TSO provides balancing services for the shippers. It does not directly own or operate these services but buys them from the market based on annual tendering. In practice, only Gasunie and NAM can offer short-term flexibility services at the moment.

The Gas Act also defines the role of the authorities and the dispute settlement processes. DTe is entrusted to monitor the gas industry regarding possible anti-competitive behaviour and it can initiate procedures independent of plaintiff action. It does not yet impose fines or other sanctions. The Ministry of Economic Affairs monitors behaviour relevant to policy, such as security of supply. NMa, the Netherlands Competition Authority, and the Minister of

14. An entry-exit system means separate tariffs for entry points and exit points. A shipper's portfolio may include both contracted entry and exit capacity. In the Netherlands, the entry and exit capacities do not have to be contracted simultaneously, but must be contracted well in advance of the actual transport start date. The gas, which the shipper offers to GTS for transport at its contracted entry points is delivered simultaneously by GTS to the shipper at its contracted exit points. The shipper has a free choice of entry and exit points.

Economic Affairs enjoy information disclosure rights with respect to the gas business, including the right to investigate companies' accounts and their administrative procedures. The rules for negotiated TPA make explicit reference to Dutch competition law, and the NMa is the body responsible for dispute settlement. According to the Guidelines for Gas Storage, NMa also settles disputes in gas storage access. Appeals against NMa rulings take place in the Regulatory Industrial Organisation Appeals Court.

PRICES

Natural gas prices in the Netherlands for industrial consumers are in the mid-range in IEA countries (see Figure 23). For households, they are among the highest. This is largely explained by the taxes, which increase the pre-tax prices that are closer to the international average. Taxes and other fees on gas and other fuels are discussed in more detail in Chapter 3. From 1990 to 2002, gas prices for industry fluctuated significantly (see Figure 24). Similar fluctuation cannot be observed in the prices for the household consumers which increased slightly in the first part of the decade, remained steady in mid-1990s and increased again in 2000 to 2002 as a consequence of the rapid increase of energy taxes. Prior to market opening, gas (and electricity) was sold at very low subsidised prices to greenhouse users. Since these cross-subsidies were abolished, prices for this consumer group increased rapidly.

Natural gas prices for small consumers are set by the regulator (DTe) until the full market opening in July 2004. For large consumers, prices are set freely. Gas price-setting follows the "market value" principle, meaning that gas is priced according to the prices of alternative fuels for each consumer group. Principally, this means linking gas prices to gas oil prices for households and fuel oil prices for larger consumers. Daily published gas wholesale prices, as can be found for electricity in the electricity exchange, are not yet available. Initiatives have been taken to create a wholesale gas exchange, starting with the Title Transfer Facility (TTF). Some reference prices can be found at the trading point EuroHub and through interaction with the Belgian trading point at Zeebrugge.

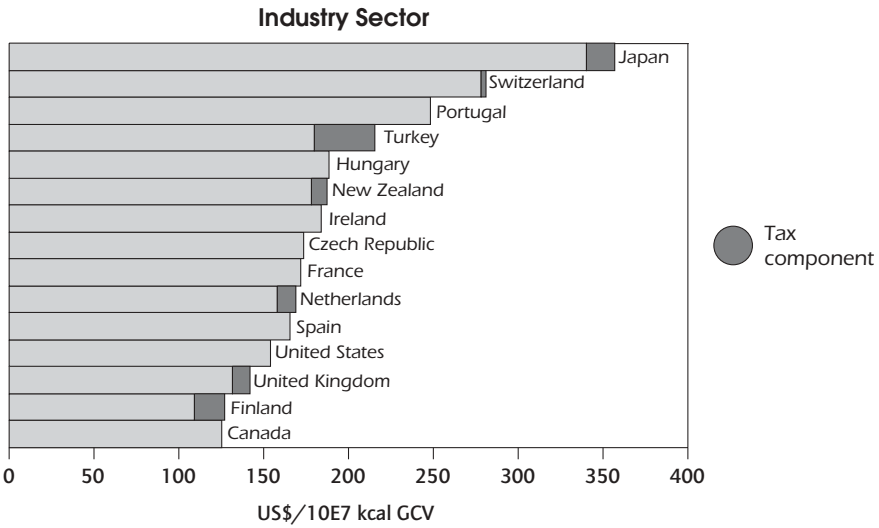
CRITIQUE

OIL

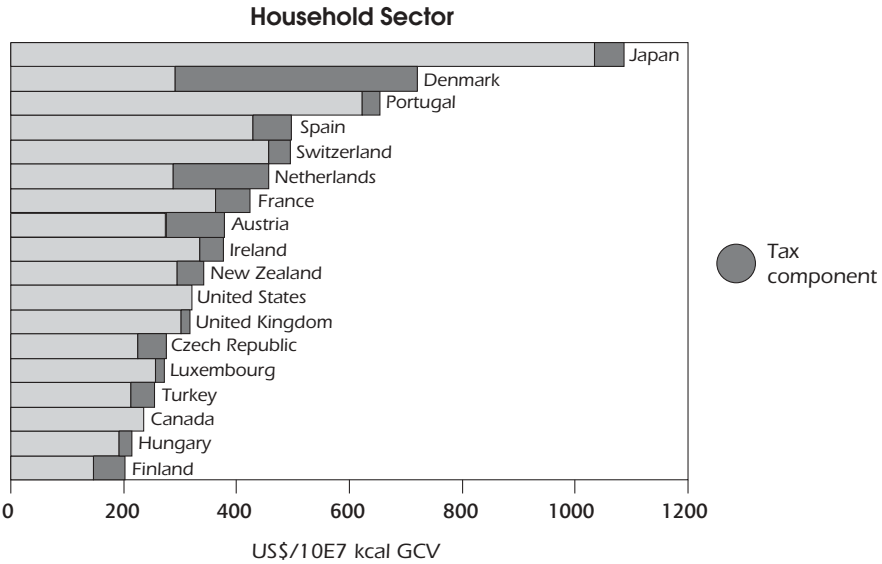
Gasoline prices in the Netherlands are among the highest within the IEA. Taxes do not seem to explain this adequately because the pre-tax prices are also among the highest. Furthermore, the Netherlands has a sizeable refining industry and one of the largest oil tanker ports in Europe, Rotterdam, giving one of the most frequently used oil reference prices in the European market.

Figure 23

Gas Prices in IEA Countries, 2002



Note: Tax information not available for Canada and the United States. Data not available for Australia, Austria, Belgium, Denmark, Germany, Greece, Italy, Korea, Luxembourg, Norway and Sweden.

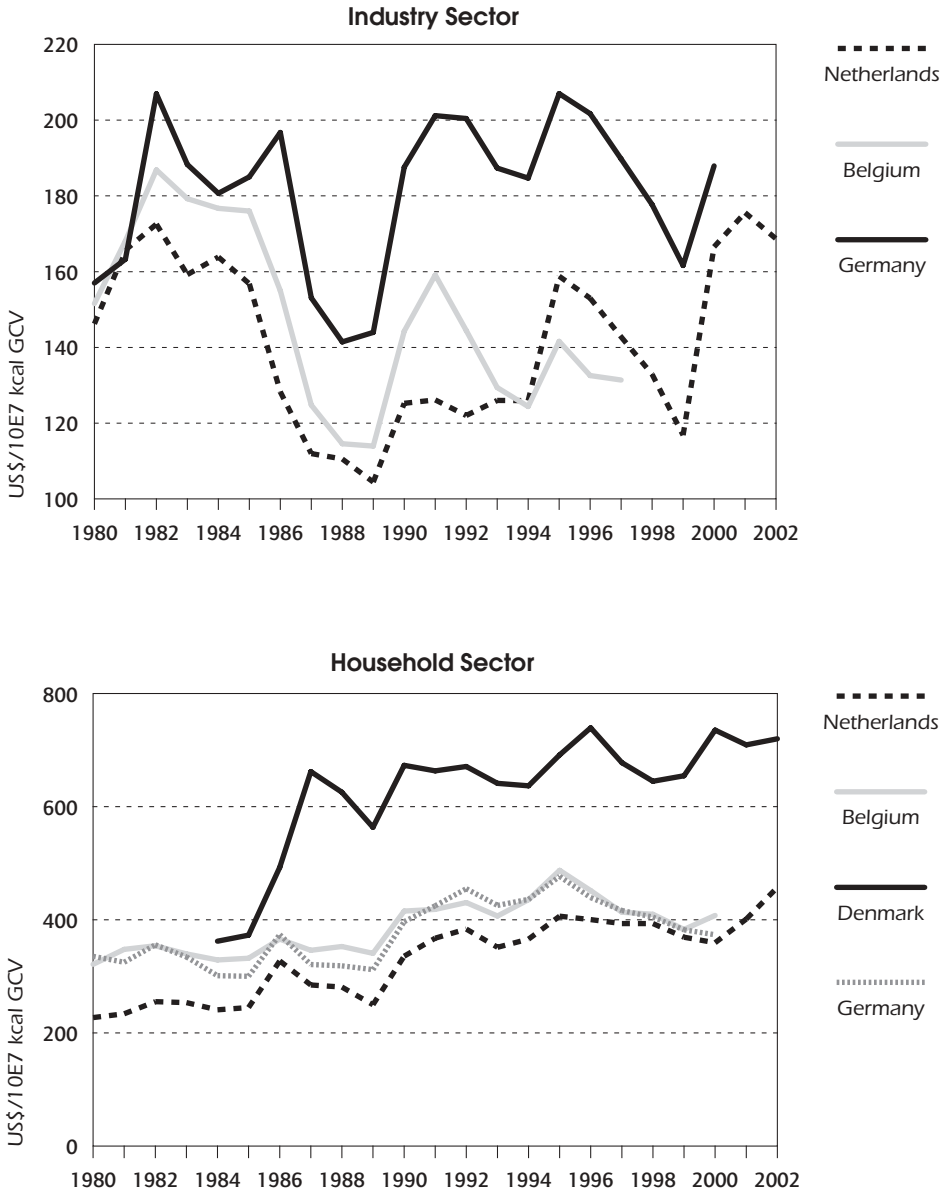


Note: Tax information not available for Canada and the United States. Data not available for Australia, Belgium, Germany, Greece, Italy, Korea, Norway and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 24

Gas Prices in the Netherlands and in Other Selected IEA Countries, 1980 to 2002



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

The reason for high prices appears to be inadequate competition because the retail market has been dominated by a small number of players, most of them linked to the refining industry. Auctioning of filling stations and other measures may help in this respect because new market entry becomes possible and because more and more filling stations give discount on the advisory prices, which the major oil companies establish for their retailers. The government is encouraged to continue monitoring the market and taking further measures as necessary. In particular, it should facilitate the arrival of new entrants into the market, such as supermarket pumps.

UPSTREAM NATURAL GAS

The large domestic gas resources have contributed greatly both to security of supply and state revenues. Recognising this, the government has protected the gas resources by slowing down the depletion rate of the Groningen field through a production cap, maintaining the small fields policy and promoting imports. However, the upstream gas policy has come to a point where it needs to be thoroughly reviewed owing to the gradual depletion of the Groningen field, declining production from the small fields and market liberalisation. Production in the small fields has reached its peak and is declining both because the resources are limited and because the regulatory and fiscal framework for investment is unsatisfactory. Market liberalisation sets further challenges for enhancing production from the small fields.

Declining production from the small fields leads to faster depletion of the Groningen field because the cap is set at the national level and not directly for Groningen production. Therefore, the government has been considering alternative cap mechanisms, either a lower national cap or setting a cap on Groningen production. Recently, the minister proposed the latter alternative to the parliament. A cap on Groningen production will be administratively simpler because there will be no need to revise it with each future variation in small fields production. It will also increase transparency because the objective is not to restrict total gas production but Groningen production. If a cap is set for Groningen production, the question is at what level it should be set: lower, equal or higher than the existing level?. A cap lower than or equal to Groningen's production today could lead to security of supply problems because small fields, and even imports in the short term, may not match domestic gas demand. An appropriate level needs to be set taking into account the prospects of future small fields production, the prospect of import and the prolongation of the lifetime of Groningen for years to come.

Because small fields production helps to prolong the swing capacity of the Groningen field, it contributes positively to security of supply not only in the Netherlands but also at the EU level. If the cost-benefit analysis of energy security policies finds that the net benefits of maintaining small fields policy

are clear, cost-effective measures will be needed to improve investment. Theoretically, small fields production, which is quite steady year-round, can be replaced by gas imports to maintain Groningen's capabilities but this requires additional investments in transmission infrastructure, particularly interconnections, which are currently congested. A specific policy is needed to encourage production from the small fields. To date, the main incentive has been the possibility to sell all gas to Gasunie, *i.e.* providing a guaranteed market. Owing to market liberalisation and the foreseen split of Gasunie into transport and supply companies, it may no longer be possible for Gasunie to continue its present role. Consequently, a new arrangement has to be considered. One possibility would be to create a quota obligation whereby all retailers would be obliged to acquire a certain percentage of their gas from the small fields. Nevertheless, the gas resources both in the small fields and Groningen are definite and a longer-term view needs to be taken. The role of the small fields policy should be constantly assessed from longer-term perspectives together with the expansion of import facilities and the need for flexible operation of the gas industry under the liberalised market. The assessment of the small fields policy should draw on the cost-benefit methodology and framework developed for assessing security of supply issues, and the government's implementation of the most cost-effective policy measures should continue here.

The regulatory and fiscal framework for investment needs to be stabilised. It is hampered by uncertainties caused by changes in policy and legislation, market liberalisation and environmental requirements. First, consideration should be given to the reintroduction of "depreciation at will" for offshore projects when its cost-effectiveness has been determined. Second, significant gas deposits lie in environmentally sensitive areas such as the Wadden Sea. While environmental reports show that the environmental impacts caused by additional gas production in this area are not significant, further development of gas in this area has been blocked by environmental arguments. In view of the overall environmental impact of alternative supply sources and fuels, it should be investigated whether the development of gas in this and other environmentally sensitive areas could be justified and on what conditions. In this respect, the government's recent initiative to allow the development of the Wadden Sea deposits and to use the gas revenues for environmental restoration projects in the same area appears sensible. Third, government intake on the profits from small fields should be reviewed with respect to attracting investment, noting that maximising taxes on individual projects does not necessarily maximise the government profits as a whole. Fourth, administrative processes should be streamlined because they take too much time and are uncertain with respect to their outcome, hence reducing interest to enter the processes. Lastly, the government is encouraged to continue to ensure the effectiveness of licences by making them conditional on actual activities to avoid strategic behaviour whereby certain players reserve areas for exploration just to prevent others from doing it.

RESTRUCTURING OF THE *GASGEBOUW*

The present structure of the gas sector is 40 years old. One of the major challenges for the government is restructuring the *Gasgebouw* according to the present circumstances and EU legislation. This should occur in a manner that creates a compatible and open market, promotes competition and meets energy security objectives.

The first step in the process is to create an independent transmission system operator (TSO) which is both the requirement of the new EU Gas Directive and a prerequisite for effective market opening as a legally unbundled TSO enhances transparency in tariff-setting. Therefore, it is important that an independent TSO be established as planned on 1 July 2004.

The second step of restructuring, the split of Gasunie Trade and Supply into two competing companies, is highly complex as it involves unravelling commercial and public interests and subsequently developing new legislation and new contracts for certain aspects. This complexity was portrayed by the temporary halting of the negotiations in October 2003. Nevertheless, restructuring could increase competition in supply and retailing. Implementing the split may also become necessary from the point of view of EU competition law; the European Commission has raised objections to joint gas sales by gas companies in Denmark and in Norway, which is not an EU member but a member of the European Economic Area.

It is not certain how active competition would become after the split, particularly in the shorter term, between the companies that have a long history of close collaboration in the gas sector. It is also not certain that the two supply companies would become equally strong rivals given their possibly different interests and strategies. Furthermore, the presence of only two strong competitors, even alongside the producers of small fields, is hardly enough for the development of effective wholesale competition. It is doubtful that new entrants could compete equally with the two companies because they simply do not have similar access to the resources and services, such as flexibility (via Groningen or storage) and quality conversion, which is instrumental for supplying the L-gas market (see Downstream Natural Gas for more details).

DOWNSTREAM NATURAL GAS

Access to import infrastructures, flexibility and conversion facilities are essential for the effective functioning of the market. At present, available contractual capacity at interconnections is very small, which limits import possibilities for new entrants and possibilities to increase imports which are inevitable in the longer term as domestic production declines. In this respect, the UK connection (BBL) should be advanced and the North European Gas

Pipeline from Russia studied. Though it is the role of industry to make the investments, the government should encourage this by sending the right signals to the market. Some IEA member countries have opted for, for example, temporary exceptions for TPA obligations in new gas pipelines. In the case of congestion, the TSO should use market-based mechanisms, such as auctioning, for the allocation of capacity. The EuroHub and Title Transfer Facility (TTF) help increase liquidity in the market by facilitating a spot market and creating new possibilities to access gas. However, the volume traded through TTF is still rather modest. As it is too early to say how well the EuroHub and TTF will work, it is important that the government monitors their operation. TTF might be developed into a gas exchange, comparable to that in the electricity sector.

Serving consumers, particularly small ones, requires access to flexibility services. These services can be purchased from storage owners and from the TSO which tenders the services. However, Gasunie Trade and Supply and NAM have a dominant position in this respect and hence they may not have much incentive to propose low prices. Another factor is the currently used hourly balancing. Most countries have opted for the daily regime because it is easier to administer and less stringent. A daily regime is also more compatible with the international gas market from where the shippers need to buy their gas as the gas traded in the hubs is sold on a daily baseload basis. The DTe has taken the initiative to establish regulation for third-party access to gas storage but the effectiveness of the rules remains to be demonstrated because there are very few practical cases of access. It is, nevertheless, important to take into account the role that this storage plays in helping gas production. It would be advisable to analyse the adequacy of the balancing scheme as a whole, including pricing. Investments in new storage capacity, particularly by new entrants, should be encouraged, for example by introducing a partial exemption from the TPA obligation to storage or ensuring adequate tariffs for storage services. This could reduce the cost of the flexibility services but it may still be difficult to compete with the cost of flexibility of the Groningen field. Further development of the TTF to include access to flexibility services could be one option.

The Dutch gas market consists of two different markets, H-gas and L-gas markets in two separate grids. According to the European competition law, when either consumers or suppliers can switch between two "similar" products (in this case H-gas and L-gas), the definition of the market depends on the magnitude of the switching costs. If switching costs are at least 5% to 10% of total costs, then the relevant products are in separate markets. The Brattle Group has estimated the supply-side switching costs (involving the costs of quality conversion and flexibility services) to be approximately 7% to 10% of H-gas prices and the demand-side switching costs (involving distribution companies to switch from L-gas to H-gas and converting all domestic central heating systems) to be approximately 9% to 14% of H-gas prices, thus

indicating separate markets. Switching the demand side to H-gas may not be possible in practice. The H-gas market has been largely liberalised whereas the L-gas market, including the smallest consumers, has not been liberalised for the most part and is effectively a Gasunie monopoly via its sales to the distribution companies.

It is impossible for individual small consumers to change from L-gas to H-gas because of the separate grid systems. The switching cost arising from changes in the grids is also higher than supply-side switching costs. Therefore, conversion facilities are absolutely essential for the L-gas consumers to be able to access the market. So, access to quality conversion services must be enabled in order to facilitate competition. Therefore, planning that the new TSO will provide conversion services is a positive step.

Sixty-five per cent of the gas market has been opened for competition and full market opening will take place in July 2004. It is commendable that the government has recognised the benefits of market liberalisation even though it may negatively affect state revenues from gas in the short term. Compared to many other European countries, competition has developed relatively well in the Dutch gas market. However, several problems persist and more competition could be induced by increasing transparency in the market through market restructuring, particularly establishing an independent TSO. Also the switching problems, measurement data problems and billing problems experienced in the second phase of market opening need to be solved quickly for the currently eligible consumers and it needs to be ensured that they are not repeated in the last phase of liberalisation.

The special characteristics of small consumers need to be addressed in the last phase of liberalisation. They require very high reliability, which makes it essential to ensure effective and fairly priced access to flexibility services. The need for these services is further intensified by their load profile, which is more variable and sensitive to weather variations than that of larger consumers. Adequate information needs to be provided for the small consumers and attention needs to be paid to minimising the costs of switching. It is also not clear what the cost of switching is for small consumers as compared to the benefits of switching and its consequences on the expected switching activity. The government is encouraged to study it in this market segment.

RECOMMENDATIONS

The government of the Netherlands should:

- *Continue to monitor the development of competition in oil retailing and take additional measures as necessary.*

- *Promote a stable regulatory and fiscal framework for domestic gas production by:*
  - *Revising the tax and fiscal incentives, including the reintroduction of "depreciation at will" or other incentives.*
  - *Reviewing and streamlining regulatory procedures related to environment and spatial planning, including searching for an environmentally sustainable solution for using the gas deposits in environmentally sensitive areas.*
- *Review the cap mechanism on national gas production with a view to securing production from the small fields.*
- *Adapt the small fields policy to be compatible with an open and competitive market as long as it makes a positive contribution to energy security. Make this a continuous process.*
- *Restructure the* Gasgebouw *as soon as possible, including promptly establishing a legally independent TSO.*
- *Monitor and facilitate the development of EuroHub and Title Transfer Facility.*
- *Create a framework that encourages investment in infrastructures, including interconnectors, gas storage and quality conversion facilities, which is compatible with market mechanisms.*
- *Set a clear plan to tackle gas market bottlenecks in order to facilitate new market entry and to avoid excessive market power. This should address access to flexibility (including storage) services, quality conversion, inadequate import capacity and the balancing regime but without endangering investments.*

SUPPLY

In 2002, energy from renewable sources amounted to 48 PJ (equivalent to 1.15 Mtoe), of which the majority was biomass and renewable municipal solid waste (see Table 10). In absolute terms, the supply of renewables has increased threefold from 1990 when only 16.7 PJ of renewables were used. However, owing to the increase in total TPES, the share of renewables in TPES has increased only from 1% in 1990 to 2% in 2002.

Table 10

Renewable Energy Production in the Netherlands, 1990 to 2002 (PJ)

Domestic production	*1990*	*1995*	*2000*	*2001*	*2002*[1]
Hydropower	0.70	0.73	1.18	0.97	1.0
Wind energy	0.46	2.62	6.86	6.81	7.5
Photovoltaics	0.00	0.01	0.07	0.11	0.14
Thermal solar energy	0.07	0.17	0.41	0.48	0.5
Heat pumps	..	0.24	0.63	0.80	1.0
Heat/cold storage	0.01	0.07	0.47	0.66	0.8
Sub-total	**1.26**	**3.84**	**9.62**	**9.83**	**10.94**
Bioenergy	**15.40**	**17.06**	**28.07**	**32.13**	**37.0**
Waste incineration	6.31	5.58	11.59	12.86	12.8
Biomass incineration	6.48	6.51	10.67	13.44	18.7
• *local – heat*	*6.48*	*6.48*	*7.40*	*7.40*	..
• *local – energy*	*0*	*0*	*1.49*	*1.49*	..
• *co-combustion*	*0*	*0.03*	*1.78*	*4.55*	..
Biomass gasification	0	0	0	0	0
Biomass fermentation	2.62	4.97	5.80	5.82	5.4
Total	**16.66**	**20.89**	**37.68**	**41.97**	**48.0**

1. 2002 figures are provisional.

Source: CBS/Novem, 2002.

In 2001, gross heat production from renewables was 16.5 PJ, including 3.4 PJ from non-renewable municipal solid waste. Hence, heat production from renewables accounted for about one-third of the total use of renewables. Electricity generation from renewables totalled 3.6 TWh and contributed 3.4% to total generation in 2002. There has been some increase from 1990 when generation from renewables was 0.82 TWh and their share in total generation was 1.1%. The shares of different renewables in electricity generation are shown in Table 11. At the end of 2001, total generating capacity from renewables was 953 MW of which 480 MW was wind, 414 MW municipal solid waste, 38 MW hydro and 21 MW photovoltaics. By 2002, wind generating capacity increased to 800 MW, all of which was installed onshore.

Table 11

Renewable Electricity Generation, 2000 to 2002 (GWh)

Domestic production	*2000*	*2001*	*2002*[1]
Hydropower	142	117	124
Wind energy	829	825	910
Photovoltaics	7.7	13.1	16.7
Thermal solar power	-	-	-
Heat pumps	-	-	-
Heat/cold storage	36	53	68
Sub-total	**1 015**	**1 008**	**1 119**
Bioenergy	**1 601**	**2 007**	**2 576**
Waste incineration	923	1 036	1 011
Biomass incineration	378	670	1 260
Biomass gasification	-	-	-
Biomass fermentation	300	302	305
Total domestic production	**2 616**	**3 016**	**3 695**

1. 2002 figures are provisional.

Source: CBS/Novem, 2002.

POLICY

OBJECTIVES

The Third White Paper on Energy Policy of 1995/96 established a target to increase the contribution of renewables to TPES from 1% in 1995 to 10% in

2020. The basic package of the CO_2 reduction plan and the Renewable Energy Action Programme 1997 to 2000 set an interim target of 5% by 2010, which requires an increase of 3.5 percentage points from the current level. Following the EU directive to promote electricity production from renewables (2001/77/EC), the Netherlands has agreed to an indicative target of generating 9% of its electricity from renewables by 2010. The targets for TPES and electricity generation are consistent; if the target of TPES is met, the target for electricity generation will also be reached.

The Netherlands lacks the altitude necessary for dams or even significant run-of-the-river hydropower. Given the climatic conditions, possibilities for photovoltaics are also limited. Therefore, policy for renewable electricity generation mainly focuses on wind energy and biomass, which will contribute for the most part to the targets.

There are no individual targets for other renewable energies but offshore wind power for which an indicative target of 6 000 MW has been established for 2020. The first two offshore plants, with capacities of 100 MW and 120 MW, will be constructed in 2004 to 2005. A new system for licensing of wind off-shore parks is under development. It takes a liberal approach, meaning that wind parks are in principle allowed anywhere in the Dutch Exclusive Economic Zone, except in restricted areas like shipping routes.

POLICIES AND MEASURES

The Netherlands is taking both demand-side and supply-side measures to promote renewables. On the demand side, consumers were given the freedom to choose their "green electricity" supplier in July 2001. Households also receive subsidies if they invest in equipment using renewable energy. On the supply side, direct incentives are given to producers. According to the Energy Research Centre of the Netherlands (ECN), the gap between the cost of green electricity and that produced by fossil fuels cannot be closed by mere internalisation of the environmental externalities of the latter but other measures are necessary.

Between July 2001 and July 2003, renewable energy consumption up to 10 MWh per year was completely exempted from the environmental tax on fuels (so-called "ecotax"). This measure was successful in terms of increasing the number of green electricity buyers; the number of customers climbed from approximately 250 000 in July 2001 to over 1.5 million in 2003 (20% of households).

This enormous increase in demand had some unanticipated negative consequences. Ecotax exemption led to very large electricity imports from existing renewable energy installations abroad, resulting in a considerable loss of tax revenues. At the same time, the scheme did not effectively

stimulate additional investments in renewables in the Netherlands or elsewhere. The production of renewable electricity in the Netherlands has not risen enough to cover demand because the industry considered the regulatory and fiscal framework too unstable and because of the difficulties and delays in obtaining permits and licences, especially for wind turbines.

These consequences caused the government to review its renewables policy and subsequently led to an amendment to the 1998 Electricity Act. This amendment is called Environmental Quality of Electricity Production (*Milieukwaliteit Elektriciteitsproductie*, MEP) and came into force in July 2003. The MEP aims to increase investors' confidence and improve the cost-effectiveness of renewable electricity support. The MEP provides for operating support through a combination of reduced ecotax exemptions and subsidised feed-in tariffs. In effect, the ecotax exemption was reduced to €c 2.9 per kWh for most forms of renewable electricity for consumption up to 10 MWh per year (see Table 12). It is planned that ecotax exemption will be gradually decreased and the subsidies increased to compensate for the ecotax reduction.

Under MEP, Dutch renewable electricity generators receive subsidies, which depend on the difference in costs (including investment, operation and maintenance costs) between their facilities and conventional (non-renewable) units (see Table 12). The maximum level of the subsidy is set at the difference between the production cost of offshore wind power and the average selling price of fossil-fuel power, on average €c 2.7 per kWh. The renewables eligible for subsidies are wind energy, bioenergy (including waste incineration, landfill gas and digestion), hydropower, photovoltaics and wave and tidal energy. Furthermore, the producer must be connected to the Dutch electricity grid and the installation must be maintained and exploited for at least ten years. Finally, only installations put into use after 1 January 1996 are eligible. For each installation, the level of the MEP tariff is fixed for ten years at the level when it was first requested by the producer. The ecotax exemption will be abolished at the beginning of 2005.

The feed-in tariff levels are reviewed annually, taking into account the decline in costs resulting from learning curves. In the annual reviews, tariffs are fixed for the next two to three years. The government prefers annual reviews over a pre-set reduction scheme to be able to use the latest market parameters to define the appropriate tariff level.

The MEP scheme had a budget of €129 million for July to December 2003, of which €70.5 million was used for renewables and the rest for promoting CHP. In 2004, the total MEP budget is expected to increase to €281 million and in 2005 to about €298 million of which €164 million (2004) and €181 million (2005) will be used for renewables. The MEP tariffs are financed through an annual MEP levy on all connections to the electricity grid in the Netherlands. It is collected by the distribution network operators and passed on to the TSO.

The levy amounted to €34 per connection in 2003 and is to be increased to €40 in 2006. The MEP is financially neutral to electricity consumers because their contribution is compensated by an equivalent reduction in annual ecotax charges. The government expects that the introduction of the MEP will increase investors' confidence since generators will receive a guaranteed fixed payment per kWh for up to ten years.

In addition to indirect subsidies through the feed-in tariffs, renewable electricity generators benefit also from support through Energy Investment Tax Relief (EIA). The objective of EIA is to promote investments in energy saving and renewable energy. 55% of the investments may be deducted from the profits tax. The budget for the EIA was €161 million in 2003. In 2002, the total investments in renewable energy projects eligible to EIA amounted to €803 million.

Table 12

MEP Support to Renewables (€c/kWh)

	2003			*2005*
Source	*Feed-in tariffs*	*Ecotax exemption*	*Total support*	*Feed-in tariffs*[4]
Onshore wind[1]	4.9	2.9	7.8	7.7
Offshore wind	6.8	2.9	9.7	9.7
Biomass (> 50 MW_e)[2]	4.8	2.9	7.8	7.0
Biomass (< 50 MW_e)	6.8	2.9	9.7	9.7
Mixed biomass[3]	2.9	0	2.9	2.9
Landfill gas and digestion	0	2.9	2.9	2.1
Photovoltaics	6.8	2.9	9.7	9.7
Hydropower	6.8	0	6.8	9.7
Wave energy, tidal energy	6.8	2.9	9.7	9.7

1. During a maximum period of ten years, up to 18 000 full load hours.

2. MEP subsidies are guaranteed only for three years because the government considered that more thorough studies on fuel are needed before committing itself to a longer scheme.

3. Includes municipal solid waste. The MEP feed-in tariff is granted in proportion to the degree of biologically degradable material, and applies only to installations with a minimum total energy efficiency of 26%.

4. Ecotax exemption will be abolished on 1 January 2005.

Source: The Ministry of Economic Affairs.

The "green certificate" trading scheme was introduced in July 2001. The renewable electricity producer is granted green certificates by TenneT for the electricity it delivers to the grid. The certificates function as guarantees of origin of the electricity. They can be traded on the green certificate market to provide additional income to renewable energy generators. The demand for green certificates comes from electricity suppliers who can use the green certificates to claim the ecotax exemption. Since the maximum level of ecotax exemption is €c 2.9 per kWh, this is also the maximum value of a green certificate. As the green certificates associated with foreign renewable electricity have also been eligible for the ecotax exemption since January 2002, domestic producers compete with foreign producers on the green certificate market. Hence, the market price of green certificates depends on the level of the ecotax exemption and on competition from foreign sources. In 2003, the regulation was revised to implement the EU Renewables Directive by replacing the green certificates by guarantees of origin.

Present covenants between government and market parties on renewable energy technologies in the built environment, including photovoltaics and heat pumps, have all been phased out at the end of 2003. Evaluation has shown that covenants are not an efficient policy instrument in the built environment. Instead, renewable energy policy in the built environment will be integrated in current energy efficiency policies in that field. The wind energy covenant, BLOW, will continue. Its objective is to have 1 500 MW of installed onshore wind capacity in 2010.

Maximum contribution of biomass is estimated at 1.9 Mtoe to 2.2 Mtoe in 2010. A Biomass Action Plan has been developed in co-operation with market parties and has been sent to the parliament in late 2003. The Action Plan tackles various restrictions and problems that are faced when starting up biomass projects, in the field of financing, licensing, public relations, the availability of fuel and biomass technology. At present, the use of biomass is already promoted by providing subsidies to replace the use of coal by biomass in power plants (see Chapter 6, the section on Coal).

The lead times for investment in renewable energies tend to be long owing to complex licensing and permit procedures. At present, it can take four to five years to complete the process for wind power. The government is making efforts to address the barriers formed by spatial planning by introducing harmonisation and acceleration of the planning procedures required under the Spatial Planning Act. For example, an interdepartmental project group initiated by the Ministry of Economic Affairs has been set up and will be focusing on structural solutions to permit procedure and spatial planning issues. Furthermore, a so-called Wind Energy Taskforce has been installed to assist the various authorities in permit procedures and in trying to find locations for wind farms in their planning activities.

The Energy Premium Regulation (EPR) is yet another instrument aimed at increasing demand for renewable energy in households. Subsidies are financed from the revenues of the regulatory energy tax (REB) and can be given to both tenants and landlords. EPR was first implemented in 1999 by giving tax incentives but was converted into a subsidy scheme in January 2003. In 2002, it had a total budget of €24 million for renewables of which some €16 million was used for photovoltaics. The estimated total budget for renewables for 2004 is €12 million.

Subsidies are available for solar water-heating systems. In 2002, they amounted to €5.5 million. Most utilities and some cities provide additional subsidies. The average subsidy for solar water-heaters is €700 for both new houses and existing buildings. Leasing of large solar hot-water systems is a new activity for some utilities; the leasing term is 15 years. There is a tax reduction for companies investing in solar systems. Subsidies for industrial product development are also available.

CRITIQUE

The Dutch targets for renewable energies are challenging given the past trends and present low development. Good potential lies primarily in biomass and wind although solar water-heating and photovoltaics have niche applications. The government has recognised the challenges and put in place a number of significant policy measures, particularly after the introduction of the 1995 White Paper.

Liberalisation of the green electricity market and the ecotax exemption have substantially increased renewable electricity demand but not domestic generation. Instead, renewable electricity imports increased without any significant additional investments in the Netherlands or abroad. Increased imports, in turn, led to the congestion of the transmission system bringing power to the Netherlands, increasing congestion rents for the TSOs in both the Netherlands and Germany. One estimate is that the rent for this congestion could exceed €100 million annually, thus increasing cost for electricity consumers.

To promote domestic renewable electricity generation, the Netherlands is moving from a demand-oriented to a supply-oriented approach by introducing the MEP. The primary objective of the MEP is to encourage investment. Another objective of the new orientation is to alleviate the congestion problems in the transmission system. As in Germany, the feed-in tariff system is likely to boost domestic renewable electricity generation. And, because investments need lead time to implement and the reduction of the ecotax is likely to reduce imports, it is possible that in the very short term there may be a supply shortage of green electricity. This could happen because many

retailers have kept their green electricity prices at the level it was before the ecotax reduction. This scarcity of supply could, however, encourage investments in domestic renewable electricity generation.

Despite the MEP's possible strong impact on increasing domestic renewable electricity generation, the government should be attentive in its implementation. Under a feed-in tariff scheme, depending on the design, the incentives for cost reduction may not be strong. Unless the benefits resulting from increasing competition are passed on to the consumer, it may be the producers, not the consumers, who benefit from any cost reductions. However, because the framework for promoting renewables changed drastically in 2003, it is not advisable to change the framework radically in the short to mid-term to avoid undermining investor confidence. Consequently, the programme should be carefully monitored and comparisons made with other policy options. Opportunities to strengthen future policies to reduce cost and pass through cost reduction benefits to consumers should be pursued.

It is a challenging task to set an appropriate level of feed-in tariff for forthcoming years owing to the uncertainty of future costs, as these costs will largely be driven by global, not national markets. The government's strategy of annually reviewing the feed-in tariff for new investment is a prudent response to the challenge. The current system of guaranteeing a fixed feed-in tariff for investors for ten years should increase their confidence as they need predictability. On the other hand, care should be taken not to weaken cost reduction efforts by guaranteeing the cost recovery of offshore wind at whatever level at the time of revision. While guaranteeing predictable tariffs for the planning horizon of projects, it is necessary to aggressively lower tariffs from year to year as global costs come down, noting that learning impacts of offshore wind are quite high.

Any scheme should be implemented in better consultation with the industry and other stakeholders. The IEA review team discovered that some industry representatives as well as some environmental non-governmental organisations are not convinced that the feed-in tariff scheme is the best model to encourage investment. These groups emphasised the need to eventually harmonise the approach at the EU level.

The support for the use of biomass, to total €c 7 to €c 9.7 per kWh in 2005, depending on the size of the power plant, could lead to imports of large quantities of biomass. In Scandinavia, the market prices for wood chips are only in the order of €c 1 per kWh making it interesting to export the fuel to the Netherlands. Another possible source would be the Baltic countries. Over the coming years, it is likely that biomass resources will be increasingly traded between countries that need them, resulting in the lowering of the costs of expanding electricity generation from biomass in the importing countries. This will require the Netherlands to consider how to balance the desire to expand

domestic production of bioenergy (such as local agriculture and municipal residues) and importing biomass feedstocks and refined fuels. While the former can lead to economic benefits in the longer term, the latter can immediately lower costs. However, it should be monitored whether encouraging biomass imports by subsidising domestic generation when biomass generation does not enjoy similar subsidies in the exporting countries leads to market distortions.

The Netherlands has been supporting the installation of photovoltaics through fiscal support schemes. Because of its climate, the Netherlands is not an ideal place for deployment of photovoltaics. The government has to some extent prioritised its investment support to more feasible renewable energies to optimise the use of financial resources. It has imposed a maximum cap for financial and fiscal support within the MEP at a level considered sufficient to promote offshore wind power, which is a more realistic alternative to make a significant contribution to policy objectives for renewables. Support for the development of renewables that are not as close as wind to commercial competitiveness should be focused on technology development.

Government support for renewables is sound policy because the positive environmental protection and energy security externalities of renewable energy are not currently captured by the market. However, when mature, renewables need to be exposed to competition from other mature energy sources. The precondition for this will be adequate internalisation of the different externalities. While it is a very difficult task to quantify and internalise the full range of externalities, progress towards this end should be assessed and the subsidies for renewables should be gradually reduced and eventually phased out. In assessing the subsidies for renewables, it should also be borne in mind that other policies, such as increased investments in energy efficiency, carry similar benefits and, in many cases, at lower cost than renewables.

If it grows significantly, intermittent renewable power generation, principally wind power, could have a negative impact on the stability of the grid and optimal operation of baseload power capacity. Problems could occur either when wind capacities are providing too little or too much power. Existing wind capacity, about 800 MW, is only about 3.3% of the total capacity and hence not yet a concern. However, the indicative objective for offshore wind capacity is 6 000 MW in 2020. The 2002 Capacity Plan of TenneT, the electricity transmission system operator, uses scenarios[15] which indicate that the share of wind power will be roughly 10% to 26% of the total capacity in 2025. There are no universal limits above which problems are encountered, so the local conditions in the Netherlands need to be studied. Technical solutions and

15. In the scenarios, offshore wind power is expected to increase by 1 500 MW to 6 000 MW.

business and regulatory practices can help the integration of large wind capacities. However, these solutions require research and development as well as new management techniques. Additional investments to the networks may also be necessary. However, the continuous modernisation of the grid may reduce the incremental investment needed and, hence, the financial burden on wind power companies.

Although about one-third of renewable energy used in the Netherlands is heat, there are no specific targets and policies, except subsidies for solar water-heating, in place for heat production from renewables. For example, thermal solar applications can be even more economically feasible in the Dutch colder climate than in warmer countries because the relative lack of resources could be offset by the longer heating season.

RECOMMENDATIONS

The government of the Netherlands should:

- *Monitor closely the costs of the Environmental Quality of Electricity Production (MEP) scheme and incorporate strong incentives for cost reduction and competition, recognising that global learning will be the principal driver of cost reduction.*
- *Monitor closely the long-term economic impacts and the impact on international biomass markets of expanding domestic biomass production and importing biomass.*
- *Place caution on promoting technologies not necessarily suited to the climate conditions in the Netherlands, such as photovoltaic energy.*
- *Assess progress towards a competitive renewable energy sector with a view to ensuring a stable investment environment until targets are met. Phase out the subsidies in the longer term when the different positive and negative externalities of renewables and other energy forms have been internalised.*
- *Investigate the requirements for the reliability and stability of the future electricity network, given the indicative goal of connecting large amounts of wind power to the grid.*
- *Study the possibilities to increase the use of renewables in heat production.*

ELECTRICITY, HEAT AND NUCLEAR POWER

INDUSTRY STRUCTURE

Prior to market reform, the Dutch power market was dominated by four generating companies, namely EPON, EZH, EPZ and UNA, forming the so-called "centralised" market. They co-operated through an organisation called Sep (Samenwerkende Elektriciteits-Produciebedrijven) which was a joint stock company owned by its members. Sep's most important role was to own and operate the high-voltage transmission grid (380 kV and 220 kV levels) and it enjoyed a statutory monopoly on imports until 1998. Sep stopped co-ordinating the centralised market after the establishment of the TSO, TenneT, in October 1998. However, Sep continued to own TenneT until November 2001 when TenneT, together with its transmission assets, was purchased by the State and Sep was dissolved.

Despite market reform and several recent ownership arrangements, a few generators still dominate the domestic market. Three of the four centralised generators were acquired by foreign utilities. UNA sold its shares to Reliant Energy (US) and EZH was acquired by E.On Benelux (Germany). 80% of EPON's shares were sold to Electrabel (Belgium) and the Dutch bank ING bought the remaining 20%. Essent and Delta have each purchased 50% of EPZ's shares. In 2000, the market shares of the main generators were Essent/Delta 21%, Electrabel 18%, Reliant Energy 15%, E.On Benelux 11%, Nuon 2% and CHP/autoproducers 33%. Nuon increased its market share considerably by a take-over of Reliant's European businesses in February 2003 but finalisation of the process is awaiting NMA approval. Both Electrabel and E.On are predominantly privately-owned companies. The authorities have stated that they do not accept any further concentration in the generation market because they consider that the Dutch market is still mainly a domestic one and that the European market is insufficiently developed.

As the owner and operator of the Dutch high-voltage grid, TenneT's tasks are to:

- Ensure the stability and reliability of the Dutch electricity system.
- Carry out load balancing in the Dutch system and with neighbouring countries.
- Maintain the high-voltage grid in good condition to allow access and maximum capacity utilisation.

- Facilitate power market transactions between participants.
- Allocate grid capacity and apply transmission prices to all market participants in a non-discriminatory, transparent and verifiable manner.
- Constantly optimise the infrastructure in relation to technological and economic developments.
- Apply the transmission prices established in the Tariff Code.

Before market reform, there were 23 electricity distribution companies with seven million consumers. All of them also distributed natural gas and eleven distributed district heat. Following the introduction of the 1998 Electricity Act, legal unbundling has been implemented at the distribution level as distribution companies have divided their network and supply activities into different companies. In effect, there are at present 20 regional grid companies (see Table 13). The grid companies, as well as supply companies, have mainly remained under the ownership of provincial governments or municipal councils. In March 2004, the Ministry of Economic Affairs sent a letter to the parliament proposing the development of legislation for mandatory ownership unbundling by January 2007. The main reason for this is to avoid any possible distortions to competition and to best serve the consumers. Some parts of the high-voltage grid are owned by the regional grid companies but TenneT is responsible for the management, maintenance and renovation of these lines. It has the intention to purchase these networks together as well as the 150 kV and 110 kV grids; the estimated budget for this is €700 to €800 million, which would more than double TenneT's current assets of €500 million.

Table 13

Regional Grid Companies

DELTA Netwerkbedrijf BV	Essent Netwerk Limburg BV
ENBU BV	Essent Netwerk Noord NV
ENECO Edelnet Delfland BV	EWR Netbeheer BV
ENECO Netbeheer BV	InfraMosane NV
ENECO Netbeheer Midden-Holland BV	Netbeheerder Centraal Overijssel BV
ENECO Netbeheer Weert NV	Noord West Net NV
ENECO Netbeheer Zuid-Kennemerland BV	Continuon Netbeheer NV
ENET Eindhoven BV	ONS Netbeheer BV
Essent Netwerk Brabant BV	RENDO Netbeheer BV
Essent Netwerk Friesland BV	Westland Energie Infrastructuur BV

Source: The Ministry of Economic Affairs.

Supply to captive consumers (at present households and small businesses) is subject to obtaining a licence from the Ministry of Economic Affairs. At present, 36 companies have the licence; market opening for green electricity increased the number considerably. The Office for Energy Regulation (Dte) tries to improve the licensing procedures to take better into account risks caused by the financial, administrative or organisational weaknesses of the licence-holders; at present it has a special focus on overly aggressive sales techniques of new entrants caused by their occasionally weak financial status. Several new suppliers, including foreign ones, have managed to penetrate the market. The three major retailers are Essent (with a 33% market share in 2001), Nuon (36%) and Eneco (26%). The government expects full market opening in July 2004 to change their markets shares.

Most companies that generate, distribute, trade or supply electricity, gas or heat – in total over 130 – are members of the Federation of Energy Companies in the Netherlands (EnergieNed). Another organisation, the Free Trade Association for Electricity and Gas (VOEG), was established in 1999 to pursue a fair and transparent market. It has 38 members, many of whom are also members of EnergieNed, but more new entrants have joined VOEG than EnergieNed.

Electricity is mainly sold on the basis of longer-term contracts or for own use (CHP), but some is traded through the short-term market. The share of electricity sold through the Amsterdam Power Exchange (APX) increased from 5% in 2000 to 15% of net electricity consumption in 2002, partly driven by the market opening for green electricity, but declined to 13% in 2003. APX is a non-mandatory, bilateral pool whose core activity is day-ahead transactions. It started operating in May 1999 as a fully independent private company for electricity trade. In 2001 a division was made between the spot market and other activities. The latter ones remained with the original shareholders in a company called Endex, and TenneT became the owner of spot market and related physical activities. In 2002, APX had 39 members but the number of active traders has since declined because the traders consider that the risks have become larger and profits lower.

Grid companies need permission from the Ministry of Economic Affairs for privatisation. The ministry issued policy rules on privatisation in July 2001 but they were withdrawn in September 2002 and privatisation was forbidden until July 2004. However, the prohibition has been further extended until January 2005 because of the decision to postpone full liberalisation by six months. Privatisation has been forbidden because many members of parliament consider networks to be natural monopolies that should remain in public ownership. Some of the public owners of the regional supply and grid companies would like to sell their stakes because they consider themselves lacking the competence to run the companies in the changing markets. After the legislation on mandatory ownership unbundling has been approved,

privatisation of retailing companies will be allowed and performance evaluation will be established for the regional grid managers. Whether or not the grid companies can be privatised will be decided after 1 January 2007.

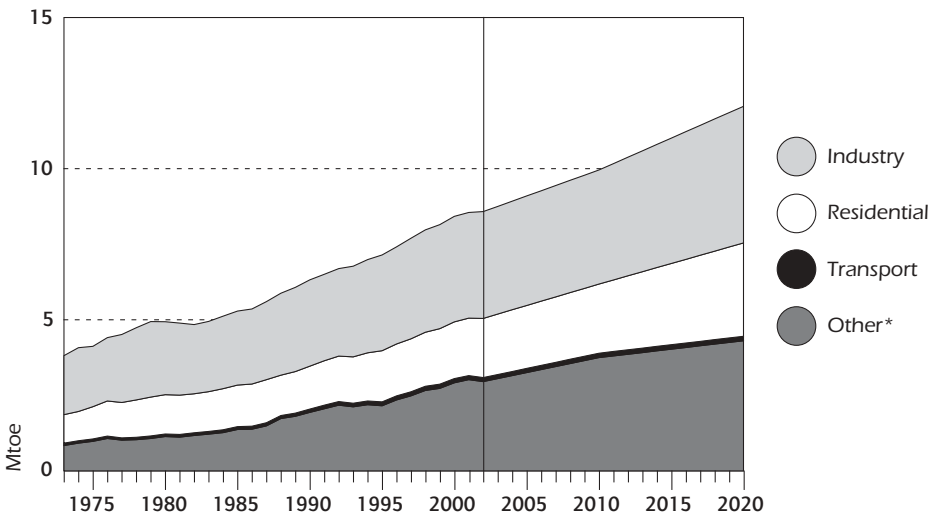
DEMAND, SUPPLY, TRANSMISSION AND TRADE

DEMAND

Electricity consumption was 100 TWh in 2002, 36% over the 1990 level. In 2002, about 41% of electricity was consumed in industry, 31% in the services sector, 23% in the residential sector, 3.7% in the agricultural sector and 1.6% in the transport sector (see Figure 25). Demand has increased in all sectors between 1990 and 2002: 96% in agriculture, 48% in services, 38% in households and 23% in industry. The government expects total electricity demand to increase by 16% between 2002 and 2010.

Figure 25

Final Consumption of Electricity by Sector, 1973 to 2020



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

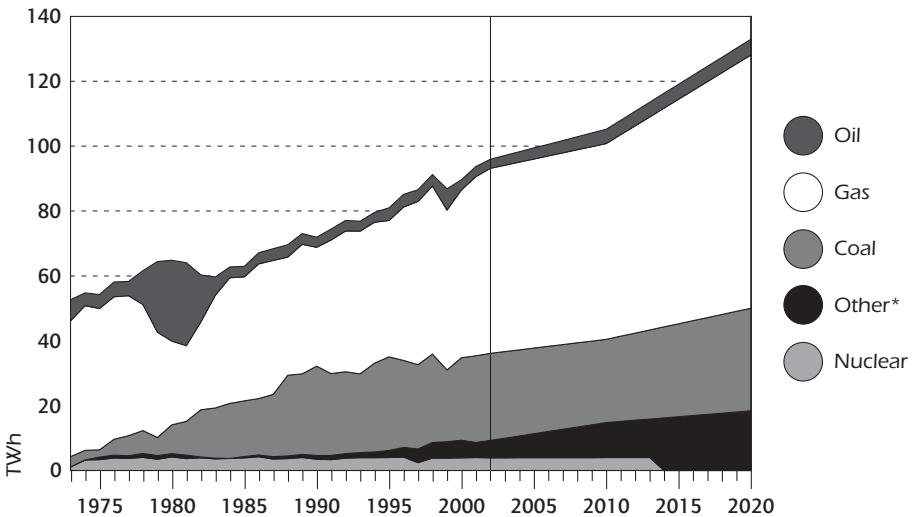
SUPPLY

In 2002, total electricity generation was 96 TWh. Dutch generation is mainly based on fossil fuels. Natural gas was by far the most important fuel (59.4%), followed by coal (28%), combustible renewables and wastes (4.3%), nuclear (4.1%), oil (2.9%) and other renewables (1.3%). There have been some

changes in the shares of different fuels from 1990 to 2002. The share of gas increased from 50.9%, replacing coal whose share declined from 38.3%. In 1990, the share of nuclear was 4.9%, oil 4.3%, combustible renewables and wastes 1.4% and other renewables 0.2%. According to IEA statistics, the share of autoproducers in Dutch electricity generation is about 14%.

Figure 26

Electricity Generation by Source, 1973 to 2020



* includes hydro, solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries,* IEA/OECD Paris, 2003; and country submission.

Information on total capacity and capacity by fuel is not available in detail, mainly because 40% of the installed generating capacity is CHP on which there is no complete information. According to TenneT's estimates, total generating capacity was 19 600 MW and peak load 16 100 MW in 2002, indicating a reserve margin of 22% in domestic generation. If import is included, the reserve margin was 28%. At present, there is only one large power plant project under construction, a 790 MW unit in Rotterdam by InterGen (Shell-Bechtel venture). The entire power output of the plant would be sold to Nuon under a 15-year power purchase agreement. If no other new investments are made, TenneT estimates the reserve margin to decline to 9% by 2010.

The government is concerned about the development of peak capacity in the medium and long term, whereas current capacity is adequate. DTe is studying the options for ensuring adequate capacity in the future and its report is expected in 2004.

The Netherlands is a net importer of electricity; the EC estimates that import capacity is about 20% of installed capacity. Imports totalled 20.9 TWh and exports 4.5 TWh in 2002. Net imports accounted for 16% of total demand. Electricity was imported from Belgium (38%), Germany (35%), France (9%), Switzerland (6%) and several other sources (12%). Both Germany and Belgium have decided to phase out nuclear power but the government has not yet analysed what the impact of these decisions will be on the possibilities to continue to import significant amounts of electricity from these countries and on prices of imported electricity.

All grid operators draw up transmission capacity plans every two years for seven years ahead. The plans describe the expected growth of electricity transport by network operator and the planned measures, including maintenance and investments.

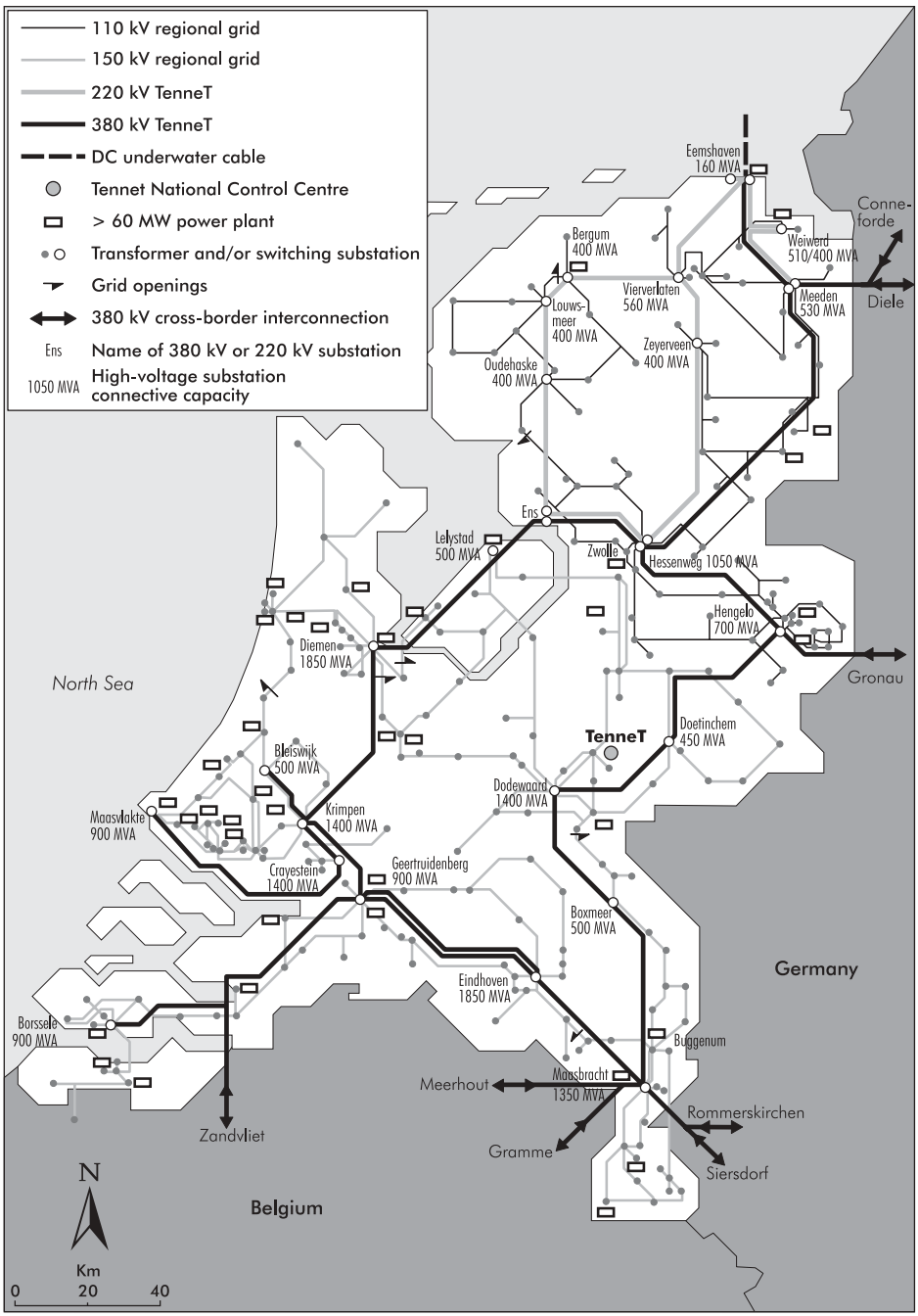
The Netherlands is relatively well interconnected with its neighbouring countries (see Figure 27). The high-voltage transmission grid has five interconnections with the neighbouring countries, three with Germany and two with Belgium – all at 380 kV level. In 2001, total net import capacity in the international interconnector capacity was 3 350 MW throughout the year. TenneT has invested in a two-phase shifter at Meden in 2003 to increase the capacity by 1 000 MW. However, it has not been possible to use this additional capacity because of unexpected changes in load flow patterns in north-western Europe[16]. Solving the problem will require additional investments. Both Belgian and German TSOs have plans to increase the capacities on their side but TenneT does not expect this to be implemented before 2007. TenneT, together with the UK's National Grid, is investigating the feasibility of developing a 1 200 MW sub-sea interconnector between the two countries. The interconnection project to Norway has recently been advanced and is expected to start operation in 2008.

Because Sep had concluded long-term contracts before market liberalisation, part of the interconnection capacity has been reserved for that purpose amounting to 900 MW until March 2005, and 750 MW between March 2005 and March 2009. DTe considers that the total interconnection capacity should be increased by at least 2 000 MW to create pressure for the prices in the Netherlands to reach and stay at a level comparable to that found in the neighbouring countries, hence indicating market integration.

16. These were caused by rapid increases in German wind power capacity; fluctuations in the deployment by market players of generating assets in several constituent areas in the neighbouring countries; and fluctuations in transmission across the interconnection between France and the UK with an impact on the cross-border interconnections between France and Belgium.

Figure 27

Map of the Dutch High-voltage Electricity Grid



Source: TenneT.

The Grid Code stipulates that 900 MW of the cross-border capacity is reserved for annual auction and at least 100 MW for monthly and 100 MW for daily auction. A mechanism is in place to ensure that capacity will be booked for real use, not for preventing access by competitors. DTe has limited the interconnection capacity that can be purchased by any party at 400 MW. In 2002, 27% of import capacity was subject to long-term contracts, 27% for annual contracts, 25% for monthly contracts and 21% for daily contracts. Electricity imported through daily contracts is designated to be sold in APX. The government considers the auction revenues to be sufficient for TenneT to improve the interconnection capacity.

The rarity of power failures implies a very good quality of networks in the Netherlands; in 2002, the average outages by a consumer were only about 28 minutes. DTe has launched a study on how to maintain the good quality of Dutch networks in the liberalised markets. The study is expected in 2004 and implementation the following year. The objective is to establish minimum quality standards with economic incentives to exceed them. Grid operators that exceed the minimum level can charge higher access tariffs.

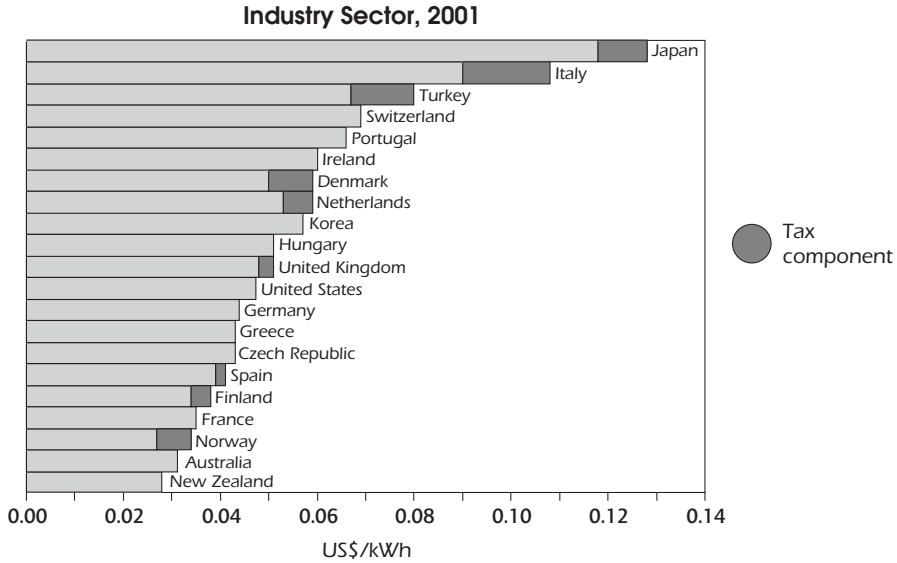
Market liberalisation and the end of the centralised dispatching under the Sep umbrella brought about the need to reorganise the balancing regime. Consequently, market parties were given the responsibility to keep their own energy balance within each settlement period and to provide their energy programmes to TenneT. This is called Programme Responsibility. All market parties (with connection capacity >60 MW) have been obliged to offer all available reserve capacity to TenneT at a free energy price without capacity payment. As this alone did not cover balancing power requirements, bilateral contracts with suppliers of regulation power oblige them to bid (all together) at least 250 MW of regulation power on the daily regulation power market established by TenneT. The settlement period in balancing was first set at one hour. As TenneT has to cover the difference between momentary balancing (MW) and energy balancing (MWh) by market parties over a settlement period, the settlement period was later reduced to 15 minutes. Annually, 1.5 TWh of electricity is purchased through these mechanisms.

PRICES

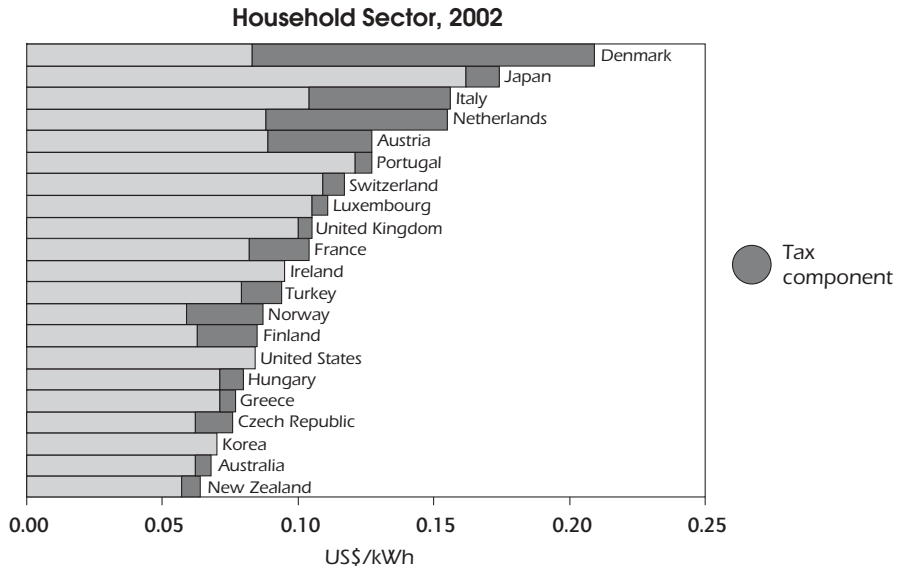
Electricity prices for households in the Netherlands are among the highest in IEA member countries (see Figure 28), largely owing to high taxes (see Chapter 3 for more details on taxation). For industries, the prices are in the higher half and clearly higher than in Germany. However, the difference has become smaller. For industry, Dutch prices increased in the first half of the 1990s, peaked in 1995 and declined thereafter (see Figure 29). While suppliers are free to set their prices for large consumers purchasing from the liberalised markets, prices for captive consumers are subject to regulation

Figure 28

Electricity Prices in IEA Countries



Note: Price excluding tax for Australia and the United States. Tax information not available for Korea. Data not available for Austria, Belgium, Canada, Luxembourg and Sweden.

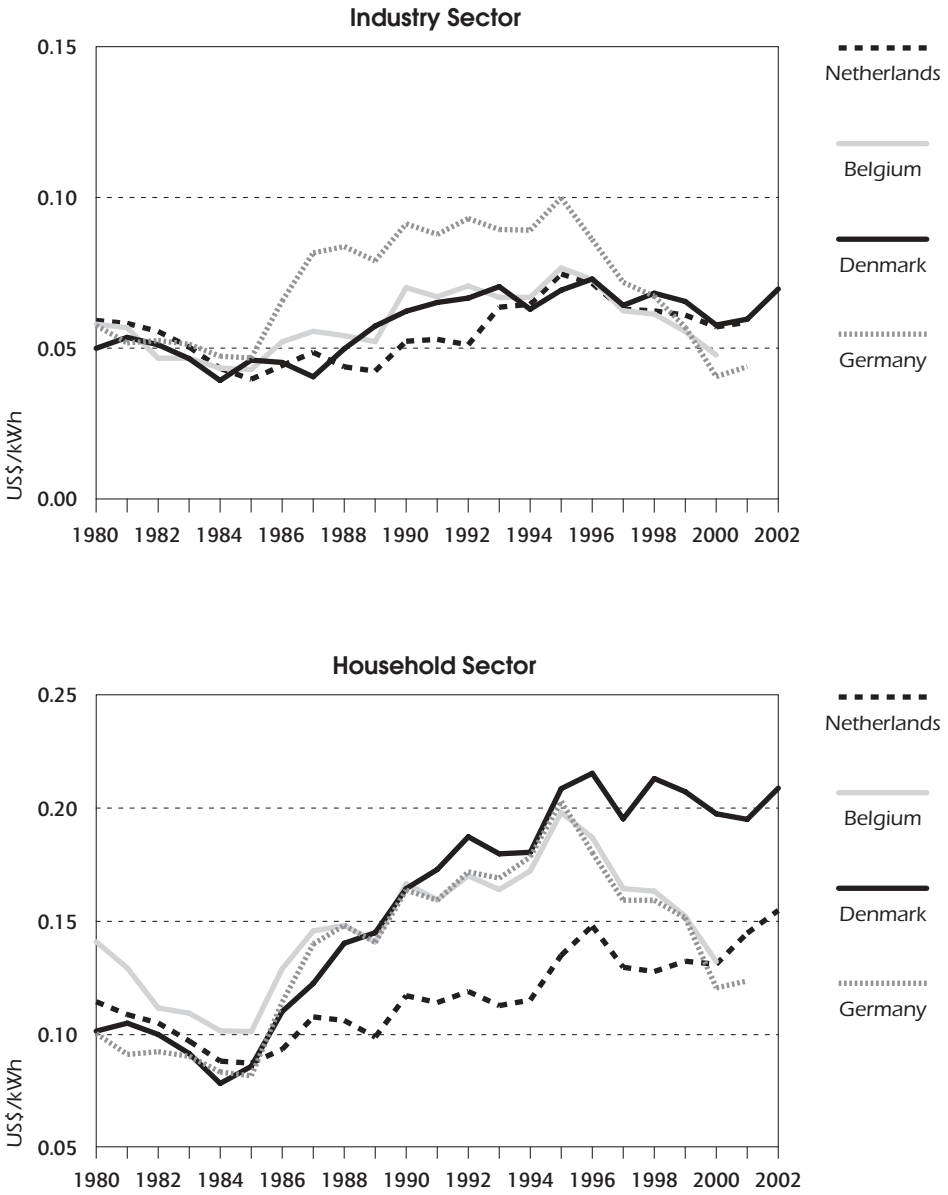


Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Belgium, Canada, Germany, Spain and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 29

Electricity Prices in the Netherlands and in Other Selected IEA Countries, 1980 to 2002



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

established by the Minister of Economic Affairs. There is, however, no national tariff for all captive consumers as they vary by supplier to take into account their different supply costs.

In many cases, APX prices are used as a reference price in bilateral contracts. The average price in the exchange was €33 and €30 per MWh in 2001 and 2002, respectively. There have been some sharp price peaks. In June and July 2001 the peaks reached €1 200 per MWh. TenneT's studies[17] indicate that the peaks were caused by plant and transmission outages in the Netherlands and Belgium, and by the lack of transparency in the market. As full information on available capacity and demand was not available, market participants perceived a significant threat of a blackout and prices peaked. The exceptionally hot weather in August 2003 resulted in prices peaking strongly, leading some industries to close down and sell their autogenerated or contracted electricity to APX; the total volume of this capacity was several hundred megawatts.

DTe's analysis has shown that the Dutch market is very sensitive to import constraints and the development of gas prices. In view of the high import percentage and the large share of natural gas in Dutch electricity supply, the sensitivity of electricity prices to these elements is considerably higher than in the surrounding countries. The TenneT report concluded that price spikes will continue to be an inherent problem in the Netherlands because the market is so small that a few unusual simultaneous events can have a significant impact on available capacity.

MARKET REFORM AND COMPETITION

The Electricity Act – Rules Relating to the Production, Transport and Supply of Electricity – is the legislative framework for the electricity sector as it stands today. All provisions of the act entered into force on 1 August 1998 except those relating to tariffs and technical requirements for network access and those relating to supply conditions for captive consumers. The latter provisions were amended twice, in December 1998 and July 1999. The act transposed the 1996 EU Directive on Internal Electricity Market into Dutch legislation.

Another important law in the electricity sector is the Electricity Production Sector Transition Act (the so-called OEPS Act) enacted in December 2000 and amended in July 2003. It provided rules for the assignment of rights and obligations after the termination of the Sep, compensation for stranded costs in this process, and finalised the details of the transfer of TenneT's shares to the State.

17. Consultant report "Recommendations for the Dutch Electricity Market". The Brattle Group Ltd., November 2001.

The Netherlands is liberalising the electricity markets faster than required by the EU directive. Market opening occurs in the following steps:

- Large end-users of 20 GWh per year were allowed to choose their supplier or to import electricity as stipulated by the 1989 Electricity Act but very little use was made of these provisions.

- All customers with capacity above 2 MW per connection were free to choose their supplier on 1 January 1999, corresponding to about one-third market opening.

- In January 2002, consumers with a total maximum transmission value of more than 3 x 80 amperes, or about 50 kW, became eligible. This step opened the markets for 60 000 small and medium-sized enterprises representing 62.5% of the entire electricity market.

- On 1 July 2004, all electricity consumers in the Netherlands are eligible.

The three last steps were defined by the 1998 Electricity Act but the date of the last step has been changed several times. While the 1998 act set the date at 1 January 2007, the Minister of Economic Affairs decided in 2000 that full market opening should take place on 1 January 2004. However, this date was postponed to 1 July 2004 because of the practical difficulties encountered in the opening of the market for small and medium-sized enterprises. When they entered the market and switched suppliers, various administrative problems occurred as the suppliers were not adequately prepared. The IT systems were not ready, causing delays in consumer switching and billing problems. These problems have raised some criticism about market opening for the small consumers. The suppliers are working to solve the problems before the markets will be fully opened. Testing of the systems in early 2004 revealed that major problems are unlikely. Since July 2001, all customers have been free to choose their supplier of green electricity (see Chapter 7).

According to the EU second benchmarking report, 20% to 30% of the large eligible industrial users have switched supplier and most of the others have renegotiated their contracts with lower prices, which are positive indicators of competition. EnergieNed estimates that about one-third of eligible electricity consumers, both large industries and medium-sized consumers, have changed suppliers and another third is considering changing. Despite the relatively active market entry, all parties involved believe that the functioning of the market should and can be improved.

An information campaign specifically focused on households started in spring 2004. Market access of households and other small consumers will be facilitated via load profiling and others will need appropriate metering. Consumers are allowed to join together and buy their electricity collectively to increase their negotiation power. Suppliers will not be allowed to collect

transfer charges from consumers who change suppliers. They will be obliged to send their tariff proposals to the Minister of Economic Affairs for approval.

Electricity sector regulation is conducted by the Office for Energy Regulation (DTe), which is a chamber of the Netherlands Competition Authority (NMa) and reports to the Ministry of Economic Affairs. While DTe prepares *ex ante* regulations of the market, NMa conducts *ex post* market reviews (see Chapter 3 for details). Some market players have reported confusion regarding which institution they should turn to for each issue, DTe, NMa or the government. Also DTe has indicated that for clarity it would be preferable that the government would concentrate on general policy issues whereas the more technical issues would be best addressed by DTe and TenneT.

DTe's principal regulations include the Tariff, Metering and System Codes. NMa and DTe have set up a Market Surveillance Committee to monitor electricity market development and to evaluate whether adequate competition has developed after market liberalisation. Its starting point is supervision of compliance with the Competition and Electricity Acts. Among other things, DTe will use the results to evaluate the rules for import capacity allocation and the balancing power market. In its work, DTe has on some occasions suffered from difficulties in accessing the relevant information, for example capacity data of the generation companies.

Electricity network access is based on regulated third-party access (TPA) tariffs. The methodology for TPA tariff calculation is established in the Electricity Act and in more detail in the Tariff Code. The network operators calculate the tariffs, but they are subject to DTe's approval. The EU's report, Benchmarking of Transmission Tariffs (October 2002), grouped countries into three categories according to the level of high-voltage transmission tariffs[18] and placed the Netherlands in the group of low-tariff countries together with Finland, Germany, Norway and Sweden. The average transmission charge in this group was about €4 per MWh. The report also suggests that distribution network tariffs in the Netherlands are in some cases higher than the average in Europe[19].

Some stranded cost issues have arisen from market reform. The government set up the Herkströter Commission at the end of the 1990s to make an independent analysis of the stranded costs and demarcation of consequent financial responsibilities. Following its advice, the government decided that Dutch generators are responsible for stranded costs arising from international

18. The cost items included were network infrastructure, operation and maintenance, system operation, administrative costs, losses, ancillary services and congestion management. Costs excluded were non-transmission-related regulatory costs, such as stranded costs and promotion of renewables.
19. Total network tariffs comprise both transmission and distribution tariffs. In the Netherlands the distribution tariff structures of the different distribution companies are uniform but tariff levels vary, making international comparison difficult.

power purchase agreements and the commission made a proposal for the division of responsibility among them. The companies renegotiated the agreements and, in some cases, paid some sizeable termination fees. The government took the financial responsibility for the stranded costs arising from eight district heating contracts (with a budget of €500 million) and the Demkolec coal gasification plant. The allocation of the stranded cost payments for the district heating for the four largest generating companies is expected to be finalised by summer 2004. It was decided that the coal gasification plant will be auctioned to clarify the exact level of the stranded costs. This package is laid down in the OEPS Act.

In addition to the administrative problems in billing, new entrants have reported other problems. They complain about the lack of transparency of the market, including the enormous market power of incumbents, and vertically integrated companies (meaning lack of ownership unbundling) leading to division of market and price-setting by a few companies.

NUCLEAR POWER

The role of nuclear power in the Dutch power industry is limited. The 480 MW_e pressurised water reactor in Borssele, commissioned in 1973, is the only operating reactor in the Netherlands. It produced 3.7 TWh of electricity and accounted for 4.1% of total electricity generation in 2002. The Borssele plant has a good operating and safety record. During 1997 and 1998, it was subject to major modernisation. After that, its availability and load factors have been among the top performers; in 2002, availability reached 93.4% and load factor 93.5%. The 60 MW_e boiling water reactor in Dodewaard, used for research purposes, was shut down in 1997 after 28 years of operation.

There has been a lot of political turbulence around the Borssele plant during the last ten years. There is general public resistance to nuclear power in the Netherlands. The Borssele reactor was due to shut down in 1997, much earlier than its design lifetime of 2013. In 1995, the owner of the reactor, the power company EPZ, attempted to obtain an extension of Borssele's lifetime beyond 25 years, to 2007. The government decided to extend the reactor's operating licence, but limited the extension to 2004. This limitation was overthrown by an administrative court but the government kept its intention to shut the reactor down in 2004. However, the new government of 2002 reversed this decision and decided that the plant will stay in operation during its economic and safety lifespan. The exact year of closure is yet unknown.

The new government considers nuclear energy as a viable option for the future, especially in view of increased environmental concerns, but foresees no construction of new nuclear plants in the near future. The Rathenau Institute conducts a study on future nuclear policy. The objective is to define which new

facts and arguments, arising from technological and social changes, play a role in the future policy.

The basic legislation on nuclear activities is the Nuclear Energy Act supplemented by decrees. Licences for nuclear facilities are granted jointly by the Minister of Housing, Spatial Planning and the Environment (VROM), the Minister of Economic Affairs and the Minister of Social Affairs and Employment and, when relevant, some other ministers. Together, these ministers form the competent licensing authorities as defined by the Nuclear Energy Act. The Minister of VROM acts as the co-ordinator.

Uranium enrichment is the most important part of the fuel cycle for the Netherlands and it is very successful. Urenco Nederland BV has a licence for a capacity of 2.5 million separative work units (SWU) per year. The total uranium enrichment market share of Urenco in the Western world is about 15% and is still growing. Urenco has concluded contracts with 15 countries. Its success is based on its advanced gas ultra-centrifuge technology. Improvements are still made in this technology as a result of an extensive R&D programme.

At the beginning of the Dutch nuclear era, the operators of the two nuclear power plants decided to implement reprocessing for economic reasons. EPZ has arranged for the recycling of Borssele's reprocessing products but no decision has been taken yet about Dodewaard.

COVRA, a state-owned company, is responsible for the treatment and storage of all radioactive waste. The recently opened storage facility at Borssele will be sealed for 100 years after Borssele stops operating, which will postpone the need to seek long-term solutions. The storage facility consists of a waste treatment and waste storage facility for low- and intermediate-level radioactive waste, and a treatment and storage facility for high-level waste (HABOG). In the COVRA premises there is also storage for radioactive waste from dismantling of nuclear facilities, beginning with the Dodewaard unit.

COMBINED HEAT AND POWER GENERATION AND DISTRICT HEATING

Installed combined heat and power (CHP) capacity amounts to approximately 7 500 MW (electricity) but there is some uncertainty on the exact amount because all smaller units may not have been included into the statistics. The heat capacity in CHP plants is estimated at 50 TJ per hour (13 GW). 3 800 CHP units with a capacity of 1 500 MW provide energy to greenhouses. The industry has an installed capacity of 4 000 MW in 150 installations. Many of the installations are joint ventures between industry and the former distribution companies. The Netherlands features a few industrial CHP

producers that have formed their own "power parks". Each industrial CHP producer has its own generating capacity and connection to the grid, and also supplies power to other sites that are not connected to the grid. The balance is accounted for by district heating plants, owned and operated by central electricity producers. About 275 000 households (4% of all) are connected to local or district heating networks with a total length of about 3 700 km. Some district heating schemes also supply heat to greenhouses.

The large-scale use of CHP in the Netherlands is a result of active promotion policies owing to the perceived environmental benefits. The government expects CHP capacity to increase to about 9 000 MW in 2010. At present there are few industrial CHP plants under construction or planning. The Energy Research Centre of the Netherlands (ECN) estimated in 2001 that the use of CHP reduces CO_2 emissions by 11 Mt.

The incentives used in the 1990s included investment subsidies of up to 17.5% (until 1995), an obligation for generating companies to purchase surplus power generated from CHP plants at the estimated full cost of new central generation facilities (also until 1995), favourable natural gas prices from Gasunie (until 2000) and an exemption from paying for backup capacity or ancillary services (until 1997). These measures resulted in a doubling of the CHP capacity in the 1990s. Growth in CHP created so much overcapacity that central generation output had to be curtailed to accommodate its surplus power.

The large share of CHP in the Dutch system before the market reform meant that the design of the electricity market had to take it into account from the outset. Market rules incorporate some preferential treatment for distributed generation, including CHP. Small-scale distributed generation (under 10 MVA) does not have to pay connection or transmission charges. Some small plants are still captive customers and can sell their output directly to the regional grid companies, who are obliged to buy it; this provision will be removed when full market liberalisation occurs in July 2004. Furthermore, imbalance charge rules have been adjusted to help distributed generation[20].

Market liberalisation has had a number of impacts on the CHP market. As a result of the unbundling requirements of electricity market liberalisation, ownership and operation of CHP are now separate from the ownership of the networks. Separation aids competition but prohibits investment by a distributor in generation to support the local network. Electricity prices have

20. The current balancing scheme was introduced in January 2001. These arrangements penalised power producers that could not predict their output accurately (two hours in advance of delivery) through imbalance charges, which were initially high. However, TenneT reviewed the situation and decided to allow producers to make final adjustments to their predicted output only one hour in advance from March 2001.

generally fallen. CHP plants, which formerly received favourable natural gas tariffs, now purchase gas competitively and rises in gas prices have financially strained CHP plants. Plants with large power generation components have been more strongly affected and one went bankrupt. As a result of the severe financial difficulties faced by the CHP units, the government responded in late 2000 with supporting measures. They were an increase in a tax credit for new CHP, exemption of CHP electricity consumption from the regulatory energy tax and financial support to CHP output up to 200 GWh of €2.28 per MWh. These measures supplemented an accelerated depreciation programme (known as VAMIL) for CHP investments that met certain efficiency targets.

In 2001, a temporary refund for CHP power was introduced in the regulatory energy tax. For the years 2001, 2002 and 2003, the refund was €5.7 per MWh supplied to the grid, provided that the unit met certain efficiency targets. In July 2003, the tax refund was replaced by a subsidy of €5.7 per MWh. In July 2004, the subsidy scheme will be replaced by a new incentive system, which is based on the performance of each CHP unit in terms of CO_2 reduction. With a total budget of €94 million for subsidies for CHP, the CO_2 reduction cost in the short term is estimated at €28 per tonne and in the longer term at €8.4 per tonne.

CRITIQUE

THE EUROPEAN DIMENSION

All parties concerned, including the government and other authorities, the power industry and the consumers are paying increasing attention to the integration of the markets with the neighbouring countries and Europe as a whole. Their primary concern is creating a level playing field for both Dutch and foreign companies by ensuring reciprocity. They perceive this almost as important an objective as ensuring the good functioning of the market within the Netherlands. The views, however, vary regarding how far market integration has developed. Whereas the government and the NMa still see the relevant market as primarily Dutch, industry considers the playing field already extending at least to the neighbouring countries. Therefore, new ownership arrangements and mergers have taken place as the industry, composed of rather small companies, is preparing for the European market. However, the government needs to ensure adequate choices for the domestic consumers. This needs continued attention. It is not an easy task to balance the interests of consumers against those of companies preparing for the growing risks in the integrating market. Also, fair market access needs to be guaranteed for new entrants who already have concerns about the market power of the incumbents. Furthermore, it is crucial for the government to be active in the international forums as decisions taken there have significant impacts on the Dutch companies and consumers.

The Netherlands imports large amounts of electricity from Germany and Belgium, which have both decided to phase out nuclear power accounting for a significant share of their power generation. As the implementation of the phase-out would likely lead to higher power prices in these countries, in Belgium after 2014 and in Germany possibly sooner, the price difference between the Netherlands and its neighbours could diminish, leading to increasing generation in the Netherlands. However, a more immediate balancing impact on prices may arise from the reduction in capacity surpluses in import countries together with the implementation of the new EU Electricity Directive. A precondition for such price pressure is solving the congestion problems in the interconnections.

In the short to medium term there will be adequate base and peak load capacity in the Netherlands and the country is well interconnected. These factors increase security of supply and facilitate competition. However, adequate investments, particularly in peak capacity, need to be encouraged in the longer term when surplus capacity diminishes.

The industry and financiers consider the investment risks larger than before market liberalisation because generators are no longer guaranteed the ability to recover all costs from power consumers nor is the future price level guaranteed. There are also regulatory barriers as licensing procedures for power projects, for example wind power, tend to be very long in the Netherlands. Frequent changes of CHP and renewables support schemes have caused uncertainty for both developers of these technologies as well as their competitors. One technology barrier is the unpredictable supply profiles of large power plants in their commissioning phase, which exposes their owners to imbalance charges.

There are some preconditions for a good investment climate. Attracting investment in power generation requires a good market design, with predictable changes and no interference in the market or in the operation of the independent institutions established to implement the market reform. The overall design of the Dutch market is quite good but transparency, among other things, should be improved as discussed hereunder. The government should avoid frequent and unpredictable changes in policies promoting certain technologies. Furthermore, the regulator could be strengthened and the government should continue its practice of not interfering with its day-to-day operations (see Chapter 3). Allowing markets to signal the need for new investment in generation means that prices will go high on occasion. The government needs to anticipate that such fluctuations will occur and ensure that consumers are aware of price risks and have options to mitigate these risks. However, establishing price caps, particularly low ones, should be avoided because they are an investment barrier endangering security of

supply and can reduce energy efficiency as shown by international experience from *e.g.* California (US) and Ontario (Canada). Attention needs to be paid also to maintaining a balanced generation mix in the liberalised markets where the investors tend to turn to short lead-time technologies, notably combined cycle gas turbines. In the Netherlands the share of natural gas is already high and new capacity is likely to use gas as well.

Peak capacity becoming more critical is a common problem to many IEA member countries. The problem can be addressed in two ways. First, the government needs to ensure that the market is effectively competitive, *i.e.* that high prices when the market is tight are not the consequence of abuse of market power. This requires a deconcentrated generation market and adequate market surveillance. Second, attempts need to be made to find mechanisms that will reduce the volatility of prices without disrupting the use of market signals to invest. One of the options considered by the Dutch government is the capacity market mechanism. Capacity mechanisms are intended to achieve new investment without spot prices by placing obligations on retailers to acquire more than sufficient capacity to supply consumers. Several governments have recently reviewed and rejected this mechanism because they expected it to increase the cost of electricity and questioned its effectiveness in stimulating new investment. The Dutch analysis concluded that capacity mechanisms have different negative effects, including being very expensive. The principal difficulty is that in practice the mechanism may give a further advantage to incumbents. There may also be incentives in the short term for gaming the rules, for instance by manipulating availability of plants to increase revenue. Another potential shortcoming is that they may discourage innovation and increase pollution by maintaining uneconomic existing power generation capacity.

Nevertheless, a well-designed capacity mechanism that requires retailers to have arranged adequate resources during peak periods might help provide incentives for retailers to acquire sufficient peak capacity or to work with customers to have sufficient demand response. It is not easy to plan a successful mechanism but its features might include[21]: requiring retailers to contract for future needs (including the ability for their loads to be cut during periods of tight supply); evaluating the performance of these retailers during periods of tight supplies; and applying enforceable penalties on retailers when they fail to comply with resource adequacy requirements (including financial guarantees to ensure the ability of the retailers to pay such penalties).

Better demand response can reduce the need for investment in peak supply capacity, which has been recognised by the government. Consumers can and do respond to price signals, but only when the conditions are right. Time-of-

21. Joskow, P., 2003. *The Difficult Transition to Competitive Electricity Markets in the US*, CMI Working Paper 28.

use and real-time pricing can yield significant demand responses during critical time periods, as well as an overall reduction in energy demand. However, since the benefits of demand response are widely dispersed among different market players, it is clear that markets will not develop a meaningful demand response capacity without facilitation by the government. Some indications of demand response were already seen in the Dutch market in August 2003 but clearer market signals are needed so that demand response can be broadened. Maximum levels for consumer prices, introduced in some countries and areas such as California, have hampered demand response and investments.

Better, more transparent and public information on demand, electricity generating capacity and interconnection capacity and flows could improve security of supply, operation of the markets and the investment climate as well as enable timely action. Information on load, availability and output can be particularly important for the new entrants as they do not have similar inherited knowledge from historic activities as the incumbents. Availability of information and transparency can be improved in many respects. One practical example is publishing the maintenance and outages of production capacity before the APX opens each day. This is enabled by the Electricity Act but it has not been implemented owing to the resistance of the generators. Publishing the data could reduce the price peaks in the power exchange and reverse the declining trend of participants in the exchange. Reduction of peaks would lead to lower wholesale prices on average and a more efficient market. Another example is ensuring that DTe has full access to all the capacity information it needs for executing its tasks. A third one is keeping better CHP statistics to have a more comprehensive view about both total and peak capacities.

TRANSMISSION AND INTERCONNECTIONS

Despite the relatively good interconnections, interconnection capacity needs to be reinforced. First, additional capacity would contribute towards more integrated markets. This could decrease prices and their volatility in the Netherlands and enable the Dutch companies to compete in other countries. However, the problem being an international one, the solutions should be sought internationally. Therefore, it is very important that the Dutch government and TenneT continue to work closely with the other European TSOs. It would also help to address these issues at governmental level in the Memoranda of Understanding (see Chapter 3). Attention should be paid to the problem of sub-optimal operation of the interconnections owing to the lower level of unbundling in Belgium and Germany. Furthermore, network investments, including those in interconnections, can be encouraged by allowing an adequate rate of return to investors. Secondly, the rapidly increasing interruptible wind capacity in Germany has led to occasional

stability problems in the Dutch grids. Also this problem requires close co-operation with German TSOs. The auctioning mechanism for the interconnections was decided when there was little wind capacity in Germany and the new stability problems make it necessary to review the current practices.

Price-setting mechanisms for networks and interconnections should take into account the costs caused by interruptible sources. In principle, those that cause the need to strengthen the networks, including both large-scale power plants and distributed generation such as renewables and small co-generation units, should bear the costs they cause.

MARKET LIBERALISATION

The Dutch government should be commended for its approach to market liberalisation; 63% of the electricity markets have been opened for competition, which has developed fairly well. The number of eligible consumers seeking for new suppliers and renegotiating their old contracts is relatively high in international comparison. This is the result of a good basic design of the market reform going beyond the minimum requirements of both the existing and even the new EU Electricity Directive. The ownership unbundling of the TSO makes it truly independent. At the distribution level, legal unbundling of distribution and retailing increases transparency. The regulatory authority is independent in its day-to-day activities and its organisational independence will be increased by new legislation in 2004 (see Chapter 3). Rules have been set for the calculation of the TPA tariffs and the regulator approves the tariff levels on *ex ante* basis. A power exchange has been established to increase the liquidity in the market and to provide a reference price. Interconnection capacity is being strengthened and the allocation process has been improved. The government has promptly solved most of the stranded cost issues arising from market liberalisation.

However, the government still faces some challenges and further improvements could be made:

- As discussed above, interconnection capacity needs to be increased and its fair and transparent allocation must be ensured. This may involve reviewing the way the import cap of 400 MW is imposed. The uniform cap for all companies may not be optimal given the variation in generating capacities and sizes of the companies.
- Policy needs to be created regarding network reliability. The government has recognised that in the liberalised markets, network companies do not have the same incentives to maintain the same level of network quality as before liberalisation and has decided to put in place economic incentives in the network tariff-setting.

- The volume in the power exchange is still rather modest and larger-scale operation could give the market proper price signals. Consolidation of the markets would lead to a smaller volume of trade whereas closer co-operation with the neighbouring countries could lead to larger volumes and intensified competition. Sharp price peaks and consequent risks have reduced the interest of the market players to participate in the APX. As discussed above, better information on the maintenance and outages of production capacity would help in this respect. Furthermore, greater liquidity, meaning more players and capacity, needs to be enhanced in the balancing market as this could help reduce price spikes.

- The remaining stranded cost issues need to be finalised.

Solving the administrative problems with consumer switching and billing in earlier stages of market liberalisation is a prerequisite for effective full market opening. Failing to solve them would further delay full market opening, leading to increasing regulatory uncertainty. One possibility could be to introduce financial penalties for non-compliance. Another challenge is informing the consumers about the reasons for market opening, ways to access the market, possible risks and ways to protect against them. Therefore, it is positive that the government has launched a wide information campaign. The cost of changing suppliers can be a barrier for small consumers to enter the market. The decision to base market access of the smallest consumers on load profiling, instead of metering, and to forbid the suppliers to collect fees for changing can help to avoid these problems. However, appropriate metering needs to be organised for other types of small consumers, such as small businesses who cannot or do not want to access the market via load profiling. Compared to other countries that have fully liberalised the electricity market, small Dutch consumers have more experience in choosing and changing their suppliers through full liberalisation of green electricity, which will possibly make them more active in seeking new suppliers when the market is opened fully.

COMBINED HEAT AND POWER PRODUCTION

CHP contributes a relative large share to Dutch power generation. Given the environmental benefits of efficient CHP installations, the government provided generous support. Though fairly large and continuous heat loads – a precondition for the competitiveness of CHP – can be found in the Netherlands in industry and agriculture, the financial and fiscal support was the driving force behind the rapid increase in CHP use in the 1990s. This led to cheaper existing baseload capacities lying idle because of overcapacity. CHP capacity reached its peak in 1999 and slightly declined thereafter as some existing units were facing financial difficulties owing to reductions in electricity prices and increases in gas prices. Given these difficulties, the

government introduced new fiscal and financial incentives. Since the motive for promoting CHP is environmental, it is positive that the government intends to revise the support scheme to take into account the actual emissions reductions arising from each installation. However, it should be evaluated how cost-effective supporting CHP is compared to other means of emissions reduction. The harmonisation of the methodology for defining high-quality CHP is being prepared in the EU now that the CHP directive has been completed. The Netherlands could promote the creation of a European-wide CHP-electricity certificate market by implementing the harmonised methodology. The forthcoming CO_2 emissions trading is likely to improve the market potential for CHP, leading possibly to yet another revision of the policies. The smallest CHP installations may also benefit from the full gas market opening because so far they have not been eligible to choose their suppliers.

NUCLEAR POWER

The political turbulences related to licensing of the Borssele power plant have been causing uncertainties about the remaining operational time of the unit and creating planning difficulties for the owner of the power plant. In this context, it is a prudent decision to keep the unit in operation as it contributes positively to security of supply. The fully depreciated unit provides an economic power source and nuclear generation does not emit CO_2. It is also commendable that the government is keeping the nuclear discussion open given that technologies develop and social and other conditions change over time. This enables it to adapt the policies appropriately in the longer term. It is essential to maintain this stable political framework.

RECOMMENDATIONS

The government of the Netherlands should:

- *Evaluate the different market mechanisms for ensuring security of supply and adequate peak load capacity. Pay attention to the possibilities of improving demand response as an alternative to capacity increases. Avoid the introduction of maximum levels for consumer prices.*
- *Improve the monitoring of the generating capacity and publish the data to increase transparency. Publish maintenance outages of production capacity.*
- *Continue to increase interconnection capacity and improve its operation in co-operation with neighbouring countries, for example through Memoranda of Understanding.*

- *Facilitate the further development and broadening of the power exchange. Enhance co-operation with other power exchanges in Europe.*
- *Ensure that full market opening will be implemented effectively and without further delays.*
- *Ensure a stable and predictable policy framework for nuclear power.*

GENERAL ENERGY R&D POLICY

RECENT ENERGY R&D POLICY DEVELOPMENT

Prior to 2000, the Ministry of Economic Affairs managed 25 technology-specific multi-annual programmes covering short- and long-term research and development (R&D), as well as demonstration and market introduction. The programmes and the specific projects funded were determined by the ministry and the Netherlands Agency for Energy and Environment (Novem). Novem reviewed the programmes annually and an external evaluator reviewed them at the end. Such evaluations found that targets, for technology uptake, energy conservation, etc., were often not met, leading simply to the continuation of programmes, with larger budgets. The programmes were deliberately broad, covering an extensive range of energy technologies.

In 2001, the government decided that it should not be dictating specific technologies to achieve general energy goals, and the programmes were changed to two broad themes: EDI, the programme for energy efficiency through innovation; and DEN, the programme for renewable energy. In the same year the White Paper, called *Energie Onderzoek Strategie* (EOS), established a framework for clarifying which key technologies should form the focus of R&D policy.

In 2002, the R&D programme was reviewed (see the box on the R&D review process) and changed to better reflect this new framework. Short-term R&D is generally left to the private sector or supported through innovation policy measures, and long-term (commercialisation after 2010) energy R&D and demonstration projects are established by the Ministry of Economic Affairs in consultation with a range of stakeholders.

GENERAL ENERGY R&D POLICY

Dutch energy R&D policy aims at making the transition to a sustainable energy system (see Chapter 3). The basic idea is to make substantial steps towards a sustainable energy situation through system innovation, especially by stimulating experiments. For energy R&D policy, this has involved narrowing the focus of energy R&D to five long-term priority areas that meet the requirements of contributing to a sustainable energy system, areas where the Netherlands has a leading R&D position. The five areas are:

- Biomass (use of biomass based on imported biomass).

The Dutch R&D Review Process

Two groups within the Dutch government reviewed the energy programme and priorities. The "energy transition group" undertook a large modelling exercise, running a range of technology scenarios to determine which technologies were the most dominant and robust in each scenario. Four themes became the priorities of the energy transition group. Transition activities in other fields are undertaken by other ministries – agriculture, transport, etc. but their reviews are not yet clearly established.

A second "R&D group", undertook a major stakeholder consultation exercise. Starting from 63 potential energy technology R&D options as defined by the stakeholders, the exercise ended up with 15-20 ranked priority topics. These were grouped into five encompassing themes, three of them overlapping with the transition themes. At the same time, the government decided that energy market liberalisation had led to the private sector concentrating its energy technology R&D on short-term measures. Thus, to compensate, government R&D would focus on long-term R&D as well as demonstration projects (also not provided by the private sector).

Criteria for priority-setting in the "R&D-group" were:

a) The contribution to a sustainable energy system (15 indicators of sustainable development were provided).

b) A leading position of the Netherlands in the field of energy research in question.

A technology gets priority if it has a high score in both criteria. A low score in both criteria means that the technology in question is not really relevant for the Netherlands. A high score on *a)* but low on *b)* means that some knowledge is desirable, mainly to be imported from other countries. A low score on *a)* but high on *b)* means that the Netherlands has high-quality knowledge, which might be interesting for other countries. Public (financial) support is given to the high priority areas and, to a limited degree, to "import" options.

The processes incorporate plans for policy and priority evaluation after four years.

- New gas and clean fossil fuels.
- Industrial energy efficiency.
- Built environment.
- Generation and networks.

Three of these areas, namely biomass, industrial energy efficiency and new gas, coincide with the transition themes.

International R&D efforts are also developed, chiefly through the EU Research Framework Programme.

In addition to the long-term R&D programmes, the ministry funds demonstration projects to support new energy technologies that the market is too wary to take up. Separately, short-term innovation research is funded by the Ministry of Economic Affairs' Innovation Office.

Applied R&D, demonstration and innovation programmes are linked up to the basic science R&D undertaken at universities and other research institutes through the partnership programmes organised by the Energy Research Centre of the Netherlands (ECN). Examples of areas of basic science linked to long-term energy R&D are photovoltaic solar energy, semi-conducting polymers, nano-structured solar cells, self-organisation of organic molecules, plasma research, high-efficiency low-temperature (polymer-based) fuel cells, bio-based chemical conversion processes, hydrogen storage technologies (carbon-based nano-structured materials), absorption storage, zeolite and nano-structured metal alloys. In the field of electricity, basic research includes potential storage in high-power density materials and structures, such as metal-hydrides, and ion-conducting materials, direct current conversion and alternating current technology.

THE R&D BUDGET AND EXPENDITURE

The government currently provides €140 million per year for energy research of which €30 million is granted to ECN to conduct priority projects. In the future, the balance will be distributed as follows:

- €35 million is granted to the Ministry of Economic Affairs' long-term R&D programme.
- €20 million is granted to the ministry's demonstration programme (currently available for any energy technology, but to be phased down to focus on the key R&D priorities). This will be linked to an incidental €35 million (€15 million in 2004) for "unique possibilities" in the transition to a sustainable economy.
- €15 million is granted by the Innovation Office as part of the general innovation research.
- €40 million is distributed by other ministries such as the Ministry of Education, Culture and Science to universities and other research institutes as part of general research grants for basic and applied scientific research.

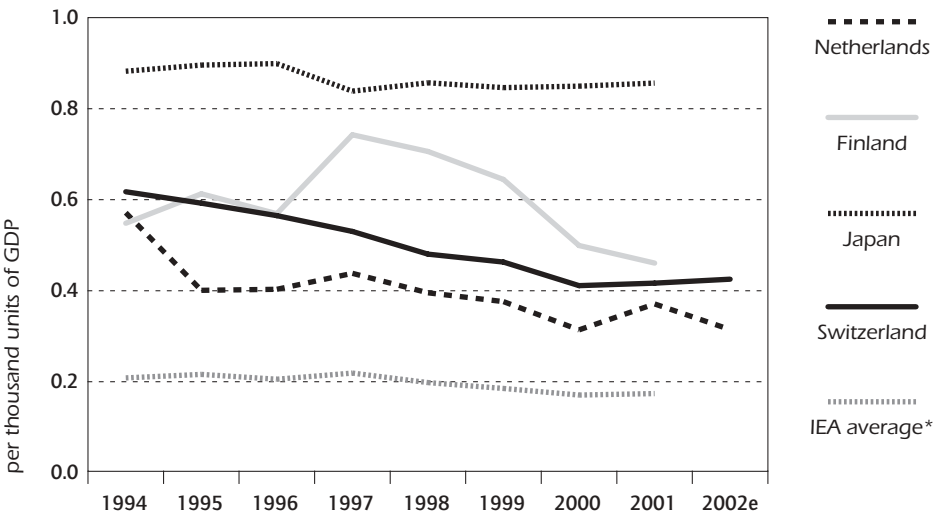
Senter (an agency within the Ministry of Economic Affairs) estimates private-sector energy R&D to be around €150 million per year. The expenditure is estimated on the basis of information collected through a fiscal scheme implemented by Senter whereby a contribution is paid towards the wage costs of researchers. The contribution is in the form of a reduction of payroll tax and social security contributions of salary workers and an increase in the tax deductions available to self-employed persons.

In terms of R&D expenditure in relation to GDP, the Netherlands continues to perform well in comparison with other IEA countries, with public-sector R&D expenditure higher than the IEA average with only Finland, Japan and Switzerland spending more. There is a commitment among EU member States to raise their annual overall R&D expenditure to 3% of GDP. In striving for this goal, the role and priority of energy R&D should be clarified.

Figure 30

Government Energy R&D Expenditure/GDP in the Netherlands and in Selected IEA Countries, 1994 to 2002

(including nuclear research)



* data not available for Korea, the Czech Republic and Ireland. Incomplete data for Australia (1994 to 1996 and after 1997), Austria (after 1999), Belgium (after 1999), Greece (1998 and 1999), Hungary (1994 and 1997) and Italy (1999). Luxembourg has no energy R&D programme. Budgets provided for recent years by some countries may have been estimated.

2002e = estimates.

Sources: *OECD Economic Outlook*, OECD Paris, 2002; and country submissions

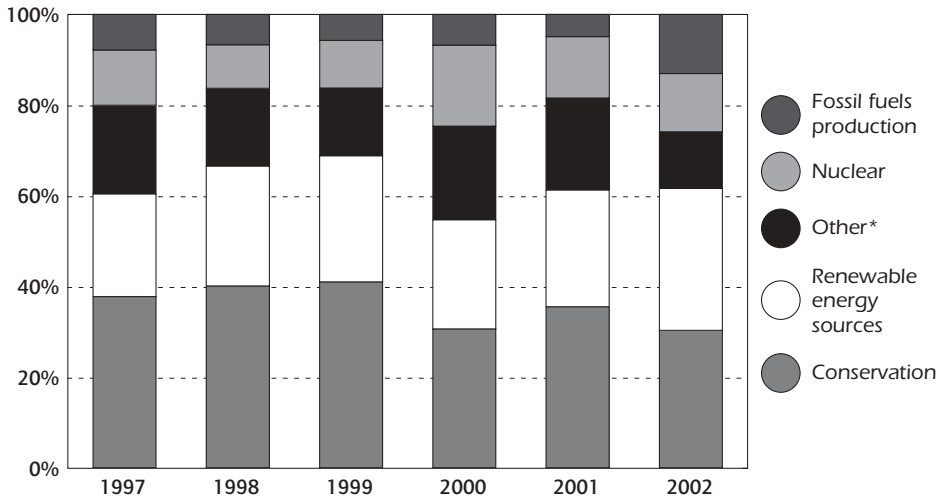
As shown in Figure 31, energy efficiency programmes made up 30% of R&D expenditure in 2002, followed by renewables (31%), nuclear (13%), fossil

fuels (13%) and "other" (12%). As yet, no specific budgets have been designated to the five long-term priority areas.

Much of the R&D financing is given to the ECN. This institute focuses on long-term research and mid-term development in the fields of energy and related services. ECN's research programme is set according to government guidelines. Many of the individual programmes are performed in co-operation with external investors. The ECN programme comprises energy efficiency in industry, policy studies, solar energy, wind energy, renewable energy in the built environment, clean fossil fuels and fuel cell technology.

Figure 31

Breakdown of Dutch Energy R&D Expenditure, 1997 to 2002



* includes power storage and cross-cutting technologies.
Source: Country submission.

R&D, DEMONSTRATION AND TECHNOLOGY DEPLOYMENT

The Netherlands has clearly examined the means of linking up research with development and demonstration aspects of new technologies. Recent discussions have highlighted critical success factors for developing needs-oriented basic research, including:

- Effective communication between stakeholders.
- Well-described (and agreed) common goals.
- A common interest in the success and the results.

- A shared burden of work.
- Acknowledging the necessity of collaboration.
- Clarity on the role of each stakeholder.
- Acceptance of each party by all other parties.

The Dutch Polymer Institute is an example of industry-academic collaboration, where companies, research institutes and university groups deal with needs-oriented basic research in relation to photovoltaic cells. A further approach is that of the BSIK consortium. BSIK is a programme to strengthen the knowledge infrastructure in broad areas of science.

R&D AND POLICY LINKS

Energy efficiency and renewable energy make up most of the government R&D in the Netherlands, reflecting the clear policy priority that these areas enjoy. Of the other sectors, the Nuclear Research and Consultancy Group (NRG) undertakes R&D on new reactor concepts and nuclear waste. This research is done in the Euratom High Flux Reactor (in Petten), which is also important from the point of view of safety, fusion and the nuclear medical field. Electricity R&D is undertaken to address security of supply issues, particularly following market liberalisation. And research on clean fossil fuels includes work on hydrogen, CO_2 storage (including a carbon sequestration offshore project starting in May 2004). A further, related initiative is the €29 million Cato R&D initiative on CO_2 capture, transport and storage. An additional, smaller programme (€2 million per year) is NEO, which supports new, unconventional ideas with "breakthrough possibilities".

More broadly, energy R&D is linked to other policy issues through a variety of programmes and measures: innovation policy, with its emphasis on co-operation, competition policy, standardisation policy, etc., all linked indirectly with the government's R&D approach. Housing standards, for instance, are one area where energy innovation is encouraged: new houses have to comply with Energy Performance Norms (see Chapter 5), but it is up to the parties involved to decide how to meet these standards. Similarly, Long-term Voluntary Agreements and Benchmarking Covenants (see Chapter 5) with industry constitute a broad incentive for energy R&D and innovation by industry.

INTERNATIONAL ACTIVITIES

Dutch R&D also has an international component, the two main elements being EU and IEA research framework programmes and networks. Within the EU, Dutch firms and institutes participate actively in the Framework

Programmes for Research and Technological Development. In 2000 this amounted to some €22 million or almost 8% of the EU budget for the Framework Programme. These funds went into a range of projects covering energy production, renewable energy, fossil fuels and energy conservation.

In addition to the European networks, the Netherlands participates in 17 of the 41 Implementing Agreements (IEA framework for international collaborative energy research, development and demonstration projects)[22]. In 2002, this participation was evaluated and the general conclusion was that participation is adding value to research programmes, but that there is scope for improvement in the effectiveness of participation. Participation only occurs when a research programme or project already exists; the Implementing Agreement framework is insufficient on its own to create a dynamic international R&D project.

CRITIQUE

The Dutch energy R&D framework has undergone several changes over the last three years, which may have led to some uncertainty for R&D planning. Overall, however, it has produced a coherent long-term R&D strategy addressing energy policy goals, with a clear regard for cost-effective policy and evaluation procedures.

Under earlier R&D regimes, the Ministry of Economic Affairs was responsible for all R&D. R&D for energy conservation has now become the responsibility of several ministries. Thus there is a strong need to co-ordinate energy efficiency R&D between the ministries, as well as to co-ordinate energy efficiency R&D with environmental, GHG-oriented R&D. In addition, within GHG R&D management, there is a sectoral breakdown and ongoing allocation of responsibilities to the different ministries. All this requires good communications and co-ordination of R&D and of R&D with policy. It is not clear that these exist in all situations.

The institutional linkages of academic institutions, government research institutes and the private sector seem to be well thought through and appear to make a significant contribution to developing deployment and marketing strategies for new energy technologies. This is to be applauded and encouraged to continue. Good experience has also been gained with the

22. Advanced Fuel Cells, Bioenergy, Clean Coal Sciences, Demand Side Management, District Heating and Cooling, Energy Technology Data Exchange (ETDE), Energy Technology Systems Analysis Programme (ETSAP), Heat Pumping Technologies, Heat Transfer and Exchanges, Hybrid and Electric Vehicles, Hydrogen Technology, IEA Clean Coal Centre, IEA Greenhouse Gas R&D Programme, Photovoltaic Power Systems, Solar Heating and Cooling, Superconductivity and Wind Turbine Systems.

execution of innovation-oriented research programmes in which industry formulates the fundamental research questions to be answered by technical universities. Industry involvement with government R&D programmes and technology prioritising appears to be very good.

Overall, the development of R&D policy and programmes appears to be founded in good review and consultation practices. In particular the energy transition management, which has a broad policy context, incorporating R&D discussions, is a good example of clear and systematic treatment of energy policy and priority-setting. The government is encouraged to continue to ensure that R&D programmes and policies are thoroughly evaluated for their cost-effectiveness and contribution to policy priorities, and that such reviews form the basis for their extension or termination. However, there can be some room for increasing the effectiveness of the activities in the long-term priority areas by allocating specific budgets to them.

The new R&D programme, which distinguishes the strong research areas and the knowledge import themes is an admirable and successful tool, and leads to a clearer focus and a more cost-effective way of spending government budgets. However, the criteria, particularly that of "the Netherlands' leading position", should be clearly defined to ensure the budget is not simply used for providing extra industry support.

The development of energy policies and targets seems to be similarly well informed, though with less clear channels of communication. For example, ECN produces policy papers and there are other technology expert stakeholders but it appears that they are not consulted in a systematic way.

Participation in international R&D has clearly been evaluated and addressed. Whilst this has led to a revision of the various means of collaborating on international R&D energy technology research, there may be some inconsistency in approach resulting from interdepartmental differences.

RECOMMENDATIONS

The government of the Netherlands should:

- *Stabilise the R&D programme framework and avoid disruptions to long-term R&D planning.*
- *Ensure that there is clear multisectoral communication regarding R&D programmes and policy priorities across ministries.*
- *Extend to all relevant stakeholders the current approach for discussing the development of specific R&D programmes.*

- *Ensure that all government departments consider creating new international research networks, or using those of the IEA, to bring in international partners from both the public and private sectors to support the work on the new R&D priorities.*

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	2001	2002	2010	2020	2030
TOTAL PRODUCTION		**56.8**	**60.3**	**60.4**	**59.9**	**59.2**	**64.8**	**..**
Coal[1]		1.1	–	–	–	–	–	..
Oil		1.6	4.1	2.3	3.2	0.8	0.8	..
Gas		53.7	54.6	55.7	54.3	54.6	60.9	..
Comb. Renewables & Wastes[2]		–	0.7	1.2	1.4	2.5	2.5	..
Nuclear		0.3	0.9	1.0	1.0	1.0	–	..
Hydro		–	0.0	0.0	0.0	0.0	0.0	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other		–	0.0	0.1	0.1	0.3	0.6	..
TOTAL NET IMPORT[3]		**6.0**	**6.4**	**16.9**	**17.1**	**21.9**	**24.6**	**..**
Coal[1]	Exports	1.4	2.2	10.6	5.7	7.4	7.4	..
	Imports	2.9	11.6	19.0	13.8	15.5	16.7	..
	Net Imports	1.5	9.4	8.4	8.1	8.1	9.3	..
Oil	Exports	42.4	60.2	68.3	68.5	43.9	43.9	..
	Imports	83.8	91.1	110.1	109.0	91.9	95.3	..
	Bunkers	11.6	10.9	14.6	14.5	17.9	20.2	..
	Net Imports	29.8	19.9	27.2	26.0	30.1	31.3	..
Gas	Exports	25.3	25.8	35.5	37.6	33.9	33.9	..
	Imports	–	2.0	15.3	19.2	16.0	16.1	..
	Net Imports	-25.3	-23.8	-20.2	-18.4	-17.9	-17.8	..
Electricity	Exports	0.1	0.0	0.4	0.4	–	–	..
	Imports	0.0	0.8	1.8	1.8	1.6	1.8	..
	Net Imports	-0.1	0.8	1.5	1.4	1.6	1.8	..
TOTAL STOCK CHANGES		**-0.3**	**-0.2**	**-0.1**	**0.9**	**–**	**–**	**..**
TOTAL SUPPLY (TPES)		**62.4**	**66.5**	**77.3**	**77.9**	**81.1**	**89.4**	**..**
Coal[1]		2.9	8.9	8.3	8.4	8.1	9.3	..
Oil		30.9	24.3	29.5	29.8	30.9	32.0	..
Gas		28.5	30.8	35.5	35.8	36.6	43.1	..
Comb. Renewables & Wastes[2]		–	0.7	1.2	1.4	2.5	2.5	..
Nuclear		0.3	0.9	1.0	1.0	1.0	–	..
Hydro		–	0.0	0.0	0.0	0.0	0.0	..
Geothermal		–	–	–	–	–	–	..
Solar/Wind/Other		–	0.0	0.1	0.1	0.3	0.6	..
Electricity Trade[4]		-0.1	0.8	1.5	1.4	1.6	1.8	..
Shares (%)								
Coal		*4.6*	*13.4*	*10.8*	*10.8*	*10.0*	*10.4*	..
Oil		*49.5*	*36.6*	*38.2*	*38.2*	*38.1*	*35.8*	..
Gas		*45.6*	*46.3*	*46.0*	*46.0*	*45.1*	*48.2*	..
Comb. Renewables & Wastes		*–*	*1.1*	*1.6*	*1.7*	*3.1*	*2.8*	..
Nuclear		*0.5*	*1.4*	*1.3*	*1.3*	*1.3*	*–*	..
Hydro		*–*	*–*	*–*	*–*	*–*	*–*	..
Geothermal		*–*	*–*	*–*	*–*	*–*	*–*	..
Solar/Wind/Other		*–*	*-*	*0.1*	*0.1*	*0.4*	*0.7*	..
Electricity Trade		*-0.2*	*1.2*	*1.9*	*1.8*	*2.0*	*2.0*	..

0 is negligible, – is nil, .. is not available.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	2001	2002	2010	2020	2030
TFC	**48.8**	**51.2**	**60.3**	**60.0**	**66.0**	**70.6**	..
Coal[1]	1.1	1.2	0.7	0.7	0.9	1.0	..
Oil	24.7	19.9	25.0	25.2	26.4	27.4	..
Gas	19.3	23.0	23.3	22.8	27.3	28.6	..
Comb. Renewables & Wastes[2]	–	0.3	0.2	0.2	0.4	0.4	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	0.0	0.0	0.0	0.0	0.1	..
Electricity	3.8	6.3	8.6	8.6	10.0	12.1	..
Heat	–	0.4	2.5	2.5	1.0	1.1	..
Shares (%)							
Coal	*2.2*	*2.4*	*1.1*	*1.1*	*1.4*	*1.4*	..
Oil	*50.5*	*38.9*	*41.5*	*42.0*	*40.0*	*38.8*	..
Gas	*39.5*	*44.9*	*38.7*	*38.1*	*41.3*	*40.6*	..
Comb. Renewables & Wastes	–	*0.6*	*0.4*	*0.4*	*0.6*	*0.5*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	–	–	*0.1*	..
Electricity	*7.8*	*12.4*	*14.2*	*14.3*	*15.1*	*17.1*	..
Heat	–	*0.9*	*4.2*	*4.1*	*1.6*	*1.5*	..
TOTAL INDUSTRY[5]	**21.2**	**21.1**	**22.9**	**22.8**	**27.2**	**30.2**	..
Coal[1]	0.8	1.2	0.6	0.6	0.9	0.9	..
Oil	10.4	8.2	9.7	9.6	10.4	10.9	..
Gas	8.1	8.8	7.6	7.7	11.7	13.4	..
Comb. Renewables & Wastes[2]	–	0.1	0.1	0.1	0.0	0.0	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	–	0.0	0.0	..
Electricity	2.0	2.9	3.5	3.5	3.8	4.5	..
Heat	–	–	1.4	1.3	0.4	0.4	..
Shares (%)							
Coal	*3.6*	*5.6*	*2.7*	*2.8*	*3.2*	*3.1*	..
Oil	*48.8*	*39.0*	*42.3*	*42.0*	*38.3*	*36.2*	..
Gas	*38.4*	*41.6*	*33.1*	*33.6*	*43.0*	*44.3*	..
Comb. Renewables & Wastes	–	*0.2*	*0.3*	*0.3*	–	–	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	–	–	–	..
Electricity	*9.2*	*13.5*	*15.3*	*15.5*	*13.9*	*15.0*	..
Heat	–	–	*6.3*	*5.7*	*1.6*	*1.4*	..
TRANSPORT[6]	**7.5**	**10.6**	**14.6**	**14.9**	**14.9**	**15.5**	..
TOTAL OTHER SECTORS[7]	**20.2**	**19.5**	**22.9**	**22.3**	**23.9**	**24.9**	..
Coal[1]	0.3	0.1	0.0	0.0	0.0	0.0	..
Oil	6.9	1.2	0.9	0.8	1.2	1.2	..
Gas	11.1	14.2	15.8	15.2	15.6	15.3	..
Comb. Renewables & Wastes[2]	–	0.2	0.2	0.2	0.4	0.4	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	0.0	0.0	0.0	0.0	0.1	..
Electricity	1.8	3.4	4.9	4.9	6.0	7.4	..
Heat	–	0.4	1.1	1.2	0.6	0.6	..
Shares (%)							
Coal	*1.6*	*0.3*	*0.1*	*0.1*	*0.2*	*0.1*	..
Oil	*34.2*	*6.2*	*3.9*	*3.8*	*5.0*	*4.7*	..
Gas	*55.3*	*72.9*	*68.9*	*68.1*	*65.2*	*61.3*	..
Comb. Renewables & Wastes	–	*1.3*	*0.7*	*0.7*	*1.7*	*1.5*	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	–	*0.1*	*0.1*	*0.2*	..
Electricity	*8.8*	*17.2*	*21.5*	*22.0*	*25.2*	*29.6*	..
Heat	–	*2.3*	*4.8*	*5.2*	*2.6*	*2.5*	..

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	2001	2002	2010	2020	2030
ELECTRICITY GENERATION[8]							
INPUT (Mtoe)	**12.0**	**15.3**	**20.1**	**20.4**	**17.6**	**22.5**	**..**
OUTPUT (Mtoe)	**4.5**	**6.2**	**8.1**	**8.3**	**9.0**	**11.1**	**..**
(TWh gross)	52.6	71.9	93.7	96.0	105.2	129.0	..
Output Shares (%)							
Coal	*6.0*	*38.3*	*28.5*	*28.0*	*24.4*	*24.5*	..
Oil	*12.3*	*4.3*	*3.3*	*2.9*	*4.2*	*3.8*	..
Gas	*79.5*	*50.9*	*58.9*	*59.4*	*57.4*	*60.5*	..
Comb. Renewables & Wastes	*–*	*1.4*	*3.7*	*4.3*	*6.7*	*5.9*	..
Nuclear	*2.1*	*4.9*	*4.2*	*4.1*	*3.8*	*–*	..
Hydro	*–*	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	..
Geothermal	*–*	*–*	*–*	*–*	*–*	*–*	..
Solar/Wind/Other	*–*	*0.1*	*1.2*	*1.2*	*3.4*	*5.1*	..
TOTAL LOSSES	**14.3**	**15.5**	**17.3**	**17.9**	**15.1**	**18.8**	**..**
of which:							
Electricity and Heat Generation[9]	7.5	8.6	9.1	9.3	6.8	9.6	..
Other Transformation	1.6	0.9	1.7	1.7	6.2	6.4	..
Own Use and Losses[10]	5.2	6.0	6.5	6.9	2.1	2.8	..
Statistical Differences	**–0.7**	**–0.2**	**–0.4**	**–0.0**	**–**	**–**	**..**

INDICATORS

	1973	1990	2001	2002	2010	2020	2030
GDP (billion 1995 US$)	252.99	374.14	504.37	505.60	616.02	788.56	..
Population (millions)	13.44	14.95	16.04	16.15	16.09	17.00	..
TPES/GDP[11]	0.25	0.18	0.15	0.15	0.13	0.11	..
Energy Production/TPES	0.91	0.91	0.78	0.77	0.73	0.72	..
Per Capita TPES[12]	4.65	4.45	4.82	4.83	5.04	5.26	..
Oil Supply/GDP[11]	0.12	0.07	0.06	0.06	0.05	0.04	..
TFC/GDP[11]	0.19	0.14	0.12	0.12	0.11	0.09	..
Per Capita TFC[12]	3.64	3.42	3.76	3.72	4.10	4.15	..
Energy-related CO_2 Emissions (Mt CO_2)[13]	153.8	157.1	177.7	177.9	166.2	187.9	..
CO_2 Emissions from Bunkers (Mt CO_2)	39.3	39.0	56.1	56.3	67.2	74.4	..

GROWTH RATES (% per year)

	73-79	79-90	90-01	01-02	02-10	10-20	20-30
TPES	1.7	–0.3	1.4	0.8	0.5	1.0	..
Coal	2.4	9.4	–0.6	0.6	–0.4	1.4	..
Oil	0.4	–2.4	1.8	0.9	0.5	0.4	..
Gas	2.4	–0.6	1.3	0.8	0.3	1.6	..
Comb. Renewables & Wastes	–	10.3	5.1	9.4	7.8	0.2	..
Nuclear	21.0	0.0	1.2	–1.5	0.2	–	..
Hydro	–	–	2.0	10.0	7.8	0.5	..
Geothermal	–	–	–	–	–	–	..
Solar/Wind/Other	–	–	29.4	8.8	14.9	6.1	..
TFC	2.0	–0.7	1.5	–0.6	1.2	0.7	..
Electricity Consumption	4.4	2.3	2.8	0.3	1.9	1.9	..
Energy Production	4.4	–1.8	0.0	–0.8	–0.2	0.9	..
Net Oil Imports	1.0	–4.1	2.9	–4.5	1.9	0.4	..
GDP	2.6	2.2	2.8	0.2	2.5	2.5	..
Growth in the TPES/GDP Ratio	–0.9	–2.5	–1.3	0.6	–1.9	–1.5	..
Growth in the TFC/GDP Ratio	–0.6	–2.8	–1.2	–0.8	–1.3	–1.8	..

Please note: Rounding may cause totals to differ from the sum of the elements.

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

1. Includes lignite.
2. Comprises solid biomass, biogas, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
3. Total net imports include combustible renewables and waste.
4. Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.
5. Includes non-energy use.
6. Includes less than 1% non-oil fuels.
7. Includes residential, commercial, public service and agricultural sectors.
8. Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.
9. Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear and 100% for hydro.
10. Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
11. Toe per thousand US dollars at 1995 prices and exchange rates.
12. Toe per person.
13. "Energy-related CO_2 emissions" have been estimated using the IPCC Tier I Sectoral Approach. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2002 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The member countries* of the International Energy Agency (IEA) seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants.

In order to secure their objectives they therefore aim to create a policy framework consistent with the following goals:

1. **Diversity, efficiency and flexibility within the energy sector** are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies**. In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. **The environmentally sustainable provision and use of energy** is central to the achieve-ment of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should where practicable have regard to the Polluter Pays Principle.

4. **More environmentally acceptable energy sources** need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA members wish to retain and improve the nuclear option for the

* Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

5. **Improved energy efficiency** can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. **Undistorted energy prices** enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. **Free and open trade** and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. **Co-operation among all energy market participants** helps to improve information and understanding, and encourage the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at their 4 June 1993 meeting in Paris.)

GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention and subsequently abbreviated, this glossary provides a quick and central reference for many of the abbreviations used.

APX	The Amsterdam Power Exchange.
bcm	billion cubic metres.
CDM	clean development mechanism.
CH_4	methane.
CHP	combined production of heat and power; sometimes when referring to industrial CHP, the term "co-generation" is used.
CO_2	carbon dioxide.
DTe	Office for Energy Regulation.
EU	European Union.
EnergieNed	Federation of Energy Companies in the Netherlands.
GDP	gross domestic product.
GHG	greenhouse gases (see footnote 2).
GW	gigawatt, or 1 watt $\times$ 10^9.
GW_{th}	gigawatt of thermal capacity.
GWh	gigawatt-hour = 1 gigawatt $\times$ one hour.
HFC	hydrofluorocarbon.
IEA	International Energy Agency.
IPCC	Intergovernmental Panel on Climate Change.
JI	joint implementation.

km^2	square kilometre.
kWh	kilowatt-hour = 1 kilowatt × one hour.
m	metre.
m^3	cubic metre.
mcm	million cubic metres.
Mt	million tonnes.
Mtoe	million tonnes of oil equivalent; see toe.
MVA	megavolt-ampere.
MW	megawatt, or 1 watt × 10^6.
MW_e	megawatt of electrical capacity.
MWh	megawatt-hour = 1 megawatt × one hour.
NAM	Nederlandse Aardolie Maatschappij
NGO	non-governmental organisation.
NMa	The Netherlands Competition Authority.
NO_x	nitrogen oxide.
N_2O	nitrous oxide.
OECD	Organisation for Economic Co-operation and Development.
PFC	perfluorocompounds.
PJ	petajoule, or 1 joule × 10^{15}.
PM_{10}	small particles, diameter under 10 micrometers.
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well.
REB	regulatory energy tax.
SF_6	sulphur hexafluoride.
SO_2	sulphur dioxide.
TFC	total final consumption of energy.
TJ	terajoule, or 1 joule × 10^{12}.

toe	tonne of oil equivalent, defined as 10^7 kcal.
TPA	third-party access.
TPES	total primary energy supply.
TSO	transmission system operator.
TWh	terawatt-hour = 1 terawatt × one hour.
VAT	value-added tax.
VenW	Ministry of Transport, Public Works and Water Management.
VROM	Ministry of Housing, Spatial Planning and the Environment.

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