The Netherlands

(Updated 2012)

1. GENERAL INFORMATION

1.1. Country overview

The Netherlands is situated in north-west Europe, on the North Sea shore. It has a coastline of 450 km, with a total land area of roughly 42,000 km^2. With over 16 million inhabitants, the Netherlands has the 25^{th} highest population density in the world and the highest density in the OECD. The country's annual population growth rate is 0.44% (Table 1).

The Netherlands is an important centre for trade and distribution, with international harbours located in Rotterdam and Amsterdam. The industrial sector is largely driven by food processing, chemicals, petroleum refining and electrical machinery. Since the discovery of hydrocarbons in the middle of the last century, the country has had significant production of fossil fuels, primarily natural gas.

Source: Wikipedia

1.1.1. Governmental System

The Netherlands is a parliamentary democracy, organised as a unitary state. Its capital is Amsterdam, while the seat of government is located in The Hague. Among other affiliations, the country is a founding member of the EU, NATO, OECD and WTO. Along with Belgium and Luxembourg, the Netherlands forms the Benelux economic union. The Netherlands is itself host to various international courts and to Europol, the European Union's criminal intelligence agency. It has a capitalist, market-based economy, ranked 13th of 157 countries according to the Index of Economic Freedom.

(Source: Wikipedia)

1.1.2. Geography and Climate

The Netherlands lies between latitudes 50° and 54° N, and longitudes 3° and 8° E. The country is divided into two main sections by three large rivers: the Rhine (*Rijn*), the Waal and the Meuse (*Maas*). The south-western part of the Netherlands is a river delta and two tributaries of the Scheldt (*Westerschelde and Oosterschelde*).

The predominant wind direction in the Netherlands is southwest, resulting in a moderate maritime climate with cool summers and mild winters. Ice days (maximum temperature below 0°C) usually occur between December and February, while freezing days (minimum temperature below 0°C) occur much more often, usually appearing between mid-November and late March. Warm days (maximum temperature above 20°C) are typically recorded between April and September, while summer days (maximum temperature above 25°C) are usually measured from May

until August. Tropical days (maximum temperature above 30°C) occur rarely, in the Netherlands, and are generally only found in the months of June and August. Precipitation throughout the year is relatively equally shared by each month.

(Source: Wikipedia)

1.1.3. Population

Population growth, density, and urban population as a percentage of the total population are shown in table 1, below.

TABLE 1. POPULATION INFORMATION

							Average annual growth rate (%)
Year	1970	1980	1990	2000	2005	2011*	2000 to 2011*
Population (millions)	13,0	14,1	14,9	15,9	16,3	16,7	0,44
Population density (inhabitants/km²)	384,0	415,0	439,0	468,0	483,0	494,0	0,49
Urban Population as % of total	61,7	64,7	68,7	76,8	80,2	82,9	0,77
Area (1000 km²)				33,9	33,8	33,7	

* Latest available data; for urban population it is 2010.

Source: Statistics Netherlands and World Bank (World Development Indicators).

1.1.4. Economic Data

The historical GDP growth rates are shown in Table 2.

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

							Average annual growth rate (%)
	1970	1980	1990	2000	2005	2010**	2000 to 2010**
GDP (millions of current US$)	*35.352*	*180.770*	*294.871*	*385.075*	*638.471*	*779.356*	7,30
GDP (millions of constant 2000 US$)	*166.361*	*226.172*	*281.956*	*385.075*	*411.168*	*441.185*	1,37
GDP per capita (PPP* current US$/capita)	0	9.878	17.641	29.408	35.104	42.165	3,67
GDP per capita (current US$/capita)	*2.711*	*12.775*	*19.722*	*24.180*	*39.122*	*46.904*	6,85

* PPP: Purchasing Power Parity

** Latest available data

Source: World Bank (World Development Indicators).

1.2. Energy Information

Historically, domestic gas production has played a key role in ensuring the Netherlands and European energy security. Domestic reserves and production are now in decline, but the Netherlands wishes to maintain a leading role in European gas markets through enhanced gas trading and by providing gas flexibility through increased storage capacity. The Netherlands has ambitions of becoming a gas hub in north-western Europe.

After the USA, the Russian Federation, Canada, the UK, Algeria, Iran and Indonesia, the Netherlands is the world's eighth biggest producer of natural gas (Table 3). Total energy consumption in the Netherlands consists of natural gas (48.2%), oil (35.2%), coal (10.9%), and nuclear energy (1.3%) and renewable energy resources (4%).

1.2.1. Estimated available energy

Table 3 shows the estimated available energy sources per January 2011.

TABLE 3. ESTIMATED AVAILABLE ENERGY SOURCES

	Estimated available energy sources					
	Fossil Fuels			Nuclear	Renewables	
	Solid	Liquid	Gas	Uranium	Hydro	Other Renewable
Total amount in specific units*		45,7	1304			
Total amount in Exajoule (EJ)						

* Solid, Liquid: Million tons; Gas: Billion m3; Uranium: Metric tons; Hydro, Renewable: TW
Source: Delfstoffen en Aardwarmte in Nederland, jaarverslag 2010. Estimated reserves per 1.1.2011.

1.2.2 Energy Statistics

Table 4 provides information on the historic growth rates of total primary energy consumption and energy production.

TABLE 4. ENERGY STATISTICS (*EJ*).

							Average annual growth rate (%)
	1970	1980	1990	2000	2005	2010*	2000 to 2010*
Total Primary Energy consumption**							
- Total	2,056	2,695	2,750	3,066	3,300	3,489	1,301
- Coal and coal products***	0,197	0,159	0,374	0,329	0,343	0,332	0,098
- Liquids	1,210	1,208	0,975	1,084	1,248	1,304	1,869
- Gases	0,646	1,274	1,290	1,465	1,479	1,641	1,145
- Nuclear	0,004	0,046	0,038	0,043	0,044	0,043	0,109
- Hydro	0,000	0,000	0,000	0,001	0,000	0,000	-2,973
- Biofuels and waste	0,000	0,010	0,040	0,073	0,112	0,141	6,878
- Electricity	-0,001	-0,001	0,033	0,068	0,066	0,010	-17,464
- Other Renewables	0,000	0,000	0,000	0,004	0,009	0,016	14,172
Energy production							
- Total	1,209	3,007	2,535	2,410	2,605	2,920	1,937
- Coal and coal products ***	0,118	0,000	0,000	0,000	0,000	0,000	
- Liquids	0,082	0,067	0,170	0,102	0,098	0,071	-3,574
- Gases	1,004	2,884	2,286	2,184	2,355	2,655	1,971
- Nuclear	0,004	0,046	0,038	0,043	0,044	0,043	0,109

- Hydro	0,000	0,000	0,000	0,001	0,000	0,000	-2,973
- Biofuels and waste	0,000	0,010	0,040	0,077	0,099	0,134	5,755
- Electricity	0,000	0,000	0,000	0,000	0,000	0,000	
- Other Renewables	0,000	0,000	0,000	0,004	0,009	0,016	14,172
Net import (Import - Export)							
- Total	1,283	0,141	0,738	1,451	1,591	1,282	-1,229

* Latest available data
** Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.
*** Solid fuels include coal, lignite
Source: IEA.

1.2.3. Energy policy

The energy policy of the Dutch government is laid out in the Energy Report 2011, which was sent to parliament in June 2011. It should be noted that the Dutch government resigned in April 2012. New elections will take place in September 2012.

In its energy policy, the government has opted for a clear international and economic approach with five key objectives:

1. Modern industrial policy
The Netherlands has a strong, innovative energy sector, and the government wants to further strengthen its competitiveness. This is good for the Dutch economy, and will contribute to economic recovery. The government has therefore identified energy as a top-priority sector. Policy will focus on both grey and green energy. In the area of green energy, the approach focuses on the development and profitability of renewable energy technologies. Innovation is essential for making renewable energy competitive, and businesses can benefit by selling these technologies on the domestic and international market. The emphasis must therefore move towards stimulating innovation and move away from promoting renewable energy through expensive and ineffective operating grants for unprofitable technologies. In terms of fossil fuels, the approach is focussed on taking advantage of the position of the Netherlands as a gas producer. As a flexible, relatively clean and plentiful source of energy, the government has earmarked an important role for gas, in the future supply of energy. The Netherlands has large gas reserves, an advanced infrastructure and extensive expertise and knowledge of gas. The government wants to capitalise on this situation by positioning the Netherlands as a gas hub of north-west Europe. This will not only generate business and jobs, but will also contribute to security of supply.

2. Expanding the share of renewable energy
It is clear that renewable energy is an essential part of the future. Investing in sustainable energy management pays off, as the ultimate social benefits outweigh the social costs. One condition is that the transition to sustainable energy be economically viable: promoting the use of technologies that are cost effective and applying innovation policy to other technologies. The economic crisis has emphasised the need for this. A hasty deployment of renewable energy leads to unnecessarily high social costs. The government will follow a two-track policy in this respect:
Long term: The long-term approach is dedicated to promoting innovation as described above, so renewable energy can compete with grey energy. Renewable energy should

be a standard part of the European internal energy market. The government therefore supports the creation of a genuine European single market for renewable energy. Short term: In 2010 renewable energy accounted for 4% of national energy use. The European target for renewable energy in the Netherlands is 14% in 2020. Achieving this goal requires substantial investment. To stimulate renewable energy production, the government has earmarked an annual sum of € 1.4 billion from 2015, which represents a major step towards achieving the 2020 target. The major instrument to stimulate the deployment of renewable energy is a feed-in premium scheme, called the SDE+. In addition, the government has made an agreement with the energy sector on the co-firing of biomass in coal-fired power plants. Two other instruments are currently being considered to further increase the share of renewable energy: (1) introduction of a supplier-obligation, under strict conditions relating to the costs for consumers and the European policy developments; (2) import of renewable energy, using the cooperation mechanisms as defined in the EU Directive on renewable energy.

3. Providing scope for all energy options towards 2050

The government wishes to develop a balanced mix of green and conventional energy in an integrated energy market. Countries should be able to benefit from comparative advantages resulting in a European energy mix which is as cheap as possible. Fossil fuels will continue to be needed in coming decades, however, work on measures to reduce carbon emissions must go on. The government sees the European Emissions Trading System (ETS) as the most important instrument for reducing carbon emissions. A properly functioning ETS should encourage sector parties to choose the most efficient technology to reduce emissions at the least possible cost to society. Carbon emissions will be reduced by a combination which involves increasing the portion of renewable energy, energy saving, nuclear energy and carbon capture and storage. The government will provide scope for all energy options, within strict conditions, to achieve a low-carbon economy by 2050 and to ensure safety and safeguard the environment. As nuclear energy produces no carbon emissions, the government sees it as a necessary step on the road to a low-carbon economy. It also helps to reduce dependence on imports of fossil fuels and strengthens security of supply. This is why the government is providing scope, within strict safety standards, for market parties to invest in new nuclear power plants in the Netherlands. The government is stimulating the development of CCS technology. Currently, only demonstration projects for under-sea storage are permitted. Eventually Dutch and European fossil energy resources will be exhausted. Global competition for energy raw materials is increasing, while the supply is concentrated in a limited number of countries and regions which can be politically or economically unstable. In addition to strengthening the European market, positioning the Netherlands as the gas hub of north-west Europe and stimulating renewable energy, the government is pursuing active energy-diplomacy to safeguard the energy supply. The new energy diplomacy is aimed at large energy players, like the United States, China, Russia and Brazil, to exploit opportunities for the sector and make use of the potential for knowledge exchange. At the same time, more attention will be paid to influencing European policy and regulation and maintaining bilateral contacts with our neighbouring countries.

4. Green Deal

The government has decided to enter into a Green Deal with society. The Green Deal will use concrete action on the road to a sustainable society, in other words, green growth. A sustainable society cannot be created automatically, nor can it be created if it has to rely on government subsidies alone. It requires a joint effort from society and government. By aiming for common objectives, we can create a robust and stable perspective for a sustainable economy. Prior to this, a gradual process of concrete actions will be set in motion, involving government and society, to demonstrate that sustainability is possible and economically attractive, and allowing the whole of society to join in. Energy saving and sustainable energy are important elements of the Green Deal. Even more effective in making energy greener is energy saving. It is difficult in practice to pursue generic energy-saving policy, as the potential for energy saving and the associated costs vary greatly from sector to sector.

5. Investing in a sound European energy market with good infrastructure. Cross-border integration of national network administrators to be facilitated.
Proper energy infrastructure is necessary to ensure clean, secure and affordable energy. The government is aiming for a well-functioning north-west European market by promoting cross-border energy flows. In this context, the government is continuing its co-operation in the Pentalateral Energy Forum, in order to improve the market linkage with our neighbouring countries and harmonise cross-border grid investment. In addition, the government is opening up the opportunities for participation in national grid managements, in order to promote northwest European integration. This will enable private funding in national network administrators and opens up access to the capital market. Regulation will be revised on a number of points. Network administrators will be given extra scope to invest in grids, to ensure security of supply and to enable the use of renewable energy, in order to guarantee a reasonable return on investment. A reasonable return will be one of the criteria used in drawing up regulation. These changes are intended to provide the power company with the security of achieving a reasonable return on regulated investments in line with the market. In Europe, the government will press for a more equitable spread of costs and returns for infrastructure, and is exploring the possibility of sharing costs proportionally between customers and producers in the Netherlands, in the short term. The government wishes to improve the investment climate in the sector by reducing the regulatory burden and by facilitating more efficient control. The focus will be on the scope for deregulation, reduction of control costs and the administrative burden and costs associated with compliance. Finally, it is necessary to make timely planning choices to ensure that there is sufficient space for future energy production, and to be able to use the available space quickly and efficiently as and when the market demands it. In this context, the government is drawing up national planning visions for wind energy on land and the underground pipelines, and is evaluating existing national planning visions SEV III (2012) and the 2015 national water plan.

1.3. The electricity system

1.3.1. Electricity policy and decision making process

Concerning the construction of new electricity generators, there are no specific requirements to be fulfilled by applicants. The Netherlands operates a system of authorization. For all construction purposes, the same authorization procedure applies. The ministry of Economic Affairs, Agriculture and Innovation has no role to play in this procedure. Depending on the scale of the project, the authorizations needed are

dealt with either by the Ministry of Infrastructure and Environment or by lower authorities.

The Dutch regulator for electricity is the Office of Energy Regulation (Energiekamer), which is a separate chamber of the Netherlands Competition authority (Nederlandse Mededingingsautoriteit, NMa).

The Energiekamer is charged with regulation and oversight duties stemming from the Electricity and Gas Act.

The Energiekamer is also responsible for:

- Issuing supply licenses for the supply of electricity and gas to captive consumers

- Determining tariff structures and conditions for the transmissions 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 transmission tariffs for electricity and gas, including the discount aimed at promoting the efficient operation of the electricity grid and gas networks

- Supervision of compliance with the Electricity and Gas Act

1.3.2. Structure of electric power sector

The Dutch electricity sector began the process of market liberalisation in the late 1990s. Prior to this, the market had been dominated by four companies that operated together through a joint-stock company, SEP. SEP's primary role was to coordinate electricity production and the planning of new plants. It was dissolved in 2001.

At the end of 2010, the five largest producers of electricity in the Netherlands are Electrabel, Essent/RWE, Nuon/Vattenfall, E.ON Benelux and Delta, which together manage over 70% of the installed capacity. NPP Borssele is owned by Elektriciteitsproduktiemaatschappij Zuid-Nederland (EPZ), which is a 50/50 joint venture of Delta and Essent/RWE.

There are also a lot of smaller companies active in the market, mainly in a decentralized capacity.

The country's transmission system operator (TSO), TenneT, was established in 1998. At present, TenneT is under ownership independent from other parts of the supply chain and fully owned by the State. It is responsible for ensuring the stability and reliability of the electricity grid, balancing the load in the Dutch system and with neighbouring countries, and maintaining the high-voltage grid in good condition in order to allow access and maximize capacity use. TenneT is also the majority owner (74.5%) of APX, the short-term trading exchange for gas and electricity.

The retail market was fully liberalised on 1 July, 2004, with all retail customers free to choose their own electricity supplier. At the same time, legal unbundling of supply and distribution network operations was instituted.

1.3.3. Main indicators

Capacity

The Netherlands' total installed power generating capacity was more than 26 GW, in 2010. Three-fourths of capacity comes from steam turbines and combined heat and power (CHP). Renewables account for over 9% of total capacity, but provided only 2.5% of total generation in 2010. Nuclear capacity is slightly over 2% of the total but, because of its high capacity factor, the share of nuclear in total generation was 3.5% in 2006, and around 3.6% in 2010.

Significant new generating capacity (over 13 GW) has been proposed to come on line between now and 2014, although not all proposed projects will be completed.

Electricity generation

Power generation in the Netherlands is dominated by natural gas, which had a 60% share in 2010. Natural gas has fuelled more than half of the Netherlands' electricity generation since the early 1980s – down from nearly three-quarters in the 1970s. Just over a quarter of generation comes from coal. With respect to renewables, over 5% comes from biomass, with less than 4% from other renewable sources . The nuclear reactor at Borssele in Zeeland continues to provide a small amount of power – 4% in 2007 – as it has since 1973. (In addition, approximately 5% of Dutch electricity supply is provided by imported nuclear power.)

According to government projections based on the so-called "global economic scenario", the share of coal-fired generation is expected to increase substantially between 2007 and 2030, rising from just over a quarter to over half of all generation. Over the same period, natural gas will fall to less than 30% of generation. This change in the fuel mix is expected to happen if the existing government policies are not extended beyond 2020. The construction of new coal-fired power plants is expected, driven by relatively low coal prices, supposedly with technological capability to implement CCS.

Table 5 shows the historic growth in electricity production, consumption and capacity in the Netherlands and table 6 the energy related ratios.

TABLE 5. ELECTRICITY PRODUCTION, CONSUMPTION AND CAPACITY

							Average annual growth rate (%)
	1970	1980	1990	2000	2005	2010*	2000 to 2010*
Net Capacity of electrical plants (GWe)							
- Thermal			16,960	20,116	20,039	23,814	1,702
- Hydro			0,037	0,037	0,037	0,037	0,000
- Nuclear			0,508	0,449	0,449	0,510	1,282
- Wind			0,050	0,447	1,224	2,237	17,472

- Geothermal			0,000	0,000	0,000	0,000	0,000
- other renewable			0,001	0,013	0,051	0,088	21,075
- Total			17,556	21,062	21,800	26,686	2,395
Electricity production (gross TWh)							
- Thermal	40,49	60,61	68,30	84,73	94,03	110,01	2,65
- Hydro	0,00	0,00	0,09	0,14	0,09	0,11	-2,97
- Nuclear	0,37	4,20	3,50	3,93	4,00	3,97	0,11
- Wind	0,00	0,00	0,06	0,83	2,07	3,99	17,02
- Geothermal	0,00	0,00	-	0,00	0,00	0,00	0,00
- other renewable	0,00	0,00	-	0,01	0,03	0,06	22,32
- Total (1)	40,86	64,81	71,94	89,63	100,22	118,14	2,80
Total net Electricity consumption** (TWh)	40,52	64,53	78,64	104,94	114,46	117,121	1,10

(1) Electricity transmission losses are not deducted.
* Latest available data
** own use is excluded from total electricity supply.
Source: Statistics Netherlands

TABLE 6. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2005	2010*
TPES per capita (GJ/capita)	159	191	185	193	202	210
Electricity consumption per capita (kWh/capita)	2950	4365	5220	6561	6989	6795
Electricity production/Energy production (%)	12	8	10	13	14	15
Nuclear/Total electricity (%)	0,9	6,5	4,9	4,4	4,0	3,4
Ratio of external dependency (%) (1)	62	5	27	47	48	37

(1) Net import / Total energy consumption.
(2) TPES = Total primary energy supply)
* Latest available data
Source: IEA and Statistics Netherlands.

2. NUCLEAR POWER SITUATION

2.1. Historical development and current organizational structure

In 1968, the first nuclear power plant, at Dodewaard, was connected to the grid. The original goal of the Dodewaard facility was to gain practical knowledge and experience with nuclear power in order to determine whether commercial application of nuclear power would be feasible. In 1973, the Borssele nuclear power plant began operation. Decisions taken by the Dutch Government and Parliament in 1974 and 1975, to expand the number of nuclear power plants, were subsequently deferred pending resolution of debates on the issue. Similar decisions taken in 1985 and 1986 were also suspended, following the Chernobyl accident. Since that time, the Netherlands' government has initiated various studies and research programmes, especially in the fields of nuclear safety and radioactive waste.

The operation license for the Borssele nuclear power plant, issued in 1973, does not contain a predetermined expiration date. This means that as long as the requirements (as stated in the regulations and the license) are fulfilled, the plant is allowed to operate. The regulatory body is charged with monitoring and control of the requirements, and will intervene if necessary. Following political pressure to shut down the plant (first by the end of 2003, later by the end of 2013) and taking into

consideration the new tasks and responsibilities of the government in the now-liberalized energy production market, the desirability of a clearly predefined expiration date for the license was recognized by the government. However, a unilateral decision by the regulatory body to shut down the plant at short notice (in 2013), even if technically possible, might lead to a considerable damages claim. It was also recognized that technical possibilities exist for continuing to operate the Borssele NPP safely, and that continued operation after 2013 could help to reduce greenhouse gas emissions

In June 2006, the Dutch Government and the owners of the Borssele NPP signed an agreement (Covenant) which allows for operation until the end of 2033 at the latest, provided requirements of the operating license and of the Covenant continue to be met. In 2010, this utmost closing date of 31st December 2033 was also fixed by law. The main agreements in the Covenant, besides the closing date, regard: 1) a so-called 'safety benchmark' (Borssele NPP must belong to the top-25% in safety of the fleet of water-moderated Light Water Reactors (LWRs) present in the European Union, Canada and the USA); 2) extra incentive for more sustainable energy management (the owners of Borssele NPP must invest a total of around € 250 million in sustainable energy) to mainly focus on energy saving, clean fossil fuels (including carbon sequestration) and renewable energy such as biomass; 3) funding of decommissioning costs.

The legal status of the agreement is such that it cannot easily be challenged by future policies on nuclear power. Also, the closing date at the end of 2033 is now taken up in the Nuclear Energy Act.

National Organisations
The licensee is primarily responsible for nuclear safety. However, the government, the regulator, technical support organizations, vendors, service providers and other stakeholders are also important to improve and to maintain a high standard of safety.

Introduction to National Organisations
The organisation of the regulatory body has changed since the publication of the Netherlands' 2010 Report to the Convention on Nuclear Safety (CNS). This is not related to the Fukushima Dai-ichi events.

Regulatory body
All nuclear facilities in the Netherlands, including the NPP of Borssele, operate under license, awarded after a safety assessment has been carried out. The license is granted by the regulatory body under the Nuclear Energy Act.

The 'regulatory body' is the authority designated by the government as having legal authority for conducting the regulatory process, including issuing licenses, and thereby regulating nuclear, radiation, radioactive waste and transport safety, nuclear security and safeguards.

Since October 2010, the Minister of Economic Affairs, Agriculture & Innovation (EL&I[1]) is the principal authority responsible for conducting the regulatory process under the Nuclear Energy Act and for the main functions of the regulatory body.

[1] Dutch: EL&I, 'Economische Zaken, Landbouw & Innovatie'

The structure of the current regulatory body is presented in figure 1, below.

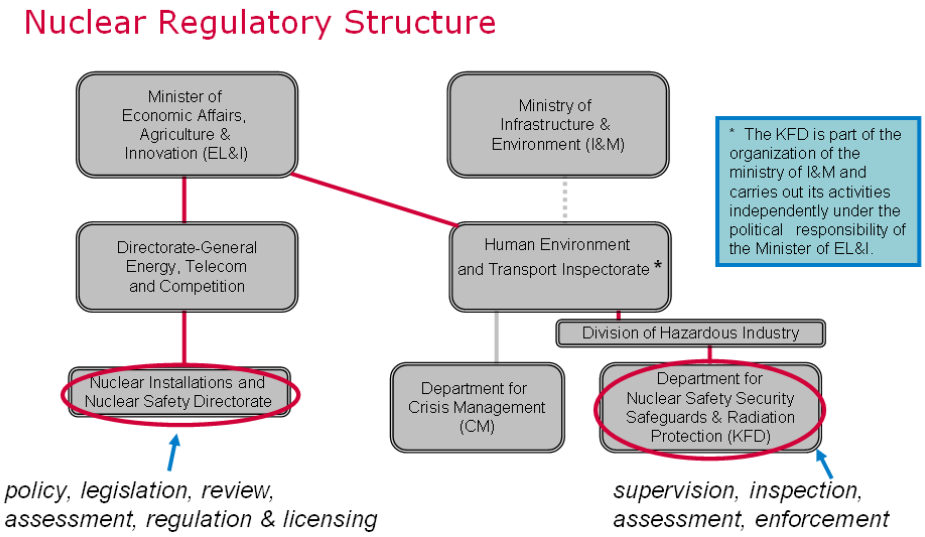

Figure 1

The new regulatory structure in the Netherlands places the Ministry of EL&I as the principal responsible authority for conducting the regulatory process, under the Nuclear Energy Act.

Within the ministry of EL&I, the 'Directoraat voor Nucleaire installaties en veiligheid' (NIV), i.e. nuclear installations and safety department, is involved in the preparation of legislation, formulation of policies (excluding energy policy) and licensing.

The nuclear inspectorate, the 'Kernfysische dienst' (KFD), is within the general responsibility of the Minister of EL&I and is the responsible for the independent supervision (safety assessment, inspection and enforcement) of the safety, security and non-proliferation of activities and facilities (including nuclear facilities). The KFD is embedded in an organisational division of the 'Inspectorate for the Environment and Transport' (ILT), which is the inspection branch of the Ministry of Infrastructure and the Environment (IenM).

Governmental supporting organisations: RIVM

The National Institute for Public Health and the Environment (RIVM) is a specialised Dutch government agency. The RIVM coordinates the back-office of the National Nuclear Assessment Team for radiological analyses and information (BOR).

RIVM is the premier expertise and orchestration centre in its field. Its remit is to modernise, gather, generate and integrate knowledge, and to make it usable in the public domain. By performing these tasks, RIVM contributes to promoting the health of the population and the environment by providing protection against health risks and environmental damage.

RIVM supports the Ministries with scientific studies about emergency preparedness for severe accidents and the ERO. RIVM works together with other (governmental)

expert organisations, such as the Royal National Meteorological Institute (KNMI), to create models for the prediction of the effects of discharges of radioactive material in the air. RIVM also operates the national radiological monitoring network.

Notified bodies
The assessment and inspection of the integrity of pressure-retaining components is subcontracted to a Notified Body, Lloyds Register Nederland BV. The assessments and inspections of the Notified Body are performed under supervision of the KFD.

Companies having the required knowledge and expertise can qualify as a Notified Body. Lloyds Register Nederland BV is one of such organisations. This organisation is the privatised former Pressure Vessel Inspectorate (Stoomwezen BV), and is certified as a Notified Body in accordance with the European Pressure Equipment Directive.

Education and training organisations
The RID/R3 organisation at the Technical University in Delft and the Nuclear Research & Consultancy Group (NRG) in Petten and Arnhem provide education and training in nuclear technology and radiation protection to clients from nuclear and non-nuclear businesses and various governmental organisations. NRG also provides training for the NPP staff.

For education and training in radiation protection, a national system exists with four levels of education. The government recognizes training institutes for a specific training program of radiation protection. In order to get a degree in radiation protection, an exam must be passed.

A change in the system of education for radiation protection is under development. Registration of radiation protection experts of the levels 2 and 3 is expected in 2013. Formal requirements to obtain registration certificates are laid down for the initial education, for continuing education and for work experience.

Technical (Support) Organisations
GRS, Germany

The Dutch regulatory body cooperates with the Technical Support Organization from Germany, GRS. This is the major Technical Support Organisation in Germany. GRS aids the German regulatory body in the regulatory oversight process. Occasionally GRS provides education and training for governmental and commercial organisations.

NRG, Netherlands

The Nuclear Research & consultancy Group (NRG) in Petten and Arnhem provides consultancy services to government and industry and provides operational support to utilities.

2.2. Nuclear power plants: Overview

2.2.1. Status and performance of nuclear power plants

Table 7 provides information on the status of nuclear power plants (NPP).

TABLE 7. STATUS OF NUCLEAR POWER PLANTS

Station	Type	Net	Operator	Status	Reactor	Construction	Criticality	Grid	Commercial	Shutdown

		Capacity (Mwe)			Supplier	Date	Date	Date	Date	Date
BORSSELE	PWR	482	EPZ	Operational	S/KWU	01-Jul-69	20-Jun-73	04-Jul-73	26-Oct-73	
DODEWAARD	BWR	55	BV GKN	Permanent Shutdown	RDM	01-May-65	24-Jun-68	18-Oct-68	26-Mar-69	

2.2.2. Plant upgrading, plant life management and license renewals

At the moment, the Borssele NPP is preparing a license application for long term operation. The license for long term operation should ensure the management of ageing and obsolescence of the installation in the period up to the end of 2033.

In 2010, the Borssele NPP was granted a license for fuel diversification, which means that the plant can also make use of Mixed Oxide fuel (MOX).

At the end of 2011, the Borssele NPP published the results of the Complementary Safety Assessment (CSA), the so-called European stress test. The review of the CSA by the Dutch regulatory body, together with the European peer review, lead (in July 2012) to the establishment of a list of measures for the Borssele NPP and their terms of implementation.

As well as the projects mentioned, the Borssele NPP has to complete their 3rd 10-yearly periodic safety review (PSR) by the end of 2013. Measures as a result of this PSR have to be implemented by the end of 2017.

The main purpose of the Dodewaard nuclear power plant was to conduct nuclear experiments for commercial applications. The Dodewaard plant was the only reactor in the world which was cooled by natural circulation. This made the plant most suitable for verification experiments on a commercial scale.

Dodewaard became operational in 1968. It was designed to operate with natural circulation, and was fitted with an isolation condenser to remove excess heat, properties that later became standard features of the new BWR design with passive safety characteristics. Originally planned to operate until 1 January, 1995, its economic life was first extended to 1 January, 1997, and later to 2004. The plant is now in the decommissioning phase. It has been decided to have a protective storage period of 40 years, after conservation measures have been put in place, before its final decommissioning.

As previously stated, nuclear energy accounts for 4% of electricity production in the Netherlands. Nuclear energy is also imported from Belgium and France (approximately 5%).

2.3. Future development of Nuclear Power

According to the agreement of 2010, between the political partners of the government of the Netherlands, more nuclear power plants will be necessary in order to realise a CO2-reduction of 20%. This government therefore intended to grant applications for new nuclear power plants, provided they fulfil the legal conditions. The government also indicated that, in a free market, it is up to commercial partners to take initiatives

for such new nuclear power plants, and that the government will not subsidise these initiatives.

Before 2010, there were already two such initiatives aiming at building NPPs with a capacity of 2500MW each in the southwest of the Netherlands, at Borssele. According to these plans, the applications for the licenses would be submitted in 2012/2013 and the plants would be ready to connect to the grid in 2018-2020. However, in January 2012, these two plans were shelved by the initiators and are on hold for at least 2-3 years.

Since the start of the government in 2010, the Ministry of EL&I has worked on developing new legal conditions on nuclear safety according to the latest views of the IAEA and WENRA. The intention is to implement these conditions in 2013, in a decree based on the Nuclear Power Act. The lessons learned from the accident in Fukushima would also be implemented in this regulation.

2.4. Organizations involved in construction of NPPs

As mentioned above, there were two initiatives aiming to build one or more new NPPs with a total capacity of 2500MW each, in the south of the Netherlands at Borssele. However, in January 2012, these two plans were shelved by the initiators and are on hold for at least 2-3 years. At the moment, it is therefore too early to make any statements about the organizations which are involved in the construction of the new build of NPPs in the Netherlands. Also, specific strategies concerning national and/or local industrial development have not been developed yet.

2.5. Organizations involved in operation of NPPs

The NPP in Borssele is owned and operated by N.V. EPZ, and will be in operation until 31 December, 2033.

2.6. Organizations involved in decommissioning of NPPs

The NPP in Borssele is owned and operated by N.V. EPZ, and will be in operation until 31 December, 2033. After shut–down, direct decommissioning will take place. It is envisaged that EPZ will hire an external company to dismantle the facility.

The NPP in Dodewaard is owned by B.V. GKN, and is in a state of safe enclosure for a period of 40 years, since 2005. Final decommissioning will start in 2045. It is envisaged that GKN will hire an external company to dismantle the facility.

2.7. Fuel cycle including waste management

Uranium enrichment

Uranium enrichment and production of ultra-centrifuges are the most important parts of the fuel cycle for the Netherlands and are very successful.

Uranium enrichment is done by Urenco NL, which belongs to the Urenco Group, with production from plants in Germany, the Netherlands, the United Kingdom, and the US. Urenco is one of the four major uranium enrichment suppliers in the world.

Urenco consists of two main business units, the Enrichment Group (UEC) and the Technology Group (ETC).

The Enrichment Group is responsible for operating centrifuge enrichment plants and marketing the enriched uranium to nuclear utilities worldwide. It has contracts with over 40 utilities in 17 countries in Europe, North America and East Asia, and a growing world market share of around 30%. By the end of 2010, the Group built up an order portfolio of €19.5 billion. Along with other Urenco plants, the Almelo operation is being expanded. In 2011, Urenco NL was granted an increase in licensed capacity from 4950 TSWu/yr separative work units to 6200 tSWu/yr.

Urenco has concluded a joint venture with Areva (Fr) that is building an enrichment facility on the basis of Urenco's ultracentrifuge technology in Tricastin (FR)

The Technology Group (ETC) owns the world-leading centrifuge technology and was formed in October 2003. Since July 2006, ETC has been jointly owned by Urenco (50%) and its joint-venture partner Areva (50%). It has its main offices in Almelo. ETC develops, manufactures, supplies and installs gas centrifuges in the Urenco enrichment plants, and in the future will also supply centrifuges to Areva, and to the Urenco facilities in Europe and in the US. ETC also designs uranium enrichment plants using centrifuge technology.

Radioactive waste and spent fuel management

The Netherlands' policy on radioactive waste and spent fuel management is based on a report that was presented to parliament by the government in 1984. This report covered two areas. The first concerned the long-term interim storage of all radioactive wastes generated in the Netherlands, and the second concerned the government research strategy for eventual disposal of these wastes.

This report led to the establishment of the Central Organisation for Radioactive Waste (COVRA) in Borsele, and to the establishment of a research programme on disposal of radioactive waste. Pending the outcome of research into disposal and pending assurance of political and public acceptance, it was decided to construct an engineered surface-storage facility with sufficient capacity for all the radioactive wastes generated in a period of at least 100 years.

Except for radioactive wastes with a half-life of less than 100 days, which is allowed to decay at the site where it is generated, all radioactive waste (and spent fuel) produced in the Netherlands is managed by COVRA, the Central Organisation for Radioactive Waste. COVRA operates a facility in the industrial area Vlissingen-Oost, in the south-west of the country. Currently, facilities for the storage of low-, intermediate- and high-level waste are in operation. The storage facility for high-level waste was commissioned in 2003, and is designed to accommodate reprocessed and vitrified spent fuel from the nuclear power stations, conditioned spent fuel from the research reactors as well as other types of high-level waste.

Transferral of the radioactive waste to COVRA includes transferral of the property and liabilities. The fact that COVRA takes full title of waste is reflected in the Transfer document and laid down in the General Conditions of COVRA. COVRA is a private organisation, all shares of which are in possession of the State of the Netherlands.

Regarding final disposal, the government policy on radioactive waste and spent fuel stipulates that all radioactive material and spent fuel produced in the Netherlands is to be disposed of in an underground repository. This repository will have to be designed in such a way that each step is reversible, in order to allow future generations to retrieve the waste, should an alternative solution become available.

Although the current radioactive waste management policy envisages no disposal in the near future, extensive research on the suitability of deep underground salt formations in the Netherlands has been carried out. In 1995, the so-called Commission Disposal Radioactive Waste ("CORA") research programme was initiated as a continuation of former research, aimed at demonstrating the technical feasibility of a retrievable underground repository in salt and clay formations. In 2001, the study was concluded. The main conclusions were:

- Retrieval of radioactive waste from repositories in salt and clay is technically feasible. The disposal concept envisages the construction of short, horizontal disposal cells, each containing one HLW canister.
- Safety criteria can be met. Even in a situation of neglect, the maximum radiation dose that an individual can incur remains far below 10 µSv/year.
- Structural adjustments to the repository design are required to maintain accessibility. This applies particularly to a repository in clay, which needs additional support to prevent borehole convergence and eventual collapse of the disposal drifts.
- Costs are higher than those for a non-retrievable repository, mainly due to maintenance of accessibility of the disposal drifts.

Because the Netherlands has adopted the strategy of storage in dedicated surface facilities for at least 100 years, there is no immediate urgency to select a specific disposal site. However, further research is required to resolve outstanding issues, to preserve expertise and knowledge, and to be prepared for site selection in case of any change to the current timetable, arising by way of future European directives, for example. The CORA committee recommended validation of some of the results of safety studies, under field conditions. Co-operation with other countries, particularly on joint projects in underground laboratories, is foreseen in this context. As regards other technical aspects, it recommended that attention be given to the requirements for the monitoring of retrievable repositories. Non-technical aspects will also be addressed.

In September 2009, after some years of delay, the third national research program on radioactive waste, OPERA, started. COVRA has been charged with conducting this € 10 million research program, while the costs are divided between the nuclear industry and the government. The goal of OPERA is to evaluate the existing safety and feasibility studies in a so-called safety case. The current considerations, with regard to the safety of a repository for radioactive waste, were made more than ten to twenty

years ago, and a re-evaluation in the light of current knowledge was considered necessary. The results of OPERA are expected around 2016.

Together with a core group of six other European countries, the Netherlands has representatives in the ERDO (European Repository Development Organisation) working group. The working group investigates the feasibility of establishing a formal, joint waste management organisation in Europe that can work on a multinational solution parallel to the national programmes. In parallel with OPERA, from which results are expected around 2016, the government will develop a national programme for management of spent fuel and radioactive waste, covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal. This national program is expected around 2014, due to the Directive on the management of spent fuel and radioactive waste (Council Directive 2011/70/Euratom), and will be based on the existing and projected national inventory of radioactive waste and spent fuel. The national program will include:

- the overall objectives of the Dutch national policy on spent fuel and radioactive waste management
- the significant major milestones, clear timeframes and responsibilities for the implementation and the achievement of these milestones, in light of the overarching objectives of the national programme
- an inventory of all spent fuel and radioactive wastes and estimates of future quantities, including those from decommissioning of nuclear installations and cyclotrons, clearly indicating the present location and the amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste
- the concepts or plans and technical solutions for spent fuel and radioactive waste management, from generation to disposal
- the concepts and/or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained, and the means to preserve knowledge of that facility while awaiting the complete decommissioning of the installation
- the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste
- the responsibility for the implementation of the national programme and the key performance indicators to monitor progress in the implementation
- an assessment of the national programme costs, the underlying basis and hypotheses for that assessment, which must include a profile over time
- the financing scheme(s) in force
- a transparent policy or process, as described in the paragraph below.

Since increasing public awareness could lead to challenges regarding the acceptance of radioactive waste disposal, it is realized that the public should be given the necessary opportunities to participate effectively in the process of decision-making on spent fuel and radioactive waste management in accordance with the national legislation and international obligations. It is also important to ensure that necessary

information on the management of spent fuel and radioactive waste is made available to workers in the nuclear and related industry, and to the general public. Information will be made available to the public in accordance with national legislation and international obligations, provided that this does not jeopardise other interests such as, inter alia, security, as layed down in national legislation or international obligations. This transparant process will also be more specified in the national programme, to be published around 2014.

Decommissioning and financial assurances for the costs of decommissioning

In principle, the operator is responsible for all aspects of decommissioning. According to new legislation, in force since April 2011, a nuclear facility shall be decommissioned directly after final shut-down. Decommissioning implies the implementation of all administrative and technical measures that are necessary to remove the facility in a safe manner and to create an end-state of 'green field'. Therefore, during the operational phase, the licensee is required to develop a decommissioning plan, describing all the necessary measures to safely reach the end state of decommissioning, including the management of radioactive waste, record-keeping, etc. This decommissioning plan shall be periodically updated every five years, and shall be approved by the authorities. The decommissioning plan ultimatelybecomes part of the decommissioning license.

During decommissioning, the licensee is required to store records of the decommissioning, the release of material, and the release of the site. At the end of decommissioning, the licensee can apply for withdrawal of the license, after presenting an end report to the authorities proving that the decommissioning was completed. After withdrawal of the license, records will be stored at COVRA.

The new legislation also requires the licensee to make available adequate financial resources for decommissioning at the moment that these are required. The licensee will therefore have to calculate the costs of all the activities described in the decommissioning plan in advance, and make financial provisions offering sufficient security that all costs are covered at the envisaged start of decommissioning. The licensee is free to choose the form of the financial provision, however, this must be approved by the authorities.

Reprocessing

The formal government policy on spent fuel management is that the decision on whether or not to reprocess spent fuel is left to the operator of a NPP. However, since reprocessing services are not available in the Netherlands, operators will have to conclude contracts with foreign companies and ship the spent fuel abroad. For shipping spent fuel to countries where reprocessing services are available, intergovernmental agreements are usually required, for the return of the reprocessed waste. This means, in practice, that support of the government (and parliament) is necessary.

In a position paper on new nuclear energy of 11 February 2011, it was confirmed that, in case an operator chooses in favour of reprocessing, the government will make efforts to conclude the necessary intergovernmental agreement that corresponds to the

timeframe of the reprocessing contract, with a maximum of 30 years. The position paper also states that the operator shall evaluate its "back-end strategy" every ten years. The government will evaluate its policy every 20 years.

In the early days, the operators of the Dutch NPPs decided in favour of reprocessing their spent fuel for economic reasons (and reuse of plutonium in breeder-reactors), and reprocessing-contracts were concluded for the spent fuel of the NPPs, until 2015. These decisions were endorsed by the government.

Currently, all spent fuel of the Dodewaard NPP (which is in a state of safe enclosure) has been reprocessed in the UK, and all reprocessed waste has been returned to the Netherlands and stored at COVRA. The spent fuel of the Borssele NPP is being reprocessed under the current contract, which terminates in 2015. The reprocessed waste is returned to the Netherlands, and stored at COVRA. Operator EPZ has announced that its intention is to continue reprocessing after 2015, and has concluded new reprocessing contracts. A new intergovernmental Agreement was signed in April 2012. The Agreement needs to be ratified by the Dutch Parliament before reprocessing operations can continue after 2015.

2.8. Research and development

NRG (Nuclear Research and Consultancy Group) is the nuclear service provider, located in Petten, in the Netherlands. The organization includes three business units and several supporting divisions; the total staff amounts to 428 persons(December 2011). NRG is responsible for the operation and the commercial exploitation of the LEU-fuelled 45 MW (thermal flux) High Flux reactor (HFR), which is owned by JRC (Joint Research Centre of the European Union). In addition, NRG exploits the Hot Cell Laboratories, a plant for waste treatment and decontamination, radiological laboratories and the 30 kW Low Flux Reactor (LFR). In 2011, exploitation of the LFR was concluded. Currently, plans for decommissioning of the LFR are being drafted.

NRG performs both funded and commercial services. Funded services are sponsored by the ministry of EL&I, within the framework of national policy covering the following areas:

- Nuclear safety and security
- Waste management and reduction
- Radiation protection
- CO_2-poor energy generation
- Public information

Research activities include:

- Safety studies on current as well innovative reactor systems
- Deep geological disposal of high-active nuclear waste
- Transmutation (burning) of long-lived actinides, including irradiation experiments in the HFR
- Testing and qualification of innovative materials
- Decommissioning

A significant part of these research activities is performed within the framework of international projects, including the European framework programme.

Within the framework of the funded programme, NRG has developed R&D tools and computer codes for the design and verification of innovative as well as inherently safe nuclear reactor concepts (both LWR type and others, e.g. HTR type). The computer codes cover applications within the fields of nuclear reactor physics, thermal hydraulics, accidents and failures as well as structural mechanics.

An important part of the commercial activities is the production of radioisotopes for medical applications. NRG is Europe's largest producer of molybdenum. Every day, more than 24,000 patients are treated with radioisotopes produced by NRG; Petten-produced isotopes for diagnostics, therapy and pain relief are used around the world. NRG is also the world’s major supplier of Ir-192 for the industrial market.

Other commercial activities and services include:

- Qualification and testing of reactor materials and fuels for current as well as innovative reactor systems, including ITER (fusion)
- Life-cycle management and long-term operation of nuclear power plants
- In-service inspections
- In-core fuel management services
- Policy and licensing support
- Radiation protection assessments
- Disposal of radioactive waste

2.8.1. R&D organizations

FOM is a foundation for fundamental research on matter, at Nieuwegein. Its physics research is mainly aimed at thermonuclear fusion.

RID at Delft operates a 2 MW university research reactor (HOR) for educational purposes, and does research on reactor physics, neutron beam physics, radioisotopes and radiochemistry.

NRG is the national nuclear research centre of the Netherlands.

Two projects are currently under development that will add value to nuclear R&D in the Netherlands. The Pallas project is aimed at the construction of a new multi-purpose reactor that should replace the High Flux Reactor in Petten from 2023. The Pallas reactor is intended for the production of medical radioisotopes and for nuclear research and irradiation services. The OYSTER project is aimed at an upgrade of the Higher Education Reactor of the Technical University in Delft. OYSTER is intended for fundamental nuclear research, education and training.

2.8.2. Development of advanced nuclear technologies

See above.

2.8.3. International co-operation and initiatives

Since the early days of the Netherlands' nuclear programme, international co-operation has been considered a necessity by all those involved. Since the joint exploitation of the Halden research reactor (together with Norway) in the 1950s and 1960s, until the Urenco co-operation in uranium enrichment of the present day, the Netherlands' nuclear activities have been undertaken in close co-operation with other countries. A strong interest in multilateral co-operation on nuclear energy matters within intergovernmental organizations complements the government's orientation toward practical co-operation with others.

Within the context of the "Open nuclear energy option", the Netherlands is interested in and remains dedicated to the development of new reactor concepts, such as advanced light-water reactors and high-temperature gas-cooled reactors, as part of the long-term strategy towards continuous improvement of nuclear safety and towards a sustainable, CO_2-poor energy supply. As representative for the Netherlands, NRG is represented in relevant boards and committees under the supervision of major organisations like the EU/Euratom, OECD/NEA and IAEA. Particularly, representation of the Netherlands (NRG) in the European Technical Platforms (SNETP, IGDTP), F4E (Fusion for Energy) and the VHTR Steering Committee of GIF (Generation IV forum; on behalf of EURATOM) and EUR (European Utility Requirements) are worth mentioning.

NRG is involved in cooperation with JRC, SCK (Belgium) and CEA (France). Together, they are currently focussed on the establishment of the future nuclear infrastructure for Europe, i.e. the Pallas reactor in the Netherlands (Petten), MYRRHA in Belgium (Mol) and the Jules Horowitz Reactor in France (Caderache)

2.9. Human resources development

One or more new nuclear power plants require sufficient knowledge and expertise in the government and the companies involved. Within the government, this concerns policymaking, licensing and supervision. In the relevant companies, this would include the construction of the nuclear installation (s), including the qualification of the Dutch supply industry, and the service and maintenance of nuclear installations.

With regards to nuclear safety, it must be possible to undertake sufficient scientific and applied research.
The Netherlands has a broad nuclear industry, with EPZ (NPP), Urenco (uranium enrichment), COVRA (Storage of radioactive waste), NRG (pure and applied research and medical isotope production) and RID (scientific research and education). Internationally, the Netherlands plays an important role particularly in the production of medical radioisotopes and the enrichment of uranium.

The Netherlands wants to maintain and strengthen this knowledge base. In this context, the stimulation of research in the field of nuclear technology is continued. Where necessary and possible, our knowledge and experience is developed and carried out in an international framework. In addition, the government welcomes the replacement of the High Flux Reactor in Petten by a new reactor (Pallas), and aims to ensure that the preconditions for authorisation are in order on time.

New nuclear plants will give powerful impetus to the development of nuclear knowledge in the Netherlands. There have to be adequate training opportunities for experts. There is an international market for technical experts, and the TU Delft has recently started to offer
specialisation in Nuclear Science and Engineering. In the province of Zeeland, secondary vocational training and a Bachelor's degree specialising in nuclear technology are offered. These initiatives are a positive development. The Ministers of Economic Affairs, Agriculture and Innovation (EL&I) and of Education, Culture and Science will jointly consider what role the government can play in addition. Funding of the research activities at NRG in Petten, from the Ministry of EL&I, will continue.

2.10. Stakeholder Communication

In the event that legal provisions exist regarding public information in the context of licensing procedures, citizens and both public and private organisations/institutions are notified of new or modified licenses under the Nuclear Energy Act.
In situations where there is no legal requirement to inform the public, it is still possible to inform the public about relevant new or amended permits. This consideration regarding public information depends on the scope and content of the permit and the effect on the environment.

Public information is generally provided through the organisation of presentations and discussion evenings. These events are organised, if possible, in the immediate vicinity of the nuclear facility concerned. These discussion evenings, as well as the procedural steps and the associated dates, are announced well in advance in local and national newspapers. Moreover, all documents that are prepared in connection with the modification of the permit are published and made available on the website of the national government: www.Rijksoverheid.nl.

For the purpose of receiving submitted views, a separate email address and telephone number are created. In this manner, the general public is given the opportunity to submit their views on relevant initiatives.

Under the ESPOO Convention, directly involved neighbouring countries are informed about the purpose, content and effect of the (new or amended) permits when larger environmental impact can occur.

In some cases, journalists are invited for separate information sessions, to provide background information on specific nuclear developments.

3. NATIONAL LAWS AND REGULATIONS

3.1. Regulatory framework

3.1.1. Regulatory authority(s)

All nuclear facilities in the Netherlands operate under license, awarded after a safety assessment has been carried out. The license is granted by the regulatory body under

the Nuclear Energy Act. The 'regulatory body' is the authority designated by the government as having legal authority for conducting the regulatory process, including issuing licenses, and thereby regulating nuclear, radiation, radioactive waste and transport safety, nuclear security and safeguards. Since the responsibility, the organisation and the location of the regulatory body as described in the August 2010 report to the 5th CNS conference has been changed significantly a few months later, this change has been presented at the April 2011 conference. The changes came about by modifications of the number of ministries and reorganisations. This new situation is shown in Figure 1.

In the Netherlands, since October 2010, the Minister of Economic affairs, Agriculture & Innovation (EL&I[2]) is the principal authority responsible for conducting the regulatory process under the Nuclear Energy Act and for the main functions of the regulatory body. These are:

- establishing regulations
- authorisation, including licensing
- review and assessment
- inspection and enforcement.

Within the Ministry of EL&I, the 'Directoraat voor Nucleaire installaties en veiligheid' (NIV), i.e. directorate for nuclear installations and nuclear safety, is involved in the preparation of legislation, the formulation of policies and licensing.

The inspectorate, the 'Kernfysische dienst' (KFD) is within the general responsibility of the Minister of EL&I. KFD is he responsible organisation for the independent supervision (safety assessment, inspection and enforcement) of the safety, security and non-proliferation of activities and facilities (including nuclear facilities). The KFD resides within an organisational division of the 'Inspectorate for the Environment and Transport' (ILenT), which is the inspection branch of the Ministry of Infrastructure and Environment (I&M).

3.1.2. Licensing Process

Licenses are required for *building, operating and decommissioning* nuclear installations (Section 15b of the Nuclear Energy Act). Amendments to a license will be needed where modifications of a plant invalidate the earlier description of it. The decommissioning of nuclear facilities is regarded as a special form of modification and is treated in a similar way. Refer to section 7.2. (i) of the Bkse decree (Nuclear installations, fissionable materials, and ores decree), which provides more guidance on decommissioning issues.

For minor modifications, a special notification procedure in the Act applies, allowing the licensee to modify the facility without a formal amendment to the lisence. This notification system can be used only if the consequences of the modification for both man and environment are within the limits of the license.

[2] Dutch: 'Economische Zaken, Landbouw & Innovatie', EL&I

In addition to the secondary regulations provided by the aforementioned Bkse decree on the handling of fissionable materials, the Nuclear Energy Act includes a separate chapter (Chapter VI) on intervention and emergency planning and response.

In parallel to the Nuclear Energy Act, there are two other acts which have a bearing on the possibility of acquiring or modifying a license:

1. The Environmental Protection Act, which stipulates that an Environmental Impact Assessment be presented if an application for a license or, in certain cases, a modification of a license is made.
2. The General Administrative Law Act, which sets out the procedure for obtaining a license and describes the participation of the general public in this procedure (i.e. objections and appeals). This law applies to virtually all procedures under any law. Notice must be given, both in the Government Gazette and in the national and local press, of the publication of the draft decision to award a license. At the same time, copies of the draft decision and of the documents submitted by the applicant must be made available for inspection by the general public. All members of the public are free to lodge written objections to the draft decision and to ask for a hearing. All objections made to the draft version of the decision are taken into account in the final version. Anybody who has objected to the draft decision is free to appeal to the Council of State (the highest administrative court in the Netherlands) against the decision, by which the license is eventually granted, amended or withdrawn.

3.2. Main national laws and regulations in nuclear power

Legislation

Nuclear Energy Act

The basic legislation governing nuclear activities is contained in the Nuclear Energy Act (‘Kernenergiewet’ or Kew). It is a framework law, which sets out the basic rules on the application of nuclear technology and materials, makes provision for radiation protection, designates the competent authorities and outlines their responsibilities. More detailed legislation is provided by associated decrees.

With regard to nuclear energy, the purpose of the Nuclear Energy Act, according to its Article 15b, is to serve the following interests:

• the protection of people, animals, plants and property;

• the security of the state;

• the security and safeguarding of nuclear material;

• the supply of energy;

• liability for damage or injury caused to third parties;

• compliance with international obligations.

The Nuclear Energy Act has been amended twice since 2007. The first amendment, in 2008, concerned the ratification and implementation of the Convention on Physical Protection of Nuclear Materials and Nuclear Facilities, and also introduced some requirements on nuclear security. The second amendment was adopted in 2009, and introduced three important modifications:

• Introduction of the obligation for the licensee to provide financial provisions for the costs of decommissioning the installation. This requirement was entered into force in 2011.

• Introduction of the possibility for the competent authority, the regulatory body, to withdraw the license of a nuclear facility after its decommissioning is completed.

• Reduction of the number of ministries involved in licensing nuclear facilities under the Nuclear Energy Act to one.

References

[1]	Nuclear Energy Act, Bulletin of Acts Orders and Decrees, 82, 1963 as revised 2009.
[2]	CONVENTION ON NUCLEAR SAFETY August 2010 National Report of the Kingdom of the Netherlands; Issued for the Fifth Peer Review Meeting, April 2011

Appendix 1: International, Multilateral and Bilateral Agreements

The Netherlands is party to treaties and conventions related to the use of nuclear technology and materials.

An important one is the ‘Treaty on the Non-Proliferation of Nuclear Weapons’ (NPT). Related are guidelines of the Nuclear Suppliers Group, which prescribe limitations to the transfer of sensitive nuclear technologies like the enrichment and the reprocessing technologies. In addition, the Netherlands has joined the ‘Proliferation Security Initiative’ (PSI), which is based on UN Security Council Resolution 1540 (UNSCR 1540) for the Non-Proliferation of Weapons of Mass Destruction (WMD).

The Netherlands is also party to several conventions on liability, like the ‘Paris Convention on Third Party Liability in the Field of Nuclear Energy’ and the ‘Brussels Convention’, supplementary to the ‘Paris Convention’, and the ‘Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention’.

Other important conventions are the ‘Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management’, and the ‘Convention on Physical Protection of Nuclear Material and Nuclear Installations’.

The following is a list of earlier international conventions and bilateral agreements signed/ratified by the Kingdom of the Netherlands in the field of nuclear co-operation.

AGREEMENTS WITH THE IAEA		
Statute of the International Atomic Energy Agency (IAEA)	Entry into force: Ratification date:	26 October 1956 20 July 1957
Agreement on Privileges and Immunities	Entry into force:	29 August 1963
Amendment of the IAEA statute	Entry into force:	27 September 1984
NPT related agreement INFCIRC/193	Entry into force:	21 February 1977
Additional Protocol to the Agreement between the NNWS, Euratom and the IAEA for the Application of Safeguards (GOV/1998/28)	Signed:	22 September 1998
Improved procedures for designation of safeguards inspectors	Proposals rejected but agreed to special procedure:	16 February 1989
Supplementary Agreement on Provision of Technical Assistance by the IAEA	Entry into force:	
INTERNATIONAL TREATIES		
Paris Convention on Third Party Liability in the Field of Nuclear Energy	Entry into force: Ratification date:	29 July 1960 28 December 1979
Additional Protocol to the Paris Convention of 31 January 1963 Supplementary to the Convention on Third Party Liability	Entry into force: Ratification date:	28 January 1964 28 September 1979
Amendment to the Paris Convention on Third Party Liability in the Field of Nuclear Energy	Entry into force: Ratification date:	16 November 1982 1 August 1991
NPT	Entry into force:	2 May 1975
Convention on Physical Protection of Nuclear Material	Entry into force:	6 October 1991
Convention on Early Notification of a Nuclear Accident.	Entry into force: Ratification date:	24 October 1991 23 September 1991

Joint Protocol Relating to the Application of the Vienna and the Paris Conventions	Entry into force: Ratification date:	21 September 1988 1 August 1991
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	Entry into force:	24 October 1991
Vienna Convention on Civil Liability for Nuclear Damage	Non-Party	
Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage	Not signed	
Convention on Supplementary Compensation for Nuclear Damage	Not signed	
Amendment to the Convention on Physical Protection	Entry into force:	8 July 2005
Treaty against Nuclear Terrorism	Entry into force:	7 July 2007
• Protocol to the 1960 Convention Regarding Third Party Liability	Entry into force:	12 February 2004
Joint protocol	Entry into force:	27 April 1992
• Protocol to the 1963 Convention Regarding Third Party Liability	Entry into force:	12 February 2004
• Framework Convention on Multilateral Nuclear Environmental Programs in the Russian Federation (MNEPR)	Entry into force:	14 April 2004
Convention on Nuclear Safety	Entry into force:	13 January 1997
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Entry into force: Ratification date:	18 June 2001 26 April 2000
ZANGGER committee	Member	
Nuclear export guidelines	Adopted	
Acceptance of NUSS codes Summary: Serve as basis for national requirements. Design, Operation and QA Codes (once adapted) introduced into regulatory framework	Accepted:	6 September 1989
Partial Test-Ban Treaty	Entry into force:	14 September 1964
Nuclear Suppliers Group	Member	
OTHER RELEVANT INTERNATIONAL TREATIES		
European Atomic Energy Community	Entry into force: Ratification date:	25 March 1957 13 December 1957

EURATOM	Member	
Security control in the field of nuclear energy	Entry into force: Ratification date:	20 December 1957 9 July 1959
European Company for the chemical processing of irradiated fuels (Eurochemic)	Entry into force: Ratification date:	20 December 1957 9 July 1959
Establishment at Petten of the Joint Nuclear Research Centre	Entry into force: Ratification date:	25 July 1961 30 October 1962
Civil liability in the field of maritime carriage of nuclear material	Entry into force: Ratification date:	17 December 1971 1 August 1991
MULTILATERAL AGREEMENTS		
Netherlands, Germany and England on collaboration in the development and exploitation of the gas centrifuge process for producing enriched uranium	Entry into force: Ratification date:	4 March 1970 18 June 1971
Netherlands, Germany, United Kingdom and the USA regarding protection of information transferred into the USA in connection with the initial phase of a project for the establishment of a uranium enrichment installation in the USA based upon the gas centrifuge process developed within the three countries	Entry into force:	4 November 1990
Netherlands, Germany, United Kingdom and the USA regarding the establishment, construction and operation of a uranium enrichment installation in the USA	Entry into force: Ratification date:	8 July 1993 21 March 1993
Netherlands, Germany, United Kingdom and the USA regarding the establishment, construction and operation of a uranium enrichment installation in the USA	Entry into force: Ratification date:	8 July 1993 21 March 1993
Exchange of Notes between the Netherlands and the United States concerning the application of non-proliferation assurances to low enriched uranium supplied to Taiwan.	Signed:	21 July 1999
BILATERAL AGREEMENTS		
Kingdom of the Netherlands and Brazil Application of safeguards to proposed exports to Brazil of uranium enriched in the Kingdom of the Netherlands by Urenco	Entry into force:	1 September 1978
Kingdom of the Netherlands and Germany	Entry into force:	4 September

concerning exports of enriched uranium to Brazil		1978
Kingdom of the Netherlands and the United Kingdom concerning reprocessing of certain quantities of irradiated nuclear fuel	Entry into force: Ratification date:	12 September 1978 30 June 1981
Kingdom of the Netherlands and France concerning reprocessing of certain quantities of irradiated nuclear fuel	Entry into force: Ratification date: Changed/adapted:	29 May 1979 17 August 1981 9 February 2009 (Trb. 2009, 41)
Extension of the agreement of 4 April 1990 regarding protection of information transferred into the United States	Entry into force: Ratification date:	5 April 1991 7 July 1992

Appendix 2: main organizations, institutions and companies involved in nuclear power related activities

NATIONAL AUTHORITIES	
Ministry of Economic Affairs, Agriculture and Innovation Bezuidenhoutseweg 30 Postbus 20401 2500 EK 's-Gravenhage, The Netherlands	Tel: +31-70-379.89.11 Fax: +31-70-347.40.81 http://www.rijksoverheid.nl/ministeries/eleni
Ministry of Social Affairs and Employment Anna van Hannoverstraat 4 P.O. Box 90801 2509 LV The Hague, The Netherlands	Tel: +31-70-333.44.44 Fax: +31-70-333.40.33
Ministry of Economic Affairs, Agriculture and Innovation Directorate-general for Energy, Telecom and Competition Directorate Nuclear Installation and Safety Bezuidenhoutseweg 30 Postbus 20401 2500 EK 's-Gravenhage, The Netherlands	Tel: +31-70-379.60.14
NUCLEAR RESEARCH INSTITUTE	
NRG Petten Westerduinweg 3 P.O. BOX 25 1755ZG Petten, The Netherlands	Tel: +31 224 564082 Fax: + 31 224 563912 http://www.nrg-nl.com/index.html
OTHER NUCLEAR ORGANIZATIONS	
International Radiation Protection Association (IRPA)	http://irpa.sfrp.asso.fr
The Netherlands Nuclear Society (NNS)	http://www.ecn.nl/society/nns

Reactor Institute Delft RID TU-Delft, Mekelweg 15 2629 JB Delft, P.O. Box 5042 2629 JB Delft, the Netherlands	Tel: +31-15-278.67.12 Fax: +31-15-278.64.22
COVRA Spanjeweg 1 4455 TW Nieuwdorp P.O. Box 202 4380 AE Vlissingen, The Netherlands	Tel: +31-113-61.39.00 Fax: +31-113-61.39.50
GKN N.V. Waalbankdijk 112a P.O. Box 40 6669 ZG Dodewaard, The Netherlands	Tel: +31-448-41.88.11 Fax: +31 448-41.21.28
Enrichment Technology Nederland B.V. P.O. Box 30 7600 AA Almelo	Tel: + 31 546 54 55.00 Fax: + 31 546 54 55.01 info@nl.enritec.com
URENCO Nederland B.V. P.O. Box 158 7600 AD Almelo	Tel: +31-546-54.54.54 Fax: +31-546-81 82 96 http://www.urenco.nl
OTHER ORGANIZATIONS	
Netherlands Energy and Research Foundation (ECN) Westerduinweg 1 P.O. Box 1 1755 ZG Petten, The Netherlands	Tel: +31-224-56.49.49 Fax: +31-224-56.34.90/56.44.80 http://www.ecn.nl/main.html
European Association for Grey Literature Exploitation (EAGLE/SIGLE)	http://www.konbib.nl/infolev/sigle/ea/index.html
Elsevier Science	http://www.elsevier.nl
FOM-Institute for Plasma Physics, Rijnhuizen	http://www.rijnh.nl
The Chemical Weapons Convention (OCPW)	http://www.opcw.nl

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