



Powering Profits

Profits, Investments and Fuel Type Mixes in the Dutch Power Sector

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Powering Profits: Profits, Investments and Fuel Type Mixes in the Dutch Power Sector

Amsterdam, June 2007

By:

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Executive Summary

This report addresses the Dutch power sector (i.e. generation and supply of electricity), identifying the major corporate players in the market, types of fuel used to generate electricity, the CO₂ emissions and nuclear waste associated with these activities, the profits being made, and investments in both renewable and non-renewable generation capacity. The report focuses on the five major corporate players active in the Dutch power sector: ENECO, Essent, Nuon, Electrabel, and E.ON Energie. For the Dutch companies, ENECO, Essent and Nuon, additional information on the ownership structure of the company, shareholders and dividends paid and received is given. A section on RWE is also included because the company is active in electricity supply in the Netherlands and has plans to invest in generation capacity in the country.

Analysis of the fuels used by the companies to generate electricity in the Netherlands reveals that fuels such as coal, natural gas, and nuclear dominate the fuel mix of most companies. Companies like E.ON Energie and Electrabel use little or no renewable sources of energy for their Dutch generation operations. Essent and Nuon do produce some (15% and 5%, respectively) electricity from renewable sources in the Netherlands, but they generate far more from non-renewable fuels. The companies' fossil and nuclear-dominated fuel mixes lead to high levels of CO₂ emissions and nuclear waste production. ENECO is the only company that has a largely sustainable fuel mix for electricity generation, but it currently has very small production capacity.

The fuel mix of electricity the companies supply to Dutch consumers mirrors the production mix. Again, the vast majority of the electricity supplied by the companies in this study is based on unsustainable fuels. The company with the highest amount of renewable electricity in its supply is RWE Energy, which bases about 45% of the electricity it supplies in the Netherlands on sustainable fuels. Essent is next with about 25% of the electricity it supplies coming from renewable sources. The other companies all supply lesser amounts of renewable-based electricity.

An investigation into the companies' planned investments in new electricity generation capacity in the Netherlands reveals that the country's overall fuel mix is set to become even less sustainable than it currently is. Although investment in renewable generation capacity is increasing significantly, this is overshadowed by the massive amount of investment that is being poured into unsustainable generation capacity. Five of the six companies examined in this study (Essent, Nuon, Electrabel, E.ON Energie and RWE Power) are planning to build large coal-fired power plants in the Netherlands. Although most of the plants will be able to co-fire biomass, they will be largely coal-based. If all the current plans are realised, over €5 billion will be invested in coal plants over the next few years, adding approximately 5,500 MW of coal-based electricity generation capacity to the Dutch power system and potentially resulting in a 60% increase in CO₂ emissions by the Dutch power sector. ENECO is the only company in the study not currently investing in a coal-fired plant, but all companies are investing more in non-renewable capacity than they are in renewables.

In this climate of largely unsustainable fuel mixes for electricity generation and supply, the power companies examined in this study are enjoying record profits. All of the companies have seen their earnings grow over the past five years, sharply in some cases. High profits are being translated into high dividends being paid to the companies' shareholders. As owners of the three Dutch companies, Dutch public authorities have benefited significantly from the power companies' activities, with some municipalities and provinces receiving over €100 million per year in dividends.

1. Introduction

Electricity provision is one of the most important services in modern life and a dynamic component of both developed and developing country economies. Essential in its own right, electricity serves as a crucial input into the production of most goods. At the same time, power production, in particular that which requires combustion of fossil fuels, is extremely burdensome for the environment. In 2005, electricity generation accounted for over 29% of global CO₂ emissions, not to mention a number of more toxic pollutants such as sulphur dioxide and nuclear waste. Increasing the percentage of power generated from renewable energy sources and phasing out fossil fuels is thus a critical challenge for governments, companies and societies around the world; the consequences of not doing so will be dire for our planet and life on it. While some energy companies appear to be genuinely committed to contributing to the shift toward a more sustainable energy solution, most are not; most companies continue to reap record profits by supplying the soaring energy demand with electricity generated from polluting, unsustainable fuels.

This report addresses the Dutch power sector, identifying the major corporate players in the market, types of fuel used to generate electricity, the profits being made, and investments in both renewable and non-renewable generation capacity. For the purposes of this report, the power sector is understood to encompass production (i.e. generation) and supply of electricity. Some discussion and figures on heat and gas, which are also essential energy services, are provided, but the focus is primarily on electricity.

Section 2 of the report provides an overview of the Dutch power sector, breaking the market down into production and supply. Major players, markets shares, and recent trends and developments are given for each of these activities.

Sections 3 – 7 go into detail on the five major corporate players active in the Dutch power sector: ENECO, Essent, Nuon, Electrabel, and E.ON Energie. For each company, information is provided on profits and earnings, the fuel mix used to generate and supply electricity, the CO₂ emissions associated with these activities, installed capacity in the Netherlands, and recent investments in renewable and non-renewable generation capacity in the Netherlands. For the Dutch companies, ENECO, Essent and Nuon, additional information on the ownership structure of the company, shareholders and dividends paid and received is given. A section on RWE (Section 8) is also included in the study because, although RWE is not currently active in generating electricity in the Netherlands, RWE Energy does currently supply electricity generated by producers in the Netherlands. In addition, RWE Power is currently planning to invest significantly in power generation capacity in the Netherlands. The final section of the report compares the companies' activities in the Netherlands and draws conclusions based on the companies' respective performance.

Research for this report was conducted by SOMO researchers Joseph Wilde-Ramsing and Tim Steinweg in March-June 2007 using a variety of methods, including analysis of the companies' annual reports and websites, a search of databases with company information, a scan of news articles and further online research. In addition, all of the major companies in this study (ENECO, Essent, Nuon, Electrabel, E.ON and RWE) received a draft of this report in the form of a company profile and were given time to respond with comments and corrections of factual errors. Most companies responded to the draft report and submitted comments within the review period that have been incorporated into

the report. A representative of Electrabel indicated that they were not able to review as diligently as they would have liked, due to time constraints.

Funding for the report has been provided by Greenpeace Nederland.

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2. The Dutch Power Market

The EU electricity and gas directives of 1996 and 1998 enshrined the notion of liberalisation of the energy market, an idea that was translated into practice in the Netherlands by the Dutch government's Electricity Law (1998) and Gas Law (2000). The unbundling, or separation, of electricity production¹ and supply that took place as part of this liberalisation process means that the companies that generate energy are not necessarily the same ones that provide it to retail customers and end-users. Currently, both the production and supply of electricity in the Netherlands are liberalised, but the distribution network is still in the hands of the Dutch state.² The major players in electricity production in the Netherlands are Electrabel, followed by Essent, Nuon, and E.ON; Essent and Nuon, along with ENECO, are also the country's primary suppliers of electricity. The non-Dutch companies Electrabel (Belgium), E.ON (Germany) and RWE (Germany) supply electricity in the Netherlands through local subsidiaries. More detailed information about each of these major players is given in the individual company sections below.

Throughout the rest of this report, figures are given for both production and supply of energy services, and these figures are not always the same, even for the same company. Therefore, it is important to be aware of the type of process, production or supply, that is discussed in each figure/table. Before delving into the specific figures for each energy company active in the Netherlands, some general information about production and supply of energy in the Dutch market is provided.

2.1. Production

In terms of production, the current total electricity generation capacity in the Netherlands is around 20,000 Megawatts (MW).³ Most of the generation capacity is owned by large power companies such as Electrabel, Essent, Nuon and E.ON; however, 25% of electricity is co-generated with heat in decentralised plants that are often owned by large industrial end-users in joint-ventures with electricity companies. Examples of this type of arrangement include the Heineken combined heat and power (CHP) plant operated by Essent and the Air Products CHP plant in Rotterdam operated by Electrabel. The country hosts thirty power plants with a capacity of between 200 MW and 600 MW.⁴ In addition, approximately 3,650 MW is imported from neighbouring countries such as Belgium and Germany⁵, as well as from the UK and Norway.

2.1.1. Fuel Mix

Due to the large natural reserves of gas in the Netherlands, most electricity has been, and still is, generated from this type of fuel. In 2004, natural gas accounted for 64% of all electricity generation. Other major fuel sources are coal, oil and renewables. Around 4% of electricity is generated by the

¹ The terms "production" and "generation" are used interchangeably in this report.

² Eurostat, "Nederland – informatieblad interne markt," January 2007, <http://ec.europa.eu/energy/energy_policy/facts_en.htm> (May 2007).

³ S. Slingerland, C. Tönjes and J. de Jong, "The European Electricity Market: Some Trends and Consequences for Investments in the Netherlands," Clingendael International Energy Programme, June 2006, <http://www.clingendael.nl/publications/2006/20060800_ciep_misc_European_electricity_trends.pdf> (May 2007).

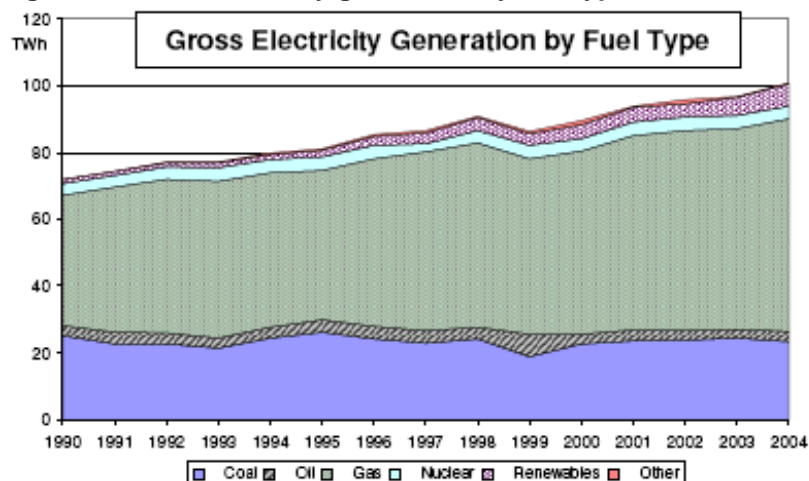
⁴ http://www.dte.nl/images/Marktmonitor%20elektriciteit%202005_tcm7-87799.pdf

⁵ <http://www.ceer->

[eu.org/portal/page/portal/ERGEG_HOME/ERGEG_DOCS/NATIONAL_REPORTS/2006/E06_NR_Netherlands-EN.doc](http://www.ceer-)

country's only operational nuclear plant in Borssele.⁶ Figure 1 shows the historical developments of electricity generation in the Netherlands by fuel type.

Figure 1: Gross electricity generation by fuel type in the Netherlands, 1990-2004



Source: EU⁷

Table 1 reveals the country's production capacity with exact maximum output per fuel type. It is clear that the vast majority of electricity produced in the Netherlands is based on fossil fuel combustion, with natural gas and coal accounting for more than three-quarters of the country's output.

Table 1: Netherlands National Electricity Production Capacity by Fuel Type, 2004

Main fuel(s)	Capacity (MW)
Nuclear fuel	450
Coal/Biomass*	4,200
Furnace gas/Natural gas	900
Natural gas - Larger units**	11,400
Natural gas/Oil -Smaller total energy installations	2,600
Waste	400
Hydroelectricity	0
Wind energy	1,100
Total	21,600

* Some coal-fired units can also burn biomass up to a maximum of approximately 25%.

** Some gas-fired units can co-fire bio-oil and biogas.

Source: Netherlands Competition Authority – Office of Energy Regulation⁸

2.1.2. Recent developments and trends in production

As a result of rapidly rising electricity demand and aging power plants, large investments in new power plants are likely in the coming years. The liberalised, unbundled nature of the Dutch power sector means that individual investors are the primary actors that choose whether to build a new plant, where it will be located and what kind fuel technology it will use; however, national support

⁶ http://nl.wikipedia.org/wiki/Nucleaire_energie

⁷ EU, "Netherlands – Energy Mix Fact Sheet," January 2007, <http://ec.europa.eu/energy/energy_policy/doc/factsheets/mix/mix_nl_en.pdf> (May 2007).

⁸ Netherlands Competition Authority – Office of Energy Regulation, "2006 Annual Report by the Office of Energy Regulation (DTe) to the European Commission," <http://www.ceer.eu.org/portal/page/portal/EREGG_HOME/EREGG_DOCS/NATIONAL_REPORTS/2006/E06_NR_Netherlands-EN.doc>.

schemes and incentives for renewables can significantly influence investors' decisions. A number of recent developments and trends have emerged in terms of the type of power plants being built and the evolution of the energy market in the Netherlands.

1. The vast majority of present installed capacity for electricity generation in the Netherlands is based on fossil fuels. In particular, the presence of natural gas in Dutch territory in the North Sea and Groningen has led to a national preference for this non-renewable fuel.
2. There has been a move towards an expansion of domestic production capacity.⁹ Practically all the large electricity companies active in the Dutch market have announced their intentions to build new power plants, including five new coal-fuelled plants for which the companies are planning to invest at least €5 billion. If all current development plans are realized (which, it should be noted, is unlikely) domestic capacity would increase by 30%. These developments have fuelled the expectation that the Netherlands will soon become a net exporter of electricity.¹⁰
3. Despite the country's heavy reliance on fossil fuels, the past few years have also seen a substantial increase in installed renewable energy capacity, which is the fastest growing area in the sector. The increased attention to renewables is primarily due to the Dutch government's support schemes and incentives for renewables, which have led to an increase in new wind and hydro projects as well as an increase in co-firing of biomass in traditional fossil fuel plants. A good example of such an incentive scheme is the "Coal Covenant" in which the Dutch government has agreed to give financial incentives to energy generators that replace some of the coal used to generate electricity with biomass. The goal of the Covenant is to achieve 15% biomass co-firing in conventional thermal power plants in the Netherlands. Due to the current state of the market, cogeneration capacity will likely not grow as fast as it has in the past.¹¹
4. The Netherlands has a relatively high percentage of cogeneration capacity installed. Power and heat cogenerations (CHP) is a highly efficient means of generating power because the heat generated in the process is also harnessed and used (for example, for domestic heating) rather than being discarded.

2.2. Supply

On July 1st, 2004, the right was given to Dutch households to choose their electricity provider, thereby finalizing a process of liberalisation of supply that had been going on for decades.¹² In earlier years, this choice had already been given to large, commercial, electricity consumers, as well as to all consumers of green electricity.

The Dutch energy services market is primarily supplied by three companies, ENECO, Essent and Nuon, who control the market in different geographical regions in the Netherlands.

Figure 2 illustrates the geographical division of supply by the Netherlands' three major energy companies.

⁹ DTE website <http://www.dte.nl/images/Marktmonitor%20elektriciteit%202005_tcm7-87799.pdf> (May 2007)

¹⁰ 'Nederland exporteur van stroom', BN/De Stem, 21-06-07, <<http://www.bndestem.nl/economie/article1551294.ece>> (June 2007).

¹¹ S. Slingerland, C. Tönjes and J. de Jong, "The European Electricity Market: Some Trends and Consequences for Investments in the Netherlands," Clingendael International Energy Programme, June 2006, <http://www.clingendael.nl/publications/2006/20060800_ciep_misc_European_electricity_trends.pdf> (May 2007).

¹² Kies Energie website, <http://www.kiesenergie.nl/vragen/1_vragen.php?list=110&id=96&nr=4> (May 2007).

Figure 2: Geographical division of major Dutch energy supply companies, 2006



Source: ENECO¹³

ENECO, Essent and Nuon control approximately 75% of the Dutch market in terms of supplying grey electricity, green electricity and gas.¹⁴ Nuon is the largest supplier of grey electricity, with 33% of the market, while Essent provides the largest share, 31%, of green energy to the country. Nuon and Essent each control 27% of the gas market.

Figure 3, Figure 4, and Figure 5 reveal the division of market shares for supplying these types of energy services in the Netherlands.

Figure 3: Dutch market shares for grey electricity supply, by sales, 2006

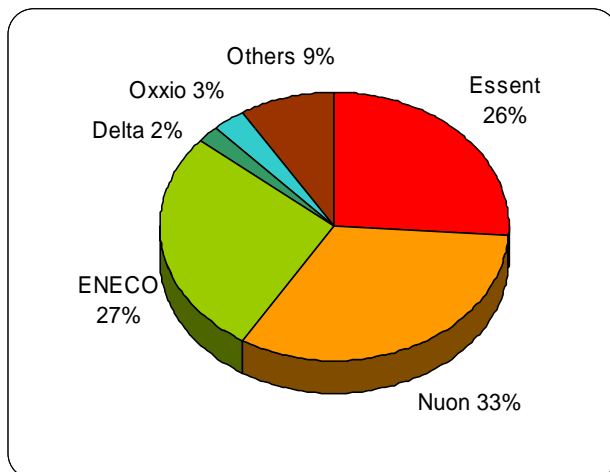
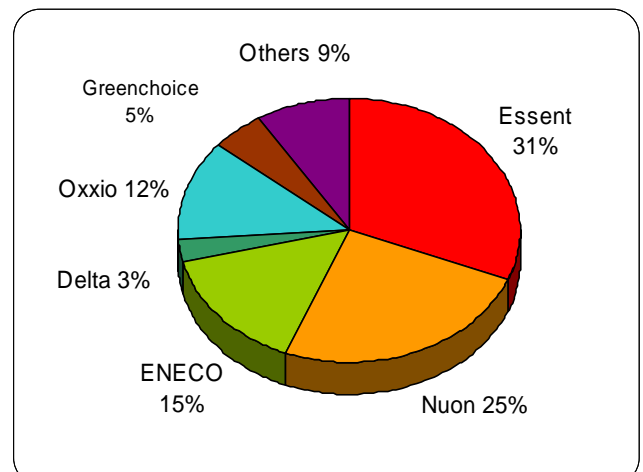


Figure 4: Dutch market shares for green electricity supply, by sales, 2006



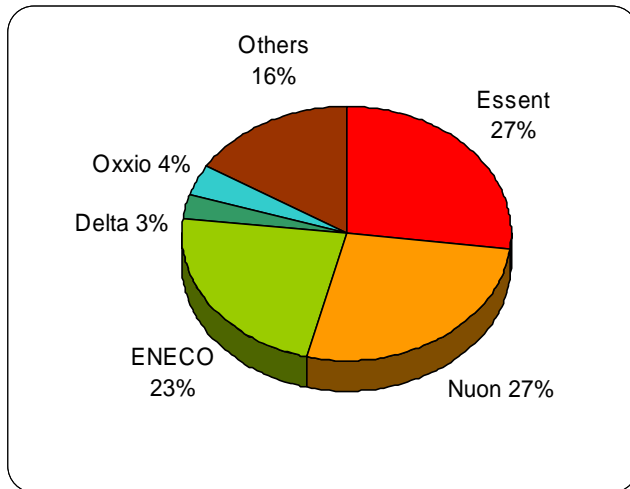
Based on: ENECO¹⁵

¹³ ENECO, "ENECO Energie Presentation to Bond Investors," June/July 2006, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

¹⁴ "Grey energy" is understood as energy generated from coal, natural gas, nuclear and other non-renewable resources. "Green energy" is from biomass, hydro, wind and solar sources. "Gas" is natural gas, a non-renewable energy source.

¹⁵ ENECO, "ENECO Energie General Presentation," April 2007, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

Figure 5: Dutch market shares for gas supply, by sales, 2006



Based on: ENECO¹⁶

In addition to the three major power supply companies, there are several other smaller players in the Dutch electricity supply market (many of which are owned by the larger companies). These include Caplare, Cogas (Electrabel), Delta, Echte Energie (ENECO), Elektran, Energiedirect (Essent), Greenchoice (30% owned by ENECO; currently merging with Echte Energie), Intergas (DONG), NRE Energie (renamed E.ON on 21 March 2007), ONS Energie (ENECO), Oxxio, Rendo (Electrabel), RWE Energy Nederland, Westland Energie (Essent).

2.2.1. Recent developments and trends in supply

The Dutch market is becoming increasingly interregionally and internationally linked, with a number of regional integration projects currently under development. These projects will create border crossing capacity and stimulate energy trade. Adaptations to German networks will likely encourage more investment by German companies in generation in the Netherlands. Furthermore, the Netherlands, Belgium and France have developed a regional roadmap, and plans for an electricity cable between Norway and the Netherlands have been approved by authorities in both countries.¹⁷ A 1,000 MW connection cable between the Netherlands and Great Britain will be in use by 2010¹⁸

Another recent trend in the Dutch power supply market is that of concentration and vertical integration, which has come about through a wave of mergers and acquisitions. For example, Electrabel recently acquired Cogas (July 2006) and Rendo (June 2006), Essent took over Westland Energie (January 2007) and Energiedirect, and ENECO recently bought ONS Energie and Echte Energie, which is also merging with Greenchoice. Furthermore, in January 2007, the two top Dutch energy providers, Essent and Nuon, agreed to merge.

¹⁶ ENECO, "ENECO Energie General Presentation," April 2007, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

¹⁷ DTE website, <http://www.dte.nl/images/Marktmonitor%20electriciteit%202005_tcm7-87799.pdf> (May 2007).

¹⁸ Het Parool, <<http://www.parool.nl/nieuws/2007/MEI/23/eco3.html>> (May 2007).

3. ENECO

3.1. Company and Profits Overview

ENECO Holding N.V. is a non-listed public limited liability company with its official seat in Rotterdam.¹⁹ Through its wholly-owned subsidiary ENECO Energie, the company supplies gas, electricity, and heat to retail and business customers throughout the Netherlands. Other activities revolve around the leasing of hot water and central heating and cooling systems, sustainable energy, public lighting, and traffic control systems. As one of the top three network operators in the Netherlands (along with Essent and Nuon), ENECO serves about 2 million customers. ENECO also owns electricity suppliers ONS Energie and Echte Energie.

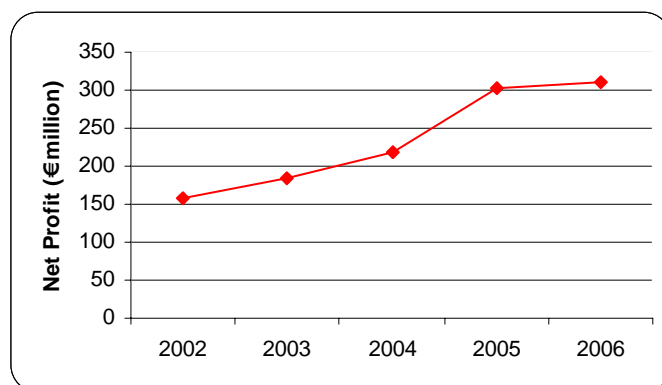
As Table 2 and Figure 6 reveal, ENECO's profits have risen slowly but steadily over the past five years. In 2006, ENECO generated a net profit of €311 million.

Table 2: ENECO net profit, 2002-2006

Year	Net Profit (€million)
2002	157
2003	185
2004	218
2005	302
2006	311

Based on: ENECO²⁰

Figure 6: ENECO net profit, 2002-2006



3.2. Ownership and Dividends

3.2.1. Ownership

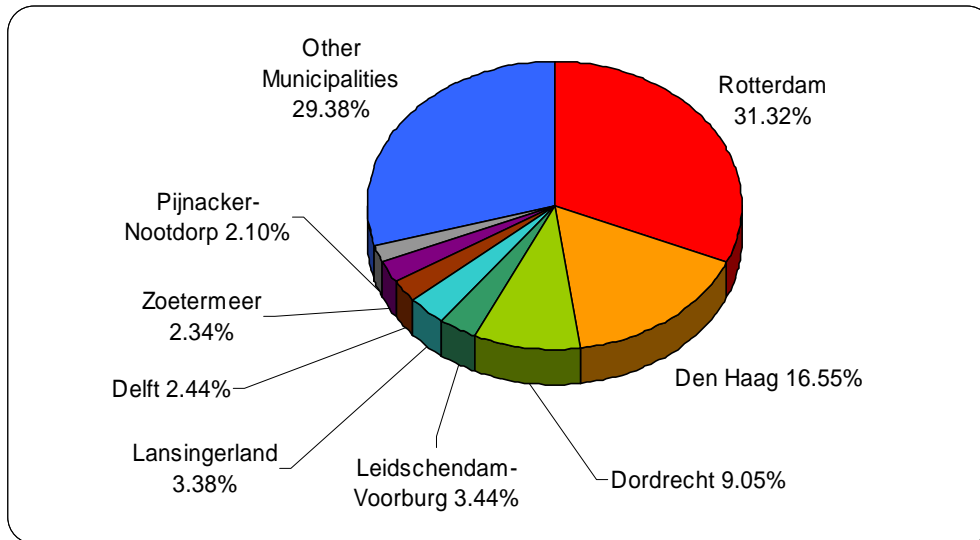
ENECO is fully-owned by Dutch municipal authorities. The company's shareholders are 67 Dutch municipalities, the most important of which are Rotterdam, Den Haag, Dordrecht, Leidschendam-Voorburg, Lansingerland, Delft, Zoetermeer and Pijnacker-Nootdorp.

Figure 7 illustrates the division of ownership of ENECO among its major shareholders, and Table 3 lists minor ENECO shareholders with less than two percent ownership.

¹⁹ ENECO Articles of Incorporation, available at ENECO website, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

²⁰ ENECO, Annual Report 2006, p.2.

Figure 7: ENECO shareholders and ownership percentage, 2006



Based on: ENECO²¹

Table 3: ENECO stakeholders with <2% stake in the company, 2006

Municipalities			
Aalsmeer	Dirksland	Krimpen aan den IJssel	Schiedam
Achtkarspelen	Dongeradeel	Leerdam	Schiermonnikoog
Alblasserdam	Ferwerderadiel	Liesveld	Sliedrecht
Albrandswaard	Giessenlanden	Lingewaal	Spijkensisse
Ameland	Goedereede	Middelharnis	Strijen
Amstelveen	Gorinchem	Nederlek	Uithoorn
Barendrecht	Graafstroom	Nieuw-Lekkerland	Vianen
Bernisse	Haarlemmerliede & Spaarnewoude	Oostflakkee	Westvoorne
Binnenmaas	Hardinxveld-Giessendam	Oud-Beijerland	Zandvoort
Bloemendaal	Heemstede	Ouderkerk	Zederik
Brielle	Hellevoetsluis	Papendrecht	Zwijndrecht
Capelle aan den IJssel	Hendrik Ido Ambacht	Ridderkerk	
Castricum	Kollumerland c.a.	Rozenburg	
Cromstrijen	Korendijk	Rijswijk	

Based on: ENECO²²

3.2.2. Dividends

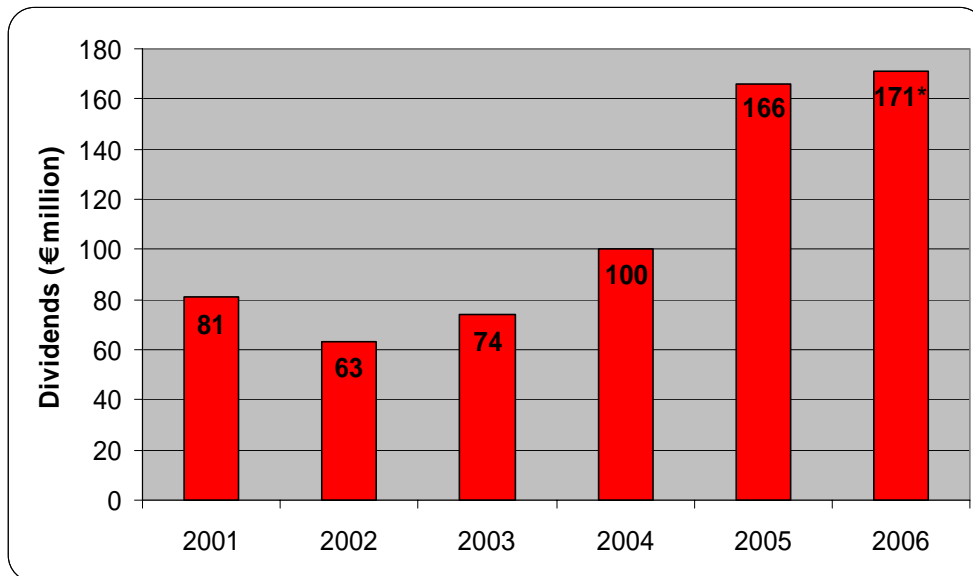
Figure 8 presents the total dividends that ENECO paid to all shareholders in 2001 – 2006. In 2006, ENECO generated an estimated €171 million in dividends for its shareholders.

²¹ ENECO website, Investor Relations – Shareholders, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

²² Ibid.

Based on the shareholders' percentage of ownership in the company, Table 4 and Figure 9 chart the dividends received by ENECO's three largest shareholders, the municipalities of Rotterdam, Den Haag and Dordrecht, between 2001 – 2006. The largest, Rotterdam, will receive a projected €53.56 million from ENECO's operations in 2006.

Figure 8: Total dividends paid to ENECO shareholders, 2001-2006



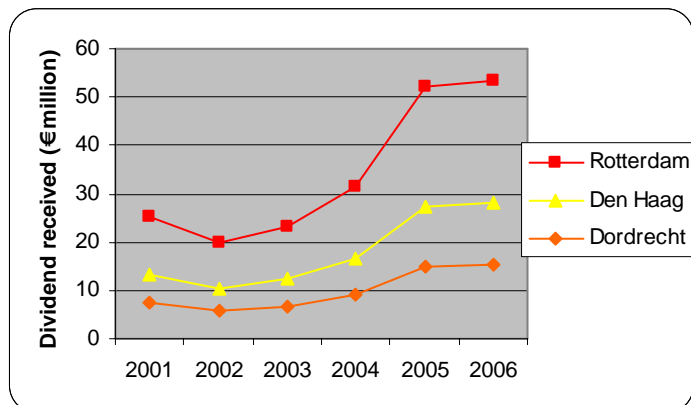
Based on: ENECO²³

* Projected²⁴

Table 4: Dividends received by top three ENECO shareholders, 2001-2006

Year	Dividends received (€million)		
	Rotterdam	Den Haag	Dordrecht
2001	25.37	13.40	7.33
2002	19.73	10.43	5.70
2003	23.18	12.25	6.70
2004	31.32	16.55	9.05
2005	51.99	27.47	15.02
2006*	53.56	28.30	15.48

Figure 9: Dividends received by top three ENECO shareholders, 2001-2006



* projected

Based on: ENECO²⁵

²³ ENECO Annual Reports 2001-2006, available at ENECO website, <<http://www.eneco.nl/investorrelations/>> (Apr 2007).

²⁴ ENECO's management has not yet proposed a dividend amount to the shareholders. This projection is based on a net profit of €311 million in 2006 and the fact that ENECO paid 55% of net profit as dividends in 2005. 55% of 311 is 171.

²⁵ ENECO Annual Reports 2001-2006, available at ENECO website, <<http://www.eneco.nl/investorrelations/>> (Apr 2007). 2006 figures are projected based on ENECO's net profit for 2006. Figures for other years are based on the shareholders percentage stake in the company in 2006 and may be different if the ownership percentage has changed significantly in the past 5 years. It should be noted that these are gross dividend figures that do not take into account taxation on dividends.

3.3. Fuel Mix and CO₂ Emissions

3.3.1. Power production and installed capacity

Until recently, electricity generation had not been part of ENECO's business activities since the company mainly focussed on the trading and supply of energy to end consumers. As a result, ENECO's installed capacity is currently very limited. As can be seen in Table 5, most of ENECO's approximately 70 MW of generation capacity is found at a number of small wind parks, the newest of which is the Ecopark near the town of Waalwijk²⁶ with a capacity of 10 MW,²⁷ but it also owns three small gas-fired plants. These plants emitted 17,000 tonnes of CO₂ in 2006.

Table 5: ENECO installed electricity generation capacity, 2006

Fuel Type	Location	Output Capacity (MW)	Total Verified Emissions 2005-06 (ton CO ₂)
Non-renewable			
Gas	Eneco CHP/HWC Ypenburg	N/A	17,096
Gas	Eneco Milieu B.V. CHP Vijfwal	N/A	
Gas	Oosterheem – Zoetermeer	4	
Renewable			
Wind	Windpark Hartel (Rotterdam)	15	
Wind	Windpark Herkingen (Dirksland)	6-9	
Wind	Windpark Van Pallandt (Middelharnis)	16-20	
Wind	Windpark Dobbelsesteen (Rotterdam)	9	
Wind	Windpark Slufter (Rotterdam)	12	
Wind	Windpark De Kroeten (Breda)	0.85	
Wind/Sun/Biogas	Ecopark Waalwijk (Waalwijk)	10	

Sources: Newspapers and websites; CO₂ emissions from EU²⁸

3.3.2. Power supply

More than half of all electricity supplied by ENECO is generated from natural gas (57%), the most common fuel type in the Netherlands. Other fuel types used include coal (23%) and nuclear power (8%), as well as the common renewable fuel types: hydro (4.3%), biomass (2.1%) and wind (1.9%).

Figure 10 shows the fuel mix of electricity supplied by ENECO and the shares of renewable and non-renewable fuel types. Based on its 2006 fuel mix for electricity supplied, ENECO was responsible for the emission of 472 grams of CO₂ per kilowatt-hour (kWh) and 0.00027 grams of high-level radioactive waste²⁹ per kWh.³⁰ Figure 11 charts the changes in ENECO's fuel mix over the past three years, revealing that the percentage of renewable electricity supplied by ENECO has remained relatively stable, but has decreased to approximately 8% from a high of 10% in 2004.

²⁶ "6000 huizen op stroom windmolens," Brabant's Dagblad, 28-03-07, Sec. B02, p.25.

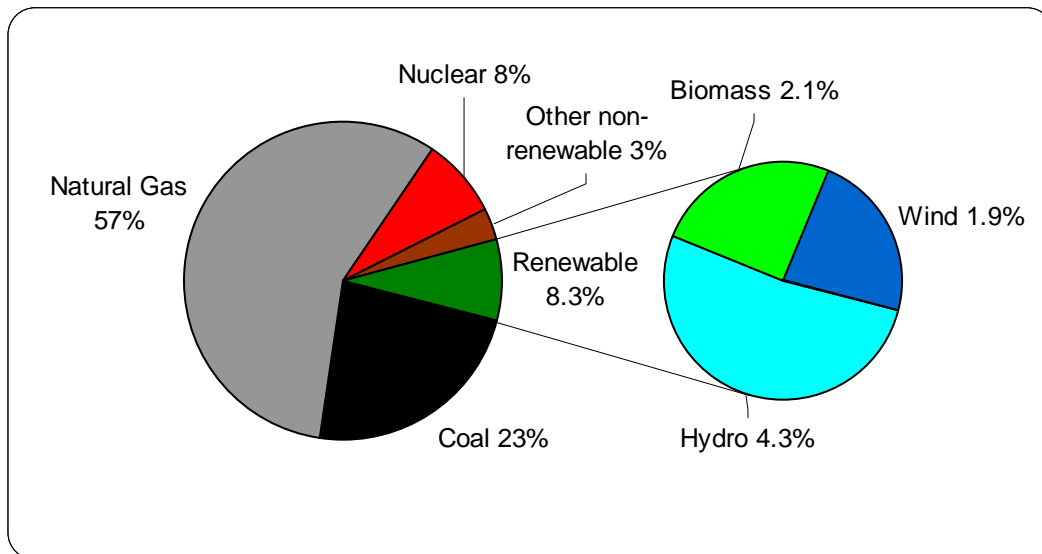
²⁷ PolderPV website, EcoPark Waalwijk, "10MW sustainable energy inc. 765 kWp solar energy in Ecopark Waalwijk (NL)," no date, http://www.polderpv.nl/Ecopark_Waalwijk.htm (09-05-07).

²⁸ European Commission, DG Environment, Emission Trading Scheme, 2006 Emissions for the Netherlands, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> (June 2007)

²⁹ This number is based on the highly radioactive spent fuel from a nuclear power plant. In addition to this high-level waste, higher amounts of medium and low-level radioactive waste are also produced.

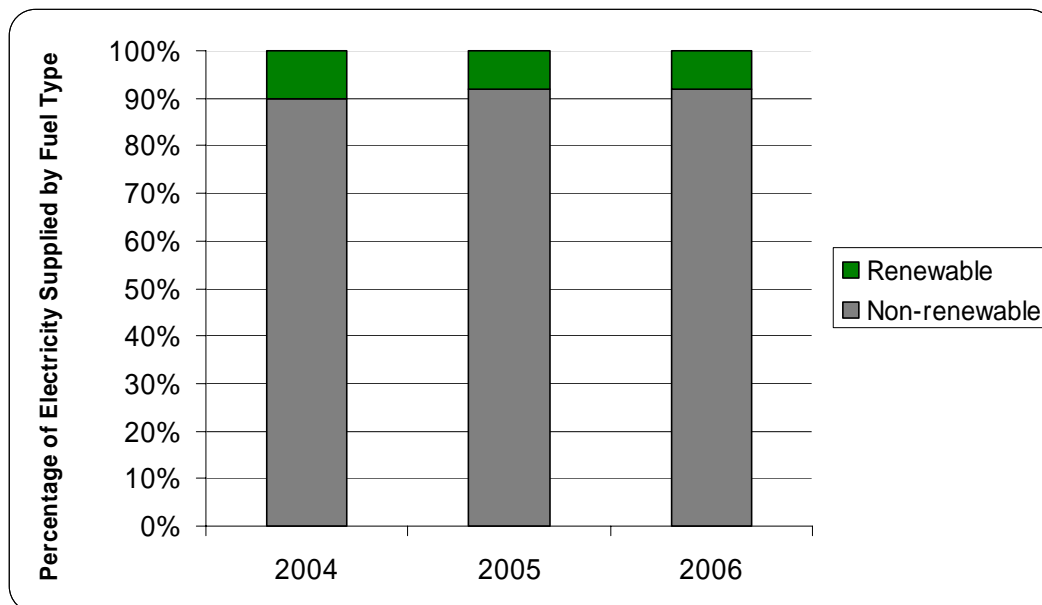
³⁰ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).

Figure 10: Fuel mix of electricity supplied by ENECO, 2006



Based on: ENECO³¹

Figure 11: Renewable vs. non-renewable electricity supplied by ENECO, 2004-2006



Based on: ENECO³²

³¹ ENECO Annual Report 2006, p.3.

³² Ibid

3.4. Strategy and Investment

In recent years, ENECO's strategy has changed in the direction of becoming a more vertically integrated energy company, and more focus has been given to the development of generation capacity. In 2006 investments in tangible fixed assets (property, plant and equipment) amounted to €262 million³³, of which €110 million is invested in renewable energy sources.³⁴

The most important investments announced include an exclusive contract for all electricity generated in a 800MW gas plant in the Rijnmond area.³⁵ This plant is owned by Intergen and until recently Nuon held the rights to its electricity.³⁶ The company has also signed a contract with Air Liquide to develop a 250MW combined heat-and-power plant on a Shell site, and has exclusive rights to all electricity generated.³⁷ Furthermore, ENECO has plans to build its own 840MW natural gas plant in Europoort.³⁸ If everything goes according to schedule, the plant would go in operation in 2010. ENECO is also investing in wind capacity, most notably in the Q7 offshore windpark near IJmuiden.³⁹ This project consists of 60 wind turbines, which have a combined capacity of 120MW and which will go into operation in 2008. Table 6 shows ENECO's major investment plans.

Table 6: ENECO announced investments in new production capacity in the Netherlands

Fuel Type	Location	Date	Amount (€)	Output Capacity (MW)
Non-renewable				
Possible take over of plants from Nuon and Essent				1,900
Gas. Exclusive contract with Intergen taken over from Nuon	Rijnmond	January 2005	Undisclosed.	800
Gas. CHP from PerGen. Exclusive contract.	Pernis	2007 in operation		250
Natural gas. ENECOGEN	Europoort	2010 in operation	400 million ⁴⁰	840
Renewable				
Wind. Q7 offshore park	IJmuiden	Construction starts 2006; 2008 in operation	383 million (shared) ⁴¹ / 287 million ⁴²	120
Wind ⁴³	St. Annaland	2007 decision		51

Table 7 shows the amount that ENECO has invested in renewable energy over the last two years compared to its total investments in tangible fixed assets. In 2005, ENECO invested €38 million in

³³ ENECO Energy, Annual Report 2006, p.40.

³⁴ C. de Ruiter, Press Officer ENECO Energie, 31 May 2007, telephone call with T. Steinweg.

³⁵ ENECO Energy, Annual Report 2006, p.19.

³⁶ "Eneco haalt stroom vlakbij," Rotterdams Dagblad, 18-08-04, sec.Economie, p.716.

³⁷ Eneco Energy, Annual Report 2006 Eneco Holding B.V., p.19.

³⁸ Idem

³⁹ ENECO Energy, Annual Report 2006, p.27.

⁴⁰ Energie in Nederland website, "Nieuwbouw centrales," no date, <http://www.energie.nl/index2.html?evn/2006/evn06-077.html> (09-05-07).

⁴¹ Rabobank, Case: Q7 Offshore Windpark; financiële oplossingen, March 2007, http://www.rabobank.com/content/images/Case_Eneco_NL.def_tcm43-44391.pdf (09-05-07).

⁴² "Eneco neemt stroom af van eerste windpark op zee," Het Financieele Dagblad, 2 april 2005.

⁴³ M. Huijben, "Bouw windmolens kan beginnen," BN/De Stem, 09-12-06.

renewables and in 2006, it invested €110 million. The 2006 figure is 42% of the company's total investments in tangible fixed assets in 2006 and approximately 35% of its 2006 net profits.

Table 7: ENECO total investments and investment in renewables, 2005-2006

Year	Investment in renewables (€ million)	Total investment (€ million)	Percentage of renewable in total investment
2005	38	180	21%
2006	110	262	42%

Based on: ENECO

4. Essent

4.1. Company and Profits Overview

Essent is a non-listed public limited liability company incorporated in 1999 with headquarters in Arnhem, the Netherlands. Essent's core market is the Netherlands, but it is also active in Germany (18%) and Belgium (2%). In addition to electricity products, Essent also provides radio, television, broadband Internet and telephony services through its Cablecom subsidiary, as well as waste management services through Essent Waste Management. In addition to supplying electricity under its own name, Essent also owns power suppliers Energiedirect and Westland Energie

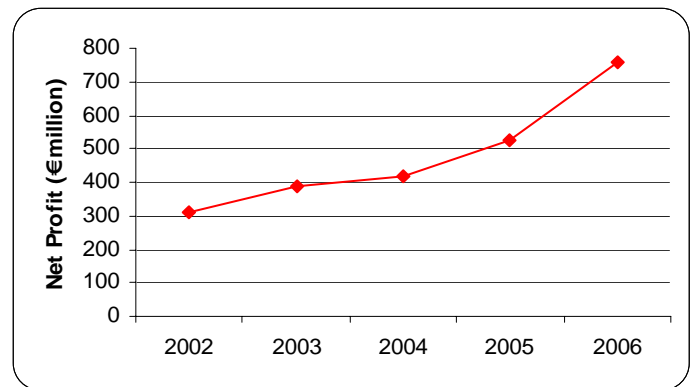
Table 8 and Figure 12 plot the progression of Essent's net profit over the past five years, revealing a steady increase in profits. In 2006, Essent generated a net profit of €761 million.

Table 8: Essent net profit, 2002-2006

Year	Net Profit (€million)
2002	311
2003	389
2004	417
2005	526
2006	761

Based on: Essent⁴⁴

Figure 12: Essent net profit, 2002-2006



4.2. Ownership and Dividends

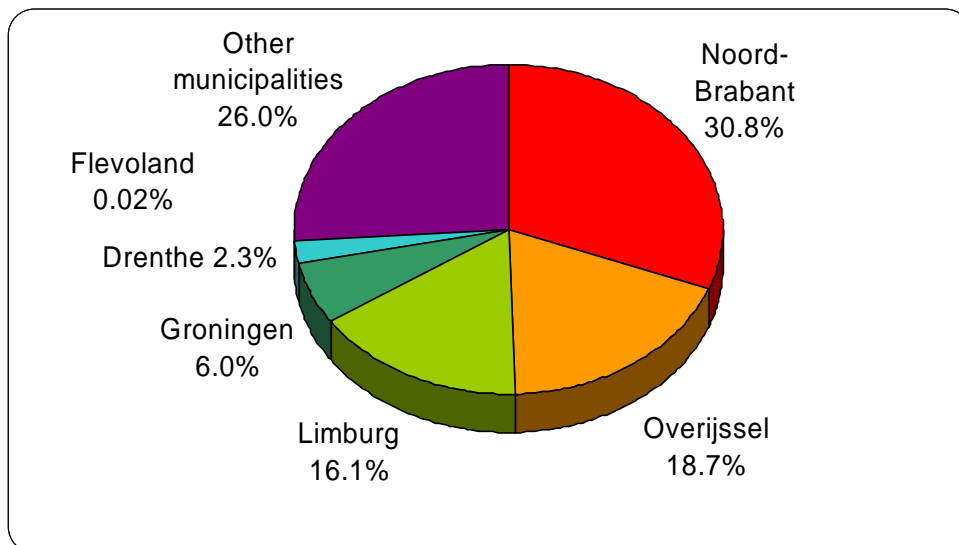
4.2.1. Ownership

Like ENECO, Essent is fully owned by Dutch public authorities. Some 74% of Essent's shares are owned by six Dutch provinces: Noord-Brabant, Overijssel, Limburg, Groningen, Drenthe, and Flevoland. The remaining 26% is held by just under 140 municipalities in these provinces and in the province of Friesland.

Figure 13 illustrates the division of ownership of Essent among its major shareholders and each shareholder's percent stake in the company.

⁴⁴ Essent, Annual Report 2006, p.8.

Figure 13: Essent shareholders and ownership percentage, 2006

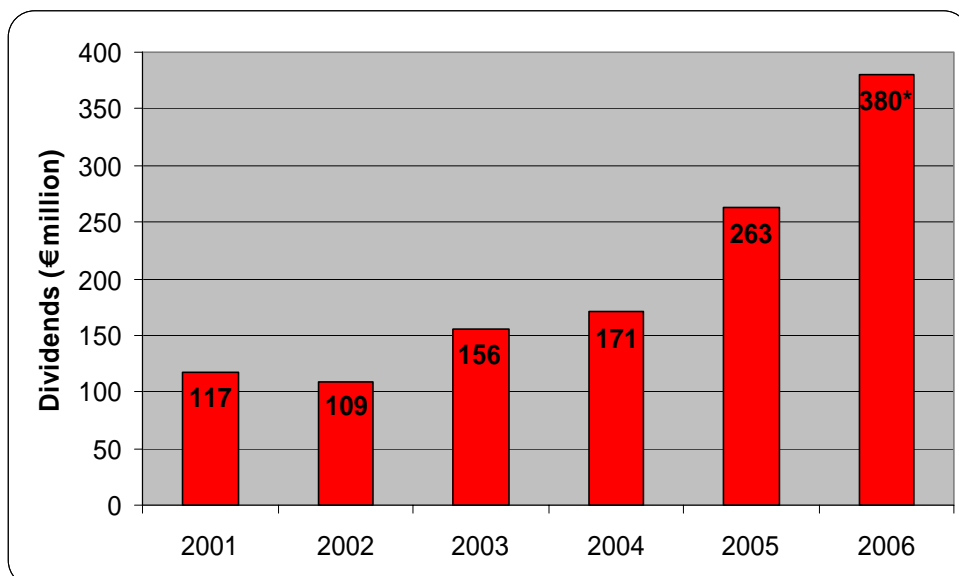


Based on: Essent⁴⁵

4.2.2. Dividends

Figure 14 presents the total dividends that Essent paid to all shareholders in 2001 – 2006. In 2006, Essent generated an estimated €380 million in dividends for its shareholders.

Figure 14: Total dividends paid to Essent shareholders, 2001-2006



Based on: Essent⁴⁶ * Proposed by Essent management and subject to approval by shareholders

Based on the shareholders' percentage of ownership in the company, Table 9 and Figure 15 reveal the dividends received by Essent's three largest shareholders, the provinces of Noord-Brabant,

⁴⁵ Essent website, Investor Relations, <http://www.essent.eu/essent/corporate_english/finance/shareholdersinformation/shareholdingstructure.html> (Apr 2007)

⁴⁶ Essent Annual Reports 2001-2006, available at Essent website, Publications, <http://www.essent.eu/essent/corporate_english/finance/publications/annual_reports.html> (Apr 2007).

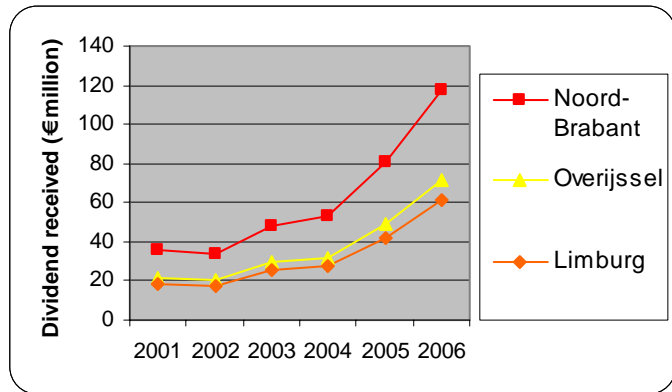
Overijssel and Limburg, between 2001 – 2006. The largest, Noord-Brabant, will receive a projected €117 million from Essent’s operations in 2006.

Table 9: Dividends received by top three Essent shareholders, 2001-2006

Year	Dividends received (€ million)		
	Noord-Brabant	Overijssel	Limburg
2001	36.04	21.88	18.84
2002	33.57	20.38	17.55
2003	48.05	29.17	25.12
2004	52.67	31.98	27.53
2005	81.00	49.18	42.34
2006*	117.04	71.06	61.18

* projected
Based on: Essent⁴⁷

Figure 15: Dividends received by top three Essent shareholders, 2001-2006

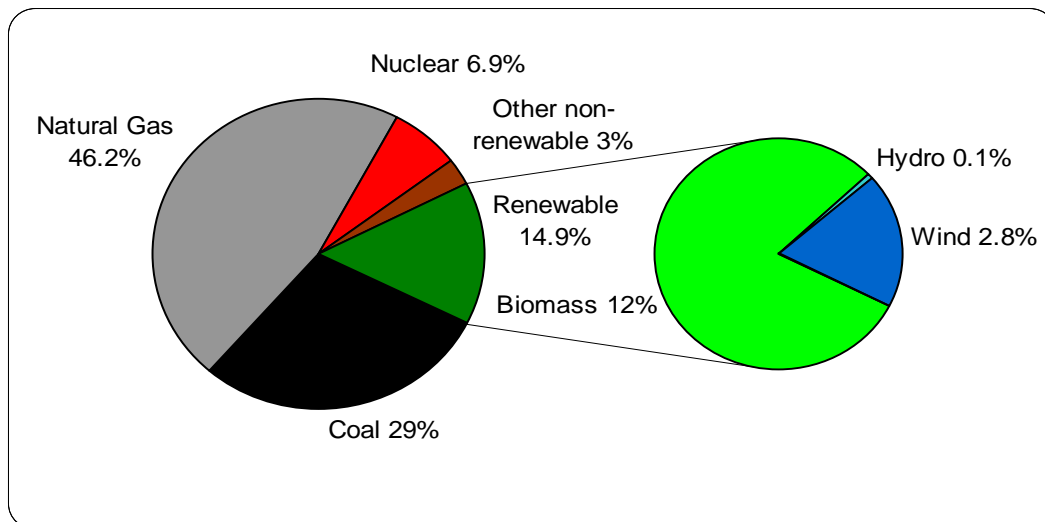


4.3. Fuel Mix and CO₂ Emissions

4.3.1. Power production

As revealed by Figure 16, nearly half of Essent’s electricity generation is based on natural gas (46.2%), which, along with coal (29%), nuclear (6.9%) and other non-renewable sources (3%), dominate the company’s fuel mix. Renewables account for approximately 15% of the electricity generated by Essent, primarily biomass (12%) and some wind power (2.8%).

Figure 16: Fuel mix of electricity generated by Essent, 2006



Based on: Essent⁴⁸

⁴⁷ Ibid. 2006 figures are based on Essent management proposal and all figures on 2006 shareholder structure. It should be noted that these are gross dividend figures that do not take into account taxation on dividends.

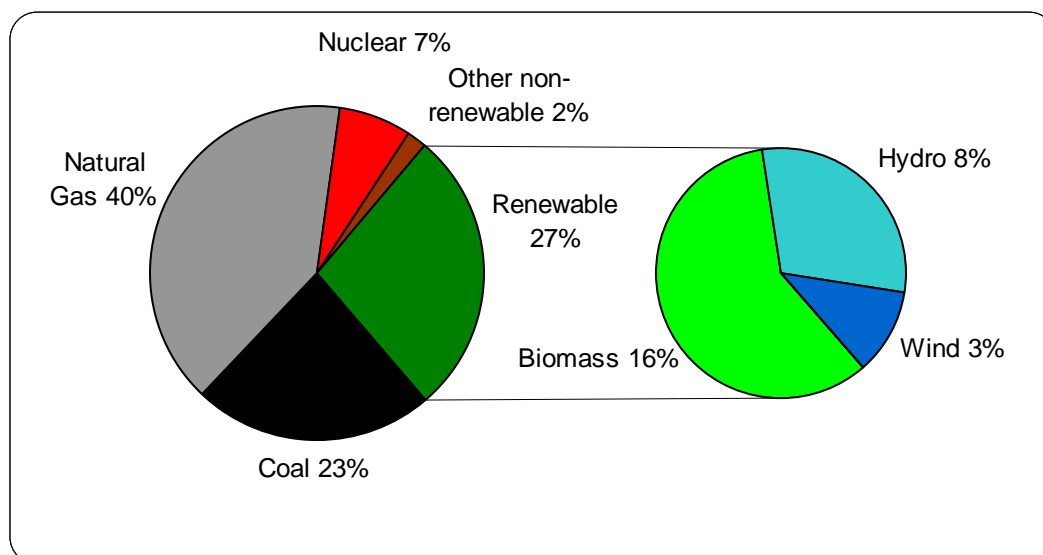
Largely as a result of this mix of renewable and non-renewable energy sources for electricity generation, Essent emitted approximately nine million tonnes of CO₂ in 2006.⁴⁹ As a result of its electricity production from nuclear fuel, the company produced six tonnes of high-level radioactive waste in 2006.⁵⁰

4.3.2. Power supply

At 27%, the percentage of renewable energy supplied by Essent is considerably higher than what it generates itself. Nevertheless, non-renewables such as natural gas (40%), coal (23%) and nuclear (7%) account for the majority of the electricity supplied by Essent. Biomass (16%) also plays a considerable role in Essent's supply, and hydro (8%) and wind (3%) round out the renewable sources.

Figure 17 illustrates the breakdown of the fuel mix for electricity supplied by Essent. Based on its 2006 fuel mix for electricity supplied, Essent was responsible for the emission of 409.8 grams of CO₂ per kWh and 0.00024 grams of radioactive waste per kWh.⁵¹

Figure 17: Fuel mix of electricity supplied by Essent, 2006



Based on: Essent⁵²

Figure 18 reveals the progression of the renewable energy supplied by Essent over the past several years, from 2003 to 2006. It is clear that the percentage of Essent's electricity from renewable sources is on the rise, but that renewables still account for only about one quarter of the electricity supplied by Essent.

⁴⁸ Essent, Sustainability Report 2006, p.14.

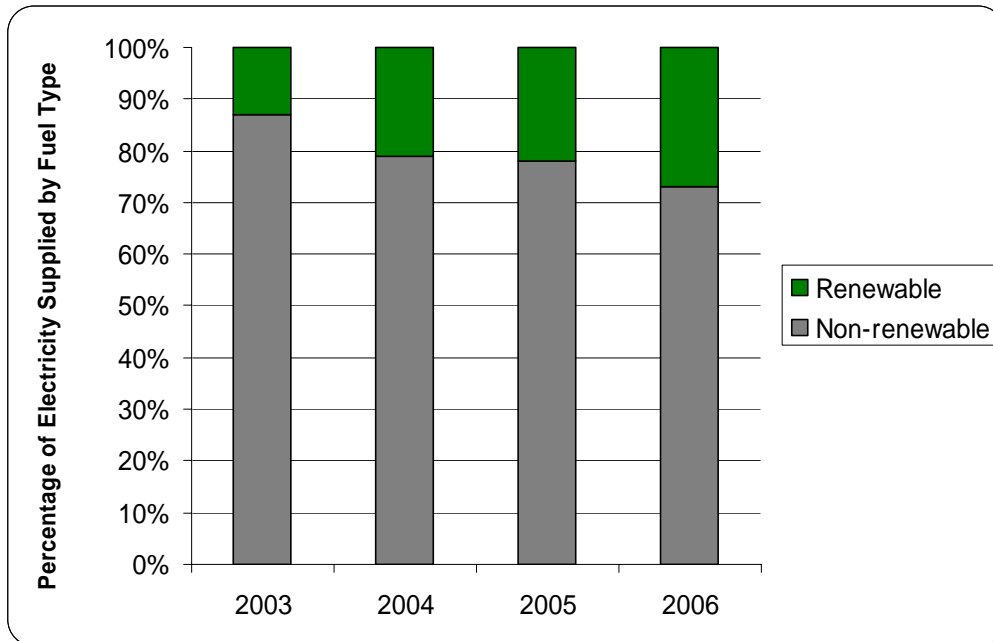
⁴⁹ S. Iwersen, J. Flauger and K. Stratmann, „Stromfirmen geraten unter Druck“, Handelsblatt, 11 May 2007, p.1.

⁵⁰ This figure is based on 0.003 gr/kWh x 4,000 GWh/jaar production in Borssele divided by two (Essent 50% ownership of Borssele).

⁵¹ Groene Stroom, Ja Graag website, <<http://groenestroomijagraag.nl/stroometiket>> (May 2007).

⁵² Essent, Sustainability Report 2006, p.14, 60.

Figure 18: Renewable vs. non-renewable electricity supplied by Essent, 2003-2006



Based on: Essent⁵³

4.4. Installed Capacity in the Netherlands

Essent is traditionally one of the largest energy producers in the Netherlands, with an installed electricity generation capacity of approximately 4,500 MW in the country in 2006. The company owns two large plants in the province of Limburg, as well as a number of combined heat and power plants throughout the country. The company is also 50% owner of EPZ, which means it is half owner of the country's only operating nuclear plant in Borssele.

In terms of renewable production capacity, Essent has one hydro plant and one biomass-only plant that account for a combined capacity of 36 MW. Three of Essent's thermal power plants also co-fire biomass, bringing the company's installed capacity dedicated to renewables to approximately 596 MW in 2006. Table 10 lists Essent's installed capacity in the Netherlands as of 2006.

4.5. Strategy and Investment

In terms of investment in new generation capacity in the Netherlands, Essent is expected to invest an estimated €5.5 billion in the coming years.⁵⁴ Most of the announced investment in production capacity is for non-renewable fuel types, most notably, a large coal plant in Geertruidenberg in which it is investing €1 billion. Essent is also planning to add a second gas-fired plant in Moerdijk⁵⁵, with a capacity of 400MW. The existing Clauscentrale is currently being expanded with an additional 320 MW.⁵⁶ The only renewable investments are part of the so-called 'Borssele Covenant', a requirement for the extension of operation of the nuclear plant in Borssele.⁵⁷

⁵³ Essent, Annual Report 2004 (p.63), 2005 (p.47) and Sustainability Report 2006 (p.14, 60)

⁵⁴ Essent, Annual report 2006, p.21.

⁵⁵ "Essent wil tweede gasgestookte centrale in Moerdijk," AFX-NL, 15-06-06.

⁵⁶ Enraedt website, "Essent onderzoekt uitbreiding capaciteit Clauscentrale," 03-08-05,

Table 10: Essent installed electricity generation capacity in the Netherlands, 2006

Fuel Type	Location	Output Capacity (MW)	Verified Greenhouse Gas Emissions 2005-06 (ton CO ₂)
Non-renewable			
Gas	EPZ Gasturbine Borssele	18 ^a	N/A
Gas	Dongecentrale, Geertruidenberg	121	182,702
Nuclear	EPZ Kerncentrale Borssele	515 ^a	-
Gas	CHP Moerdijk	339	1,173,218
Waste	AZN Moerdijk ^b	N/A	N/A
Gas	CHP Bergen op Zoom	33	93,450
Gas	CHP Den Bosch (Heineken)	32	148,810
Gas	CHP Helmond 1/2/3	83	207,715
Gas	CHP Eindhoven	49	139,945
Gas	CHP Enschede	58	228,880
Gas	CHP Erica	61	95,179
Gas	CHP Klazienaveen	61	86,017
Gas	CHP Swentibold Geleen	242	1,520,452
Waste	Essent Milieu Wijster	57	N/A
Waste	Essent Milieu Vagron, Groningen	3	N/A
Coal, Biomass	EPZ Kolencentrale Borssele	427 ^a	2,674,233 ^a
Coal, Biomass	Amercentrale, Geertruidenberg	948 coal; 295 biomass	11,227,215
Gas, Biomass	Clauscentrale, Maasbracht	1,096 gas; 184 biomass	2,696,528
Gas	25%-50% participation in seven industrial CHP plants	1,269	N/A
Renewable			
Water	Waterkrachtcentrale Linne, Maasbracht	11	
Biomass	Bio-energiecentrale Cuijk	25	474
Wind	EPZ Windpark Borssele	12 ^a	
Wind	12 windparks throughout the Netherlands ⁵⁸	81	

^a Essent owns 50% of the EPZ plants, while the other 50% is owned by Delta. It should thus be noted that only part of the EPZ capacity is available to Essent and that not all CO₂ emissions can be attributed to Essent.

^b Essent owns 80% of AZN.

Based on: Essent⁵⁹; CO₂ emissions from EU⁶⁰

<http://www.enraedt.nl/NIEUWSBRIEF/include2.php?naam=nieuws345.inc> (09-05-07).

⁵⁷ VROM website, Actueel Nieuwsberichten, Archief 2006, "Convenant kerncentrale Borsele getekend," 16-06-2006, <http://www.vrom.nl/pagina.html?id=23664> (09-05-07) & Essent, Jaarverslag 2006 Essent N.V., p.20.

⁵⁸ Essent, MVO Verslag 2006, p.38.

⁵⁹ Essent, MVO Verslag 2006, p.32.

⁶⁰ European Commission, DG Environment, Emission Trading Scheme, 2006 Emissions for the Netherlands, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> (June 2007)

Table 11 shows Essent's plans for new production capacity in the Netherlands.

Table 11: Essent announced investments in new production capacity in the Netherlands

Fuel Type	Location	Date	Amount (€)	Output Capacity (MW)
Non-Renewable				
Coal	Geertruidenberg	Begin construction 2008; 2013 in operation	1 billion	800-1,100
Gas	Moerdijk	2009 in operation	100 million	400
Liquid Natural Gas	Eemshaven	2010 in operation	300 to 400 million (shared)	
Combined heat and power (take-over of Westland Energie Services) ⁶¹	Westland	January 2007	90 million ⁶²	
Gas. Expansion capacity of Claus Plant.	Maasbracht	Procurement started in 2006	Undisclosed	320
Renewable				
Sustainable energy investments as agreed in the Borssele Convenant.			125 million	

Sources: Newspapers and websites

No information was available on the total amount of investment in new generation capacity.

⁶¹ "Essent in duurzame energie tuinbouw," NRC Handelsblad, 19-01-07, Sec. Economie, p.13.

⁶² RTLZ website, Nieuwsoverzicht, "Essent neemt Westland Energie Services over," 18-01-07, http://www.rtl.nl/financien/rtlz/nieuws/components/financien/rtlz/2007/03/0118_1430_essent_neemt_energiebedrijf_over.xml (09-05-07).

5. Nuon

5.1. Company and Profits Overview

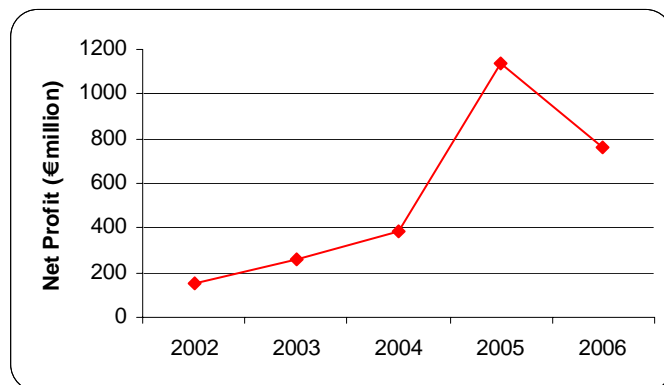
Nuon is a non-listed public limited liability company incorporated in 1998 with its registered office in Amsterdam. In addition to being one of the largest energy distributors in the Netherlands, the company has interests in energy projects and utilities in Europe, North America, and Asia and has power plants with more than 4,000 MW of capacity. Nuon provides electricity, natural gas, and heat to millions of customers in the Netherlands. The firm also markets and trades wholesale energy, and it offers energy-related services, such as equipment installation.

Table 12 and Figure 19 reveal that Nuon's profits have risen since 2002, with a sharp increase in 2005, then a slight decrease in 2006. In 2006, Nuon generated a net profit of €763 million, down from a high of €1,138 million in 2005. Nuon's peak in profit in 2005 was due to the sale of non-core and international business activities.⁶³

Table 12: Nuon net profit, 2002-2006

Year	Net Profit (€million)
2002	152
2003	259
2004	387
2005	1,138
2006	763

Figure 19: Nuon net profit, 2002-2006



Based on: Nuon⁶⁴

5.2. Ownership and Dividends

5.2.1. Ownership

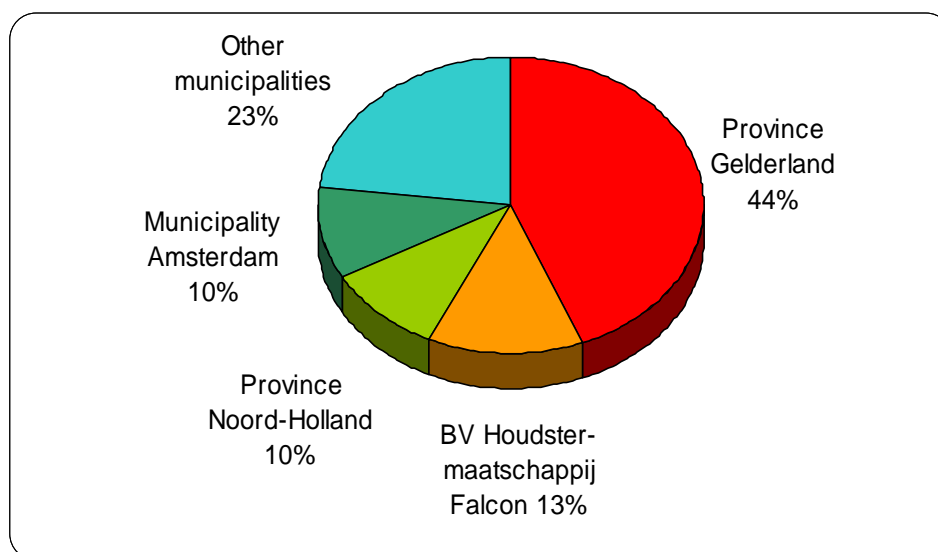
Like its Dutch counterparts Essent and ENECO, Nuon is also fully owned by Dutch public authorities. Nuon's largest shareholders are the provinces of Gelderland and Noord-Holland, BV Houdstermaatschappij Falcon and the Municipality of Amsterdam. Jointly, they hold some 76% of Nuon shares. The remainder is in the hands of some 65 other municipal shareholders.

Figure 20 illustrates the division of ownership of Nuon among its major shareholders, and Table 13 lists Nuon's minor shareholders.

⁶³ Email communication from Nuon in response to a draft of this report, 27 June 2007.

⁶⁴ Nuon, Annual Report 2006, p.147.

Figure 20: Nuon shareholders and ownership percentage, 2006



Based on: Nuon⁶⁵

Table 13: Minor Nuon stakeholders, 2006

Municipalities				Other
Aalten	Elburg	Lochem	Rijnwoude	NV Houdstermaarschappij EZW
Alkemade	Ermelo	Montferland	Ter Aar	NV Houdstermaatschappij GKNH
Almere	Geldermalsen	Nieuwkoop	Teylingen	Provincie Flevoland
Alphen a/d Rijn	Haarlem	Nijkerk	Voorschoten	
Amersfoort	Harderwijk	Noordwijk	Wassenaar	
Apeldoorn	Hatterm	Noordwijkerhout	Westervoort	
Barneveld	Hillegom	Nunspeet	Winterswijk	
Berkelland	Jacobswoude	Oegstgeest	Zeewolde	
Bronckhorst	Katwijk	Oldebroek	Zevenaar	
Boskoop	Leiden	Oost Gelre	Zevenhuizen-Moerkapelle	
Doesburg	Leiderderdorp	Oude IJsselstreek	Zoeterwoude	
Doetinchem	Lelystad	Putten	Zutphen	
Dronten	Liemeer	Rheden		
Duiven	Lisse	Rijnwaarden		

Based on: Nuon⁶⁶

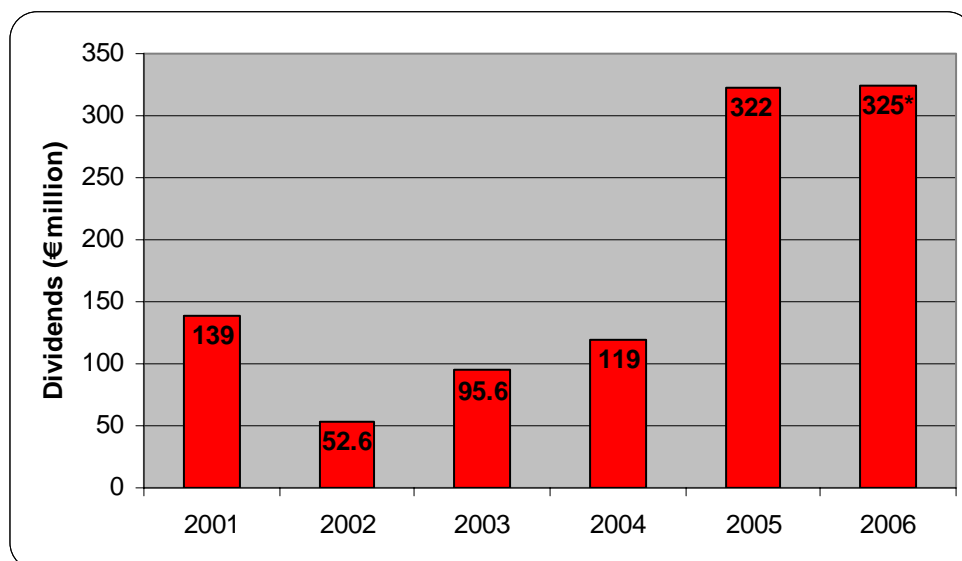
5.2.2. Dividends

Figure 21 presents the total dividends that Nuon paid to all shareholders in 2001 – 2006. In 2006, Nuon generated an estimated €325 million in dividends for its shareholders.

⁶⁵ Nuon website, Investor Relations, <<http://corporate.nuon.com/en/content.jsp?page=/en/overnuon/organisatie/>> (Apr 2007)

⁶⁶ Ibid.

Figure 21: Total dividends paid to Nuon shareholders, 2001-2006



* Proposed by Nuon management and subject to approval by shareholders
Based on: Nuon⁶⁷

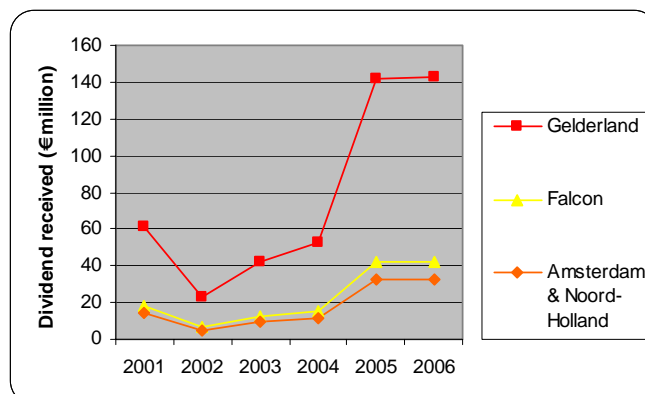
Based on the shareholders' percentage of ownership in the company, Table 14 and Figure 22 reveal the dividends received by Nuon's four largest shareholders between 2001 – 2006. The largest, Gelderland, will receive a projected €143 million from Nuon's operations in 2006.

Table 14: Dividends received by top four Nuon shareholders, 2001-2006

Year	Dividends received (€million)		
	Gelderland	Falcon	Amsterdam & N. Holland
2001	61.16	18.07	13.90
2002	23.14	6.838	5.26
2003	42.06	12.43	9.56
2004	52.36	15.47	11.90
2005	141.68	41.86	32.20
2006*	143	42.25	32.50

* projected
Based on: Nuon⁶⁸

Figure 22: Dividends received by top four Nuon shareholders, 2001-2006



⁶⁷ Nuon Annual Reports 2001-2006, available at Nuon website, Investor Relations – Reports and Publications, <<http://corporate.nuon.com/en/content.jsp?page=/en/overnuon/organisatie/>> (Apr 2007).

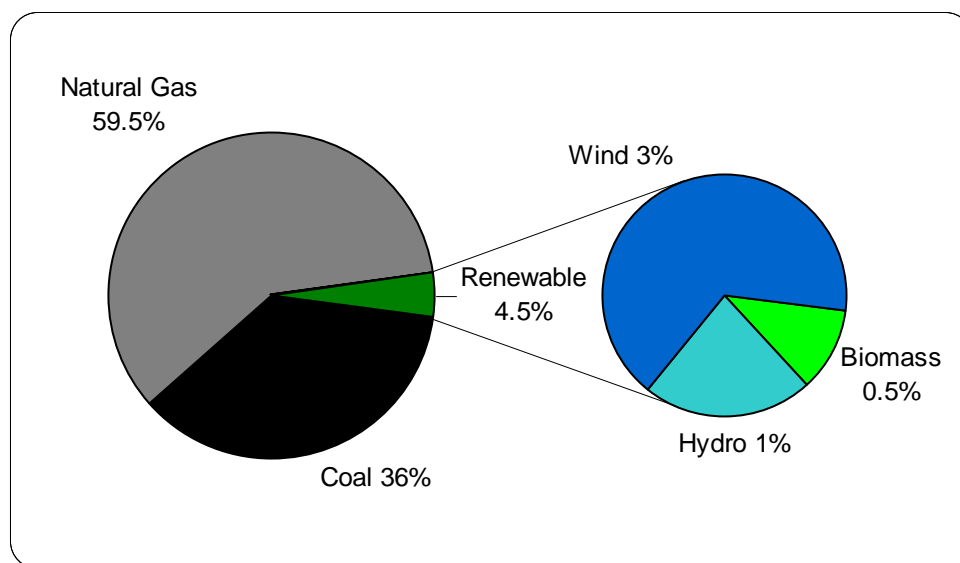
⁶⁸ Ibid. 2006 figures are based on Nuon management proposal and all figures 2006 shareholder structure. It should be noted that these are gross dividend figures that do not take into account taxation on dividends.

5.3. Fuel Mix and CO₂ Emissions

5.3.1. Power production

The percentage of renewable electricity generated by Nuon itself is considerably smaller than what it supplies. Figure 23 reveals that natural gas (60%) and coal (36%) clearly dominate Nuon's generation mix, with renewables contributing only 4.5% of the company's electricity. Of the renewables, wind is the largest source at 3% of total production. Notably, the amount of renewable power produced by Nuon dropped dramatically from 2005 to 2006. While Nuon produced 1,146 Gigawatt hours (GWh) of renewable power in 2005, it produced just over half of that (625 GWh) in 2006.⁶⁹ In comparison, the company produced 12,000 GWh of non-renewable "grey" power in 2006 (14,000 GWh in 2005).

Figure 23: Fuel mix of electricity generated by Nuon, 2006



Based on: Nuon⁷⁰

Largely as a result of this mix of renewable and non-renewable energy sources for electricity generation, Nuon emitted approximately 12 million tonnes of CO₂ in 2006.⁷¹

5.3.2. Power supply

Nuon's mix of electricity supplied is more favourable toward renewables, which account for a combined 19% of total electricity supplied. Hydro (11.4%) and biomass (5.1%) are the largest renewable sources, with wind (2.5%) and solar (0.01%) playing a minor role. Nevertheless, non-renewables such as natural gas (44.6%), coal (23%) and nuclear (8.4%) comprise the vast majority of Nuon's sources for the electricity it supplies to customers.

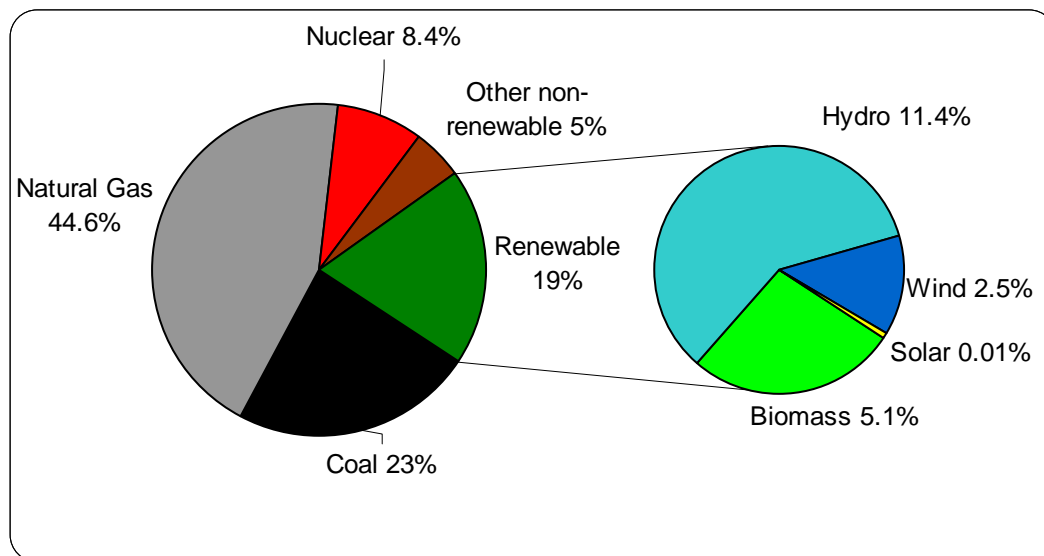
Figure 24 illustrates the fuel mix breakdown of electricity supplied by Nuon. Based on its 2006 fuel mix for electricity supplied, Nuon Group was responsible for the emission of 447.3 grams of CO₂ per kWh and 0.000254 grams of radioactive waste per kWh.⁷²

⁶⁹ Nuon, Annual Report 2006, front flap.

⁷⁰ Nuon, Sustainability Report 2006, p.104.

⁷¹ S. Iwersen, J. Flauger and K. Stratmann, „Stromfirmen geraten unter Druck“, Handelsblatt, 11 May 2007, p.1.

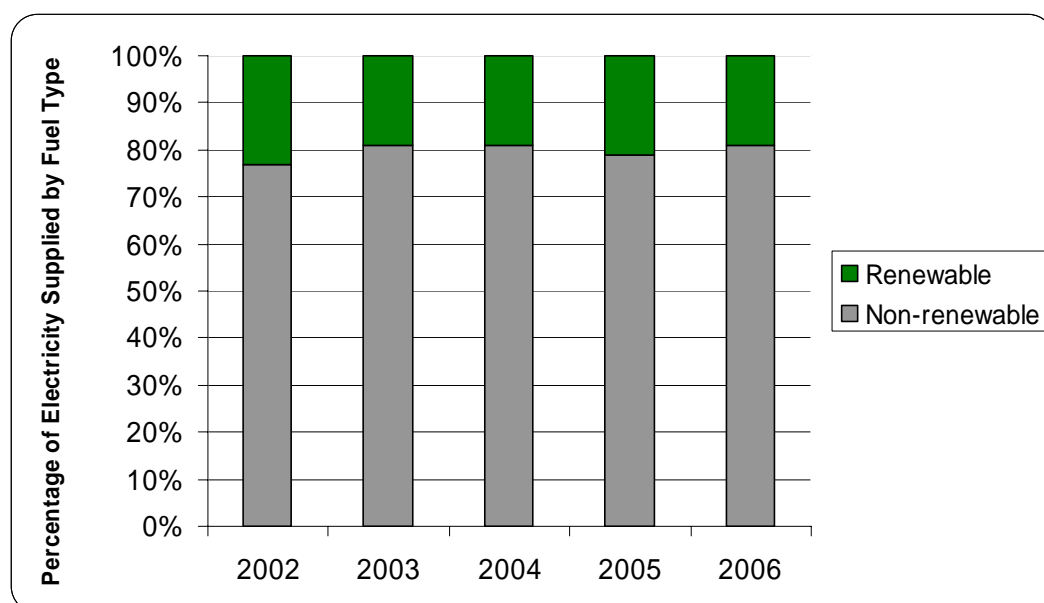
Figure 24: Fuel mix of electricity supplied by Nuon, 2006



Based on: Nuon⁷³

Figure 25 charts the evolution of the fuel mix for electricity supplied by Nuon between 2002 and 2006, revealing that Nuon has decreased the percentage of renewables that it uses over the past several years, but that the figure is now hovering steadily at around 20%.

Figure 25: Renewable vs. non-renewable electricity supplied by Nuon, 2002-2006



Based on: Nuon

⁷² Nuon, email communication in response to a draft of this report, 27 June 2007.

⁷³ Nuon Sustainability Report 2006.

5.4. Installed Capacity in the Netherlands

Nuon has approximately 4,000 MW of installed capacity in the Netherlands. The company has a large number of small and medium-sized power plants, mostly in the regions where it also supplies energy. Most of the larger plants, such as those in Amsterdam and Velsen, are either coal-fired or gas-fired. There are several smaller renewable production sites fuelled by wind and hydropower. The largest renewable generation takes place in an off-shore wind park, which has a total generating capacity of 108 MW. In total, Nuon has approximately 3,700 MW of non-renewable generation capacity in the Netherlands and 300 MW renewable capacity.

Table 15: Nuon installed electricity generation capacity in the Netherlands, 2006

Fuel type	Name/Location	Output capacity (MW)	Verified Greenhouse Gas Emissions 2005-06 (ton CO ₂)
Non-renewable			
Gas	Diemen-33	249	1,093,246
Coal	Hemweg-8 (Amsterdam)	630	6,705,931
Gas	Hemweg-7 (Amsterdam)	599	Included above
Gas	Ijmuiden1 (Ijmond)	144	3,865,383
Gas	Lage Weide, Merwede (Utrecht)	663	2,066,788
Gas	Purmerend	69	287,615
Gas	Velsen	860	7,987,219
Coal/Gas/Biomass	Buggenum-7	253	2,045,551
Gas and oil (CHP)	Vlieland	2.8	
Unclear (CHP)	Emmtec	69	
Unclear (CHP)	De Kleef	45	253,774
Unclear (CHP)	Düren	8.25	
Unclear (CHP)	Heinsberg	38.8	
Unclear (small scale CHP)	WKK park (various locations)	115	
Renewable			
Wind	Noordzee ^a	108 ^a	
Water	Various sites	25.8	
Wind	Various sites	194.8	
Biomass (stand alone)	Various sites	8.63	

^a Nuon is 50% owner of NoordzeeWind; Shell owns the other 50%. Thus, only half of the capacity of this windpark can be attributed to Nuon.

Source: Nuon⁷⁴; CO₂ emissions from EU⁷⁵

5.5. Strategy and Investment

Currently, Nuon is focusing on retail and wholesale activities in its core markets (the Netherlands, Belgium, and Germany), as well as on renewable energy production throughout Europe. In early 2007, the company agreed to merge with Essent.

⁷⁴ Nuon Sustainability Report 2006, p.104.

⁷⁵ European Commission, DG Environment, Emission Trading Scheme, 2006 Emissions for the Netherlands, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> (June 2007)

In terms of investment in new generation capacity in the Netherlands, Nuon has announced that it wants to increase its domestic production capacity, in line with the trend that can be seen throughout the country. The company is planning to expand its existing plant in Velsen⁷⁶ by 200 MW and is planning to build a very large, mainly coal-fired plant in Eemshaven under the name 'Nuon Magnum'.⁷⁷ The coal-biomass co-firing plant will have a capacity of 1,200 MW, and Nuon's investment in the project is estimated to be between €1 billion and €1.5 billion. Table 16 lists Nuon's announced investment plans in the Netherlands.

Table 16: Nuon announced investments in new generation capacity in the Netherlands

Fuel Type	Location	Date	Amount (€)	Output Capacity (MW)
Non-renewable				
Gas (Corus)	Velsen-Noord	March 2007 (announced), final decision mid 2008	Undisclosed	200 (1,000 already existing)
Coal, biomass, gasses	Magnum, Eemshaven	Announced July 2006, expected 2011	1-1.5 billion	1,200
Renewable				

Source: Newspapers and websites

Table 17 shows the amount that Nuon has invested in renewable energy over the last two years compared to its total investments in tangible fixed assets. In 2005 and 2006, investment in renewables comprised about 11% of Nuon's total investments.

Table 17: Nuon total investments and investment in renewables, 2004-2006

Year	Investment in renewables (€ million)	Total investment (€ million)	Percentage of renewable in total investment
2005	66.3	547	12%
2006	63.2	583	11%

Based on: Nuon⁷⁸

⁷⁶ "Nuon overweegt uitbreiding centrale bij Corus," AFX-NL, 30-03-07.

⁷⁷ J. Neleman, "Megawatt race," FEM Business, 11-08-06, <http://www.fembusiness.nl/fembusiness/content/nieuws/36248/article.html> (08-05-07).

⁷⁸ Nuon, Nuon Jaarverslag 2006, <<http://jaarverslagen.nuon.com/2006/>> (June 2007).

6. Electrabel

6.1. Company and Profits Overview

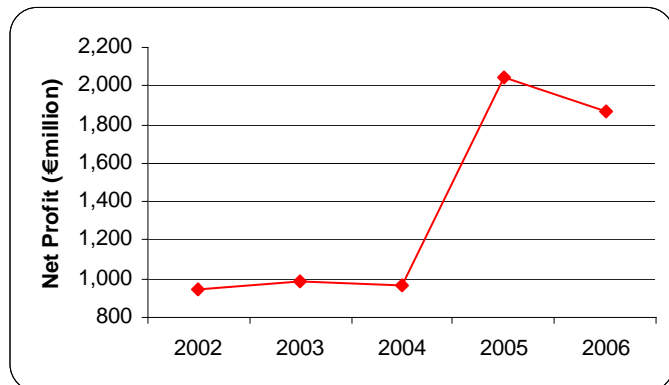
Headquartered in Brussels, Electrabel is the top power company in Belgium, supplying around 90% of that country's electricity. The company operates nuclear, fossil-fuel and hydroelectric power plants in Belgium and several other European countries, including the Netherlands, and it has a generating capacity of 28,200 MW. Electrabel supplies electricity to 5.5 million customers and natural gas to more than two million customers. The French conglomerate SUEZ owns about 98% of Electrabel, and has made a bid to acquire the outstanding shares.⁷⁹ In 2000, Electrabel acquired EPON (now Electrabel Nederland), and is now also the Netherlands' main power generator.

Table 18 and Figure 26 reveal that Electrabel's profits rose sharply in 2005, but receded somewhat in 2006. In 2006, Electrabel generated a net profit of €1,866 million, down from a high of €2,040 million in 2005.

Table 18: Electrabel net profit, 2002-2006

Year	Net Profit (€million)
2002	949
2003	985
2004	961
2005	2,040
2006	1,866

Figure 26: Electrabel net profit, 2002-2006



Based on: Electrabel⁸⁰

6.2. Fuel Mix and CO₂ Emissions

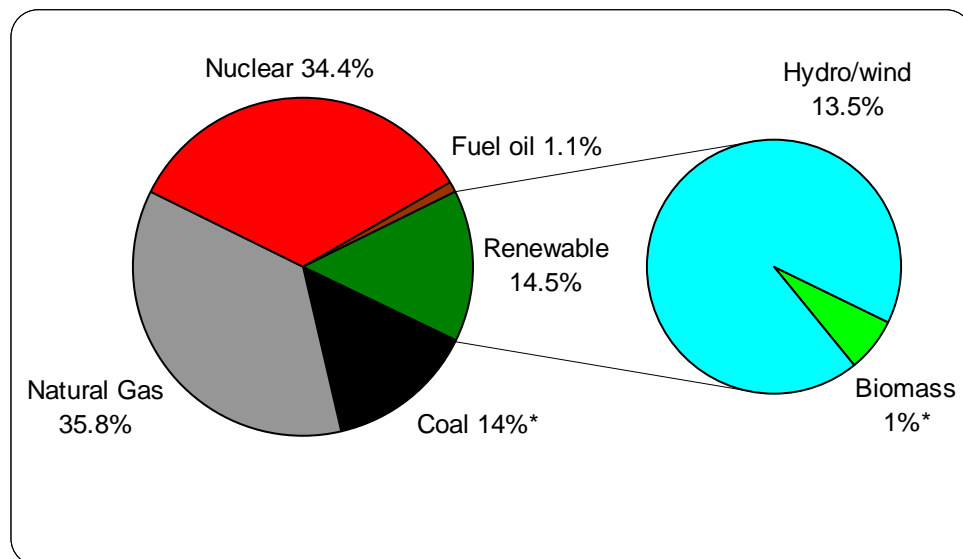
6.2.1. Power production

Electrabel has electricity generating capacity in nine countries. Figure 27, which is based on all Electrabel power plants, not just those in the Netherlands, shows that, at 34.4%, nuclear energy makes up a relatively large percentage of Electrabel's fuel mix. Only natural gas (35.8%) plays a larger role. Renewables, primarily hydro and wind power (13.5%), do make up a significant portion of Electrabel's generation capacity, but the mix is dominated by the non-renewables. In terms of GWh generated in 2006, the company produced 48,688 GWh of electricity from natural gas; 46,748 GWh from nuclear fuel; 20,128 GWh from coal and biomass; 18,360 GWh from hydro and wind; and 20,400 from other sources. Electrabel's 11 power plants in the Netherlands boast almost no generation from renewables (see section 6.3).

⁷⁹ Hoover's Company Records, Electrabel S.A., 15 May 2007.

⁸⁰ Electrabel, Annual Report 2006 (p.28), 2005 (p.19, 160), and 2002.

Figure 27: Fuel mix of electricity generated by Electrabel, 2006



* Estimation⁸¹; Based on: Electrabel⁸²

Largely as a result of this mix of renewable and non-renewable energy sources for electricity generation, Electrabel emitted 32 million tonnes of CO₂ in 2006⁸³. As a result of its electricity production from nuclear fuel, the company also produced 141 tonnes of high-level radioactive waste in 2006.⁸⁴

Figure 28 records the development of Electrabel's fuel mix between 2002 and 2006, revealing that the percentage of renewables Electrabel uses for generating electricity has increased over the past several years, but remains small compared to non-renewables.⁸⁵

6.2.2. Power supply

Electrabel supplies power to large and medium sized companies and the retail market in the Netherlands through its subsidiaries Rendo and Cogas, and additionally supplies to the Dutch wholesale electricity market. The electricity that Rendo and Cogas supply is much less sustainable than that which Electrabel generates itself. As Figure 29 and Figure 30 show, the electricity supplied by Electrabel's subsidiaries in the Netherlands is largely based on natural gas (55-58%) and coal (24-29%). Renewables comprise only between 3% and 5% of the fuel mix of Rendo and Cogas.

⁸¹ Electrabel does not give separate figures for coal and biomass, they are included in one heading. For 2006, Electrabel's percentage of coal/biomass was 15%; the authors divided this into 14% for coal and 1% for biomass based on the example of the Gelderland Power Plant, which Electrabel identifies as combined coal/biomass plant, and which uses 97% coal and 3% biomass.

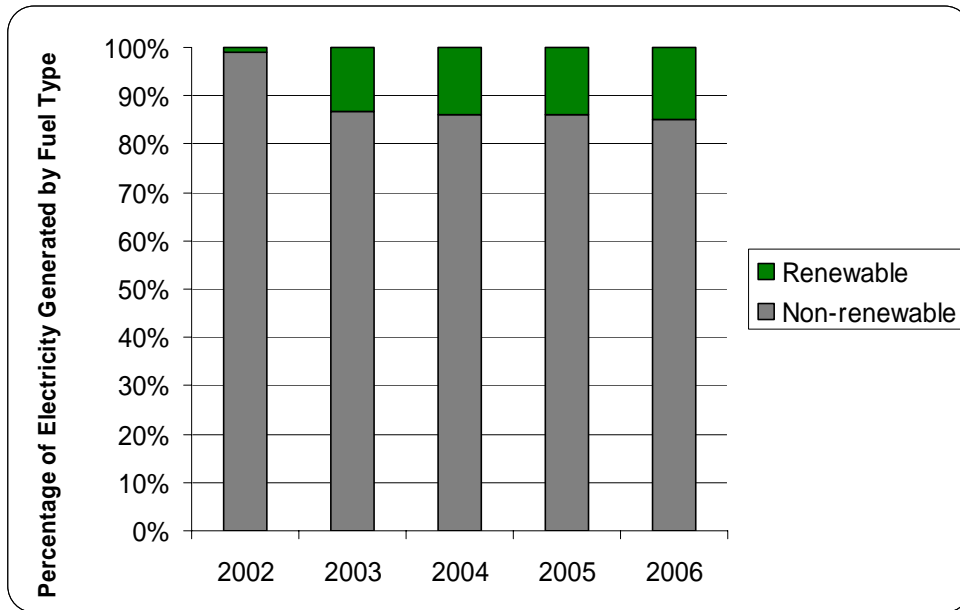
⁸² Electrabel, Annual Report 2006, p.143

⁸³ S. Iwersen, J. Flauger and K. Stratmann, „Stromfirmen geraten unter Druck“, Handelsblatt, 11 May 2007, p.1.

⁸⁴ This figure is based on 0.003 gr waste/kWh x 47,000 GWh electricity produced from nuclear fuel in 2006.

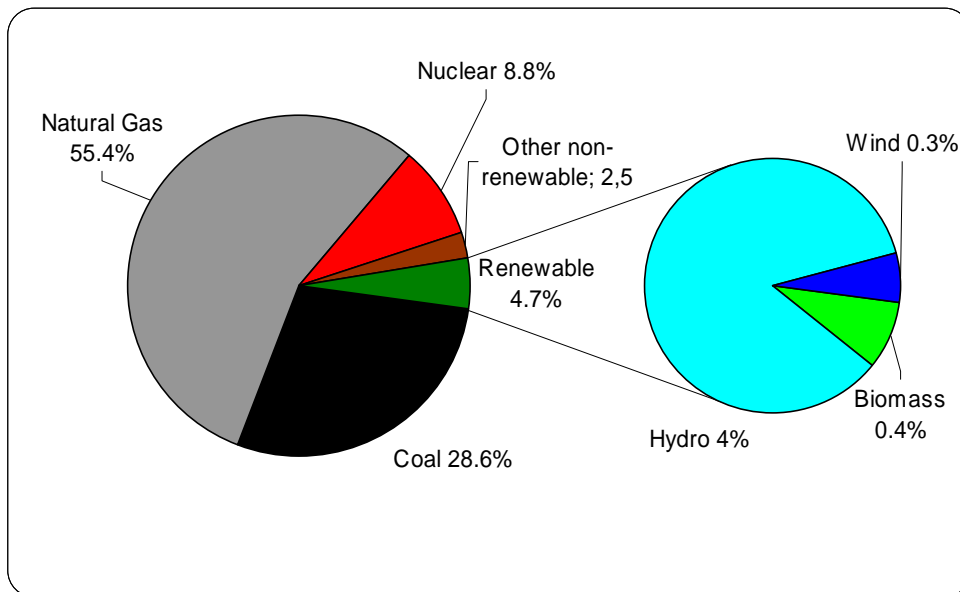
⁸⁵ Again, it should be noted that these figures are based on all Electrabel power plants, not just those in the Netherlands.

Figure 28: Renewable vs. non-renewable electricity generated by Electrabel, 2002-2006



Based on: Electrabel⁸⁶

Figure 29: Fuel mix of electricity supplied by Rendo, 2006

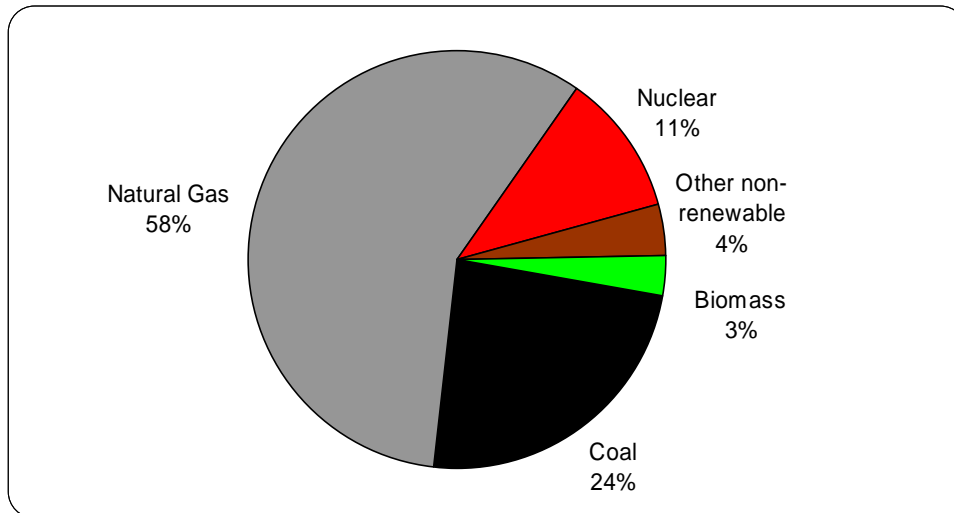


Based on: Groene Stroom, Ja Graag⁸⁷

⁸⁶ Electrabel, Annual Report 2006 (p.143), 2005 (p.166), 2004 (p.62), 2003 (p.69) and 2002 (p.71).

⁸⁷ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).

Figure 30: Fuel mix of electricity supplied by Cogas, 2006



Based on: Groene Stroom, Ja Graag⁸⁸

Based on these fuel mixes for electricity supplied, Cogas was responsible for the emission of 533.8 grams of CO₂ per kWh and 0.00033 grams of radioactive waste per kWh in 2006, and Rendo for 538.1 grams of CO₂ per kWh and 0.000264 grams of radioactive waste per kWh.⁸⁹

6.3. Installed Capacity in the Netherlands

As the Netherlands' top electricity generator, Electrabel operates 11 power plants in the country that have a combined generation capacity of 4,710.5 MW.⁹⁰ Over half of this capacity is accounted for by a single gas-fired plant in Eemshaven. The company also operates a number of medium-sized plants throughout country. Almost all energy generated in the Netherlands is from non-renewable sources. Of the company's 4,710.5 MW capacity in the Netherlands, a sole wind park in Lelystad with a maximum capacity of 3.5 MW is the only renewable plant, adding a meagre 0.07% to Electrabel's generation in the Netherlands.^{91 92} One of the company's conventional thermal power plants in the Netherlands is equipped to co-fire biomass alongside coal and gas, but the percentage of biomass actually used at these stations is negligible.⁹³ This means that approximately 99% of the electricity Electrabel currently generates in the Netherlands is non-renewable.

⁸⁸ Idem

⁸⁹ Idem

⁹⁰ Electrabel, Annual Report 2006, p.142.

⁹¹ Electrabel, Annual Report 2006, p.142.

⁹² Electrabel, Annual Report 2006, p.142.

⁹³ At the Gelderland plant, biomass accounts for only 3% of the fuel used; coal and fuel oil account for the rest. See Electrabel's website <http://www.electrabel.nl/content/corporate/ourplants/plantgelderland_nl.asp> (May 2007). No figures could be found for the Harculo plant, which Electrabel claims co-fires biomass alongside natural gas. An Electrabel representative pointed out that this is due to problems with permissions, and that it is expected that Electrabel will receive an environmental permit to co-fire up to 25% biomass in its plant in Nijmegen by July 5th, 2007; Email from Electrabel in response to this report, 29-06-07.

Table 19: Electrabel installed electricity generation capacity in the Netherlands, 2006

Fuel type	Location	Output capacity (MW)	Verified Greenhouse Gas Emissions 2005-06 (ton CO ₂ equivalent)
Non-renewable			
Gas	Eemshaven	2,417	8,538,098
Gas (CHP)	Rotterdam (AirProducts)	43	692,586
Gas (CHP)	Almere	118	723,348
Gas	Bergum	664	1,509,263
Gas	Flevoland	513	72,321
Coal/Biomass	Nijmegen	602	5,730,362
Gas/Bio-oil	Harculo	350	749,663
Renewable			
Wind	Lelystad	3.5	

Source: Electrabel⁹⁴; CO₂ emissions from EU⁹⁵

6.4. Strategy and Investment

In terms of investment in new generation capacity in the Netherlands, Electrabel's strategy of investment is to upgrade existing older plants and extend their lifecycle. The company has announced such lifecycle extensions for four of its Dutch plants.⁹⁶ ⁹⁷ In addition, the company has announced its plans to invest €1.6 billion in two plants in Flevoland (gas) and Rotterdam (coal/biomass) for a total capacity increase of 1,650 MW. ⁹⁸ The company has announced that the Rotterdam plant will be able to co-fire up to 50% biomass, calculated on an energy basis. Another investment in renewable energy is a €30M investment in a 27MW windpark in Eemshaven, according to an Electrabel representative.⁹⁹ However, Electrabel's investments in renewable energy in The Netherlands is meagre in comparison to its total investments.

⁹⁴ Electrabel, Annual report 2006, p.142; Electrabel website, "De electriciteitscentrales," no date http://www.electrabel.nl/content/corporate/ourplants/electricityplants_nl.asp (30-05-07).

⁹⁵ European Commission, DG Environment, Emission Trading Scheme, 2006 Emissions for the Netherlands, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> (June 2007)

⁹⁶ G. van der Spiegel, "Electrabel investeert in Nederlandse stroomvoorziening," Envirodesk, 21-01-05, <http://www.envirodesk.be/site/news.asp?module=NEWS&level=DETAILS&newsId=9898> (09-05-07).

⁹⁷ G. van der Spiegel, "Electrabel investeert in Nederlandse stroomvoorziening," Envirodesk, 21-01-05, <http://www.envirodesk.be/site/news.asp?module=NEWS&level=DETAILS&newsId=9898> (09-05-07).

⁹⁸ "Electrabel plant drie centrales in Nederland," Het Nieuwsblad, 22-11-05, <http://www.nieuwsblad.be/Article/Detail.aspx?articleID=gn3kijt4> (09-05-07).

⁹⁹ Email from Electrabel in response to this report, 29-06-07.

Table 20 displays Electrabel's announced investment plans in the Netherlands.

Table 20: Electrabel announced investments in new generation capacity in the Netherlands

Fuel Type	Location	Date	Amount (€)	Output Capacity
Non-renewable				
Natural gas and coal lifecycle extension	Harkulo (natural gas), Gelderland (coal), Bergum (natural gas), Eemshaven (natural gas)	2006, 2007	100 million	350 Megawatt, 602 Megawatt, 664 Megawatt, 695 Megawatt respectively
Natural gas CCGT	Flevoland	2009 in operation	1.6 billion (together with the Rotterdam plant below)	900 Megawatt
Coal and biomass	Rotterdam	2009 in operation	1.6 billion (together with the Flevoland plant above)	750 Megawatt
Wind	Eemshaven	2008 in operation	30 million	27 Megawatt

7. E.ON Energie

7.1. Company and Earnings Overview

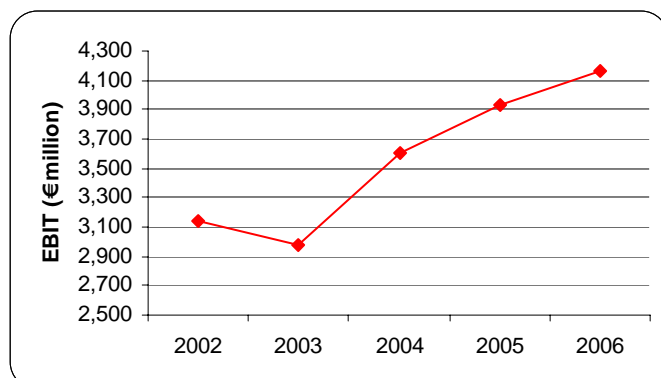
E.ON Energie AG is headquartered in Munich, Germany, and is E.ON's Central Europe market unit for energy services. E.ON Energie, a publicly-traded company listed on stock exchanges in Germany and the US, is one of Germany's top two power companies (along with RWE) and has approximately 11.6 million electricity and natural gas customers in Central Europe, whom it supplies with about 27,800 MW of electric generating capacity. Just over 3,000 MW of E.ON Energie's installed capacity is dedicated to renewables. E.ON Energie has operations in 18 countries, including the Netherlands. In addition to its Energie subsidiary, E.ON's other market units include Pan-European Gas, UK, Nordic, and US Midwest, but because of the focus on the Dutch energy services market, figures in this study are for E.ON Energie Central Europe market unit only.¹⁰⁰

Since 2003, E.ON Energie's earnings have been on the rise. Table 21 and Figure 31 give the earnings before interest and taxes (EBIT)¹⁰¹ for E.ON Energie between 2002-2006. In 2006, E.ON Energie's earnings reached €4,168 million.

Table 21: E.ON Energie EBIT, 2002-2006

Year	EBIT (€million)
2002	3,147
2003	2,979
2004	3,602
2005	3,930
2006	4,168

Figure 31: E.ON Energie EBIT, 2002-2006



Based on: E.ON¹⁰²

7.2. Fuel Mix and CO₂ Emissions

7.2.1. Power production

Figure 32, which is based on all E.ON Energie power plants, not just those in the Netherlands, shows that nuclear energy is clearly the dominant fuel in E.ON Energie's fuel mix for generating electricity, comprising nearly half of the total. Coal, including lignite (a particularly dirty form of coal), accounts for just over one-third of the company's electricity. Renewable energy sources, in the form of hydro

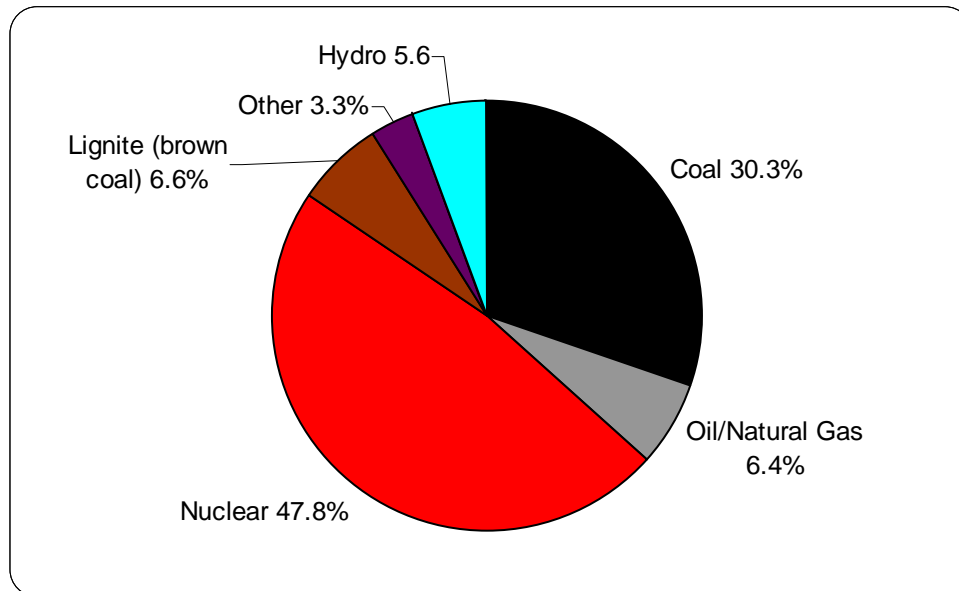
¹⁰⁰ E.ON, Annual Report 2006, p.3.

¹⁰¹ Earnings before interest and taxes (EBIT) is used here instead of net profit as a measure of profitability because the figures correspond only to the E.ON Energie market unit of E.ON, not the entire company. Rather than net profit, EBIT is the key figure for measuring the operating performance and earnings power of individual market units such as E.ON Energie.

¹⁰² E.ON, Annual Report 2006 (p.86), Annual Report 2004 (p.24) and Annual Report 2002 (p.2).

power, make up only 5.6% of total generation. Some biomass and wind is likely included in the “other” category, but E.ON did not specify this.

Figure 32: Fuel mix of electricity generated by E.ON Energie, 2006



Based on: E.ON¹⁰³

Largely as a result of this mix of renewable and non-renewable energy sources for electricity generation, E.ON (the full company, not just E.ON Energie) emitted a massive 74 million tonnes of CO₂¹⁰⁴ in 2006. As a result of its electricity production from nuclear fuel, the company also produced 189 tonnes of high-level radioactive waste in 2006.¹⁰⁵ Figure 33 illustrates the five-year history of E.ON Energie’s energy mix. The company’s percentage of renewable sources of energy for electricity generation appears to be stable at around 5%.

7.2.2. Power supply

Since it took over NRE Energie in 2005, E.ON Energie supplies power in the Netherlands that is only slightly more sustainable than that generated by E.ON Energie. Again, non-renewables natural gas (54%) and coal (23%) comprise the majority, with a significant contribution from nuclear (10%). Renewables, mainly biomass and wind, account for approximately 10% of the power supplied by E.ON. Based on this electricity fuel mix, E.ON was responsible for the emission of 495.6 grams of CO₂ per kWh and 0.00033 grams of radioactive waste per kWh in 2006.¹⁰⁶

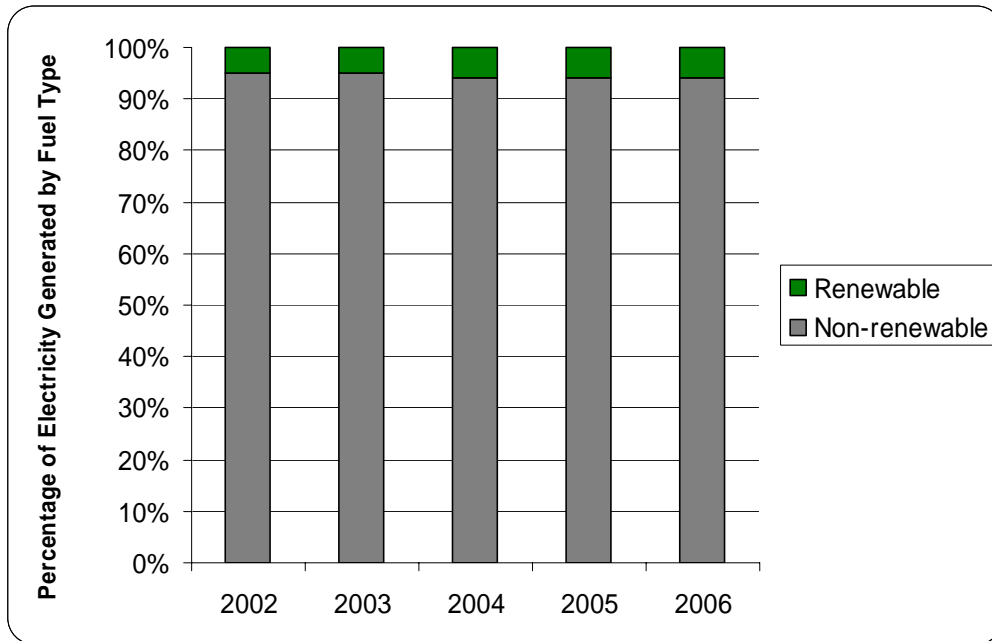
¹⁰³ E.ON, Annual Report 2006, p.89.

¹⁰⁴ Carbon emissions for just E.ON Energie were unavailable, so figure for the entire E.ON corporation are used here. This is the only place where figures are for E.ON as a whole rather than E.ON Energie. Source of figures: S. Iwersen, J. Flauger and K. Stratmann, „Stromfirmen geraten unter Druck“, Handelsblatt, 11 May 2007, p.1.

¹⁰⁵ This figure is based on 0.003 gr waste/kWh x 63,000 GWh electricity produced from nuclear fuel in 2006.

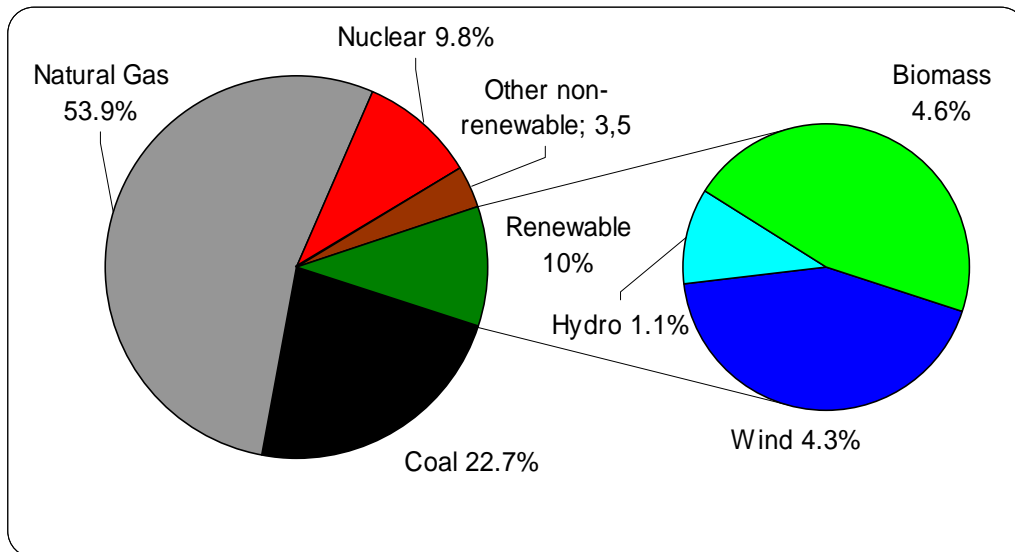
¹⁰⁶ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).

Figure 33: Renewable vs. non-renewable electricity generated by E.ON Energie, 2002-2006



Based on: E.ON¹⁰⁷

Figure 34: Fuel mix of electricity supplied by E.ON in the Netherlands, 2006



Based on: Groene Stroom, Ja Graag¹⁰⁸

7.3. Installed Capacity in the Netherlands

E.ON Energie's total installed capacity of in the Netherlands is 1,850 MW.¹⁰⁹ The largest plant is located in the Maasvlakte and has a capacity of 80 MW from natural gas and 1,040 MW from coal. As

¹⁰⁷ E.ON, Annual Report 2006 (p.89), Annual Report 2005 (p.82) and Annual Report 2004 (p.61).

¹⁰⁸ Idem

¹⁰⁹ E.On Benelux website, "Overzicht centrales E.On Benelux," no date, <http://www.eon-benelux.com/eonwww2/publishing.nsf/Content/Overzicht+Centrales> (30-05-07).

can be seen in Table 22, the other plants are all gas-fired and are all located in the Zuid-Holland province. At this time the company does not generate any electricity from renewable sources within the Netherlands.

Table 22: E.ON installed electricity generation capacity in the Netherlands, 2006

Fuel type	Location	Output capacity (MW)	Verified Greenhouse Gas Emissions 2005-06 (ton CO ₂ equivalent)
Non-renewable			
Gas	Rotterdam (Gallileistraat)	209	949,374
Gas	Rotterdam (RoCa 1,2,3)	269	1,355,334
Gas	The Hague	78	245,196
Gas	Leiden	81	247,611
Gas	Delft	93	
Gas	Maasvlakte	80	Included below
Coal	Maasvlakte	1,040	12,514,081

Based on: E.ON¹¹⁰; CO₂ emissions from EU¹¹¹

7.4. Strategy and Investment

In the Netherlands, E.ON Energie is developing another large coal-fired plant in the Maasvlakte, for which it is investing €1.2 billion.¹¹² The plant will have the capacity to co-fire animal waste. This type of waste used to be processed in cattle feed, but has since been banned and is now only used for electricity generation.¹¹³

Table 23: E.ON announced investments in new generation capacity in the Netherlands

Fuel Type	Location	Date	€ Amount	Output Capacity
Non-renewable				
Coal and Animal waste	Maasvlakte	December 2006; in operation 2012	1.2 billion	1100 Megawatt

¹¹⁰ E.On Benelux website, "Overzicht centrales E.On Benelux," no date, <http://www.eon-benelux.com/eonwww2/publishing.nsf/Content/Overzicht+Centrales> (30-05-07).

¹¹¹ European Commission, DG Environment, Emission Trading Scheme, 2006 Emissions for the Netherlands, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> (June 2007)

¹¹² E.ON-Benelux website, Over E.ON-Benelux, Pers, "E.ON besluit definitief tot investering in centrale Maasvlakte," 19-01-07, <http://www.eon-benelux.com/eonwww2/publishing.nsf/Content/definitief+tot+investering+in+centrale+Maasvlakte> (09-05-07).

¹¹³ "E-On stookt energie uit omstreden diermeel," ANP, 27-02-01.

8. RWE Power

8.1. Company and Earnings Overview

Although RWE Power currently has generation operations in the Netherlands, it is examined here because it is likely to become a major player in the Dutch power sector in the near future due to planned investment in a large electricity plant in the country. Furthermore, its sister company, RWE Energy, supplies electricity in the Netherlands.

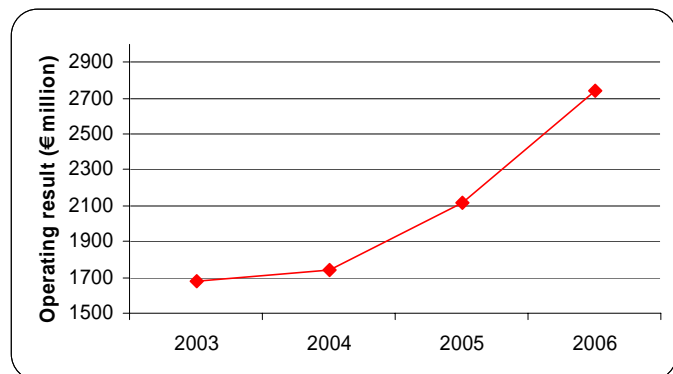
RWE Power, based in Essen, Germany, is part of the RWE Group and, with 33,264 MW of installed capacity at its disposal, it is Germany's biggest power producer and the largest company examined in this study. RWE Power produces lignite and generates electricity from coal, lignite, nuclear fuel, gas and renewables in Germany and several other countries. RWE is a publicly-traded company whose stock is listed on stock exchanges in Germany and Switzerland. In addition to its RWE Power subsidiary, the RWE Group's other market units include RWE npower (in the UK), RWE Dea (oil and gas production), RWE Energy (sales and grid) and RWE Trading (energy trading).

Since 2004, RWE Power's earnings have been on the rise. Table 24 and Figure 35 give the operating result¹¹⁴ for RWE Power between 2002 and 2006. In 2006, RWE Power's result reached €2,744 million.

Table 24: RWE Power Operating Result, 2003-2006

Year	Operating Result (€ million)
2002	N/A*
2003	1,682
2004	1,742
2005	2,112
2006	2,744

Figure 35: RWE Power Operating Result, 2003-2006



* RWE Power did not exist as an independent business unit in 2002; it was then part of the Electricity Business Area Based on: RWE¹¹⁵

¹¹⁴ Operating result is used here instead of net profit as a measure of profitability because the figures correspond only to the RWE Power unit of the RWE Group, not the entire company. Rather than net profit, operating result (which is also comparable to EBIT) is a key figure for measuring the operating performance and earnings power of individual market units such as RWE Power.

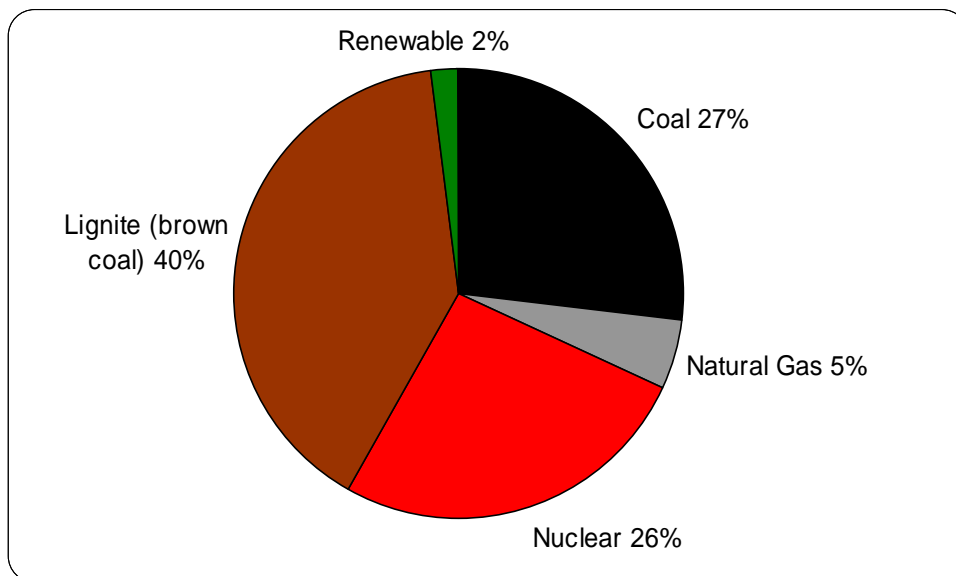
¹¹⁵ RWE, Annual Reports 2006 (p.194-5), 2004 (p.47) and 2002 (p.39).

8.2. Fuel Mix and CO₂ Emissions

8.2.1. Power production

Currently, RWE Power does not have any installed capacity in the Netherlands. In terms of its operations in other countries, RWE Power's primary fuel for electricity generation is coal, with brown and black coal accounting for nearly three-quarters of the company's total generation, as can be seen in Figure 36. Lignite, the dirtiest and least efficient form of coal, comprised nearly 40% of RWE Power's fuel mix in 2006. Other non-renewables such as nuclear (26%) and natural gas (5%) also make a significant contribution. Renewables, on the other hand, accounted for a mere 2% of generation in 2006, with hydro power being the main contributor.

Figure 36: Fuel mix of electricity generated by RWE Power, 2006



Based on: RWE¹¹⁶

Largely as a result of this mix of renewable and non-renewable energy sources for electricity generation, RWE (the full company, not just RWE Power) emitted an enormous 149 million tonnes of CO₂ in 2006, not including some plants that RWE does not own but has at its disposal.¹¹⁷ This figure makes RWE the top carbon-emitting power company in Europe, emitting more than the second and third companies (E.ON and Vattenfall) combined. RWE Power also produced 141.9 tonnes of high-level radioactive waste in 2006.¹¹⁸

8.2.2. Power supply

RWE supplies power in the Netherlands through its subsidiaries RWE Obragas N.V., RWE Haarlemmermeergas N.V. and RWE Energy Nederlands N.V. Given RWE's largely unsustainable fuel mix for generation in the rest of Europe, the company's electricity supply in the Netherlands is surprisingly sustainable. As can be seen in Figure 37, a large chunk (44%) of the electricity RWE Energy supplies in the Netherlands is based on wind power. Natural gas (35%) is still a considerable factor, with coal (9%) and nuclear (4%) playing minor roles. Based on this electricity fuel mix, RWE

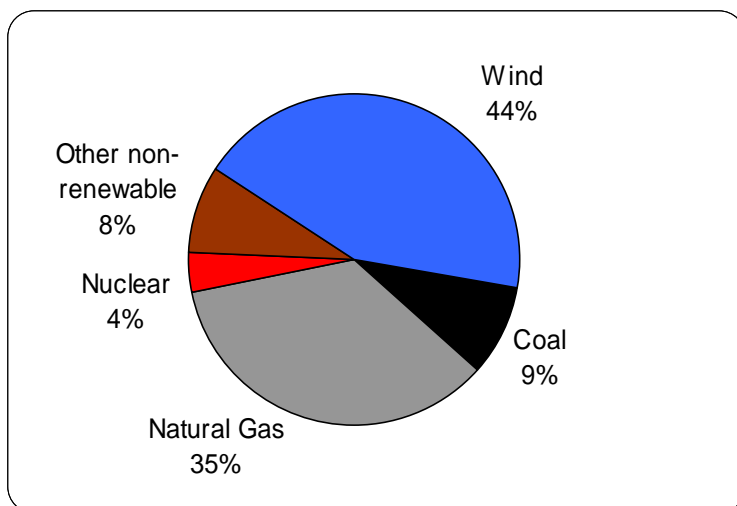
¹¹⁶ RWE, Annual Report 2006, p.46.

¹¹⁷ B. Pahnke, Investor Relations, RWE AG, 20 June 2007, telephone call with J. Wilde.

¹¹⁸ This figure is based on 0.003 gr waste/kWh x 47,300 GWh electricity produced from nuclear fuel in 2006.

Energy was responsible for the emission of 370.2 grams of CO₂ per kWh and 0.000117 grams of radioactive waste per kWh in 2006.¹¹⁹

Figure 37: Fuel mix of electricity supplied by RWE Energy, 2006



Based on: Groene Stroom, Ja Graag

8.3. Installed Capacity in the Netherlands

Currently, RWE does not have any installed capacity in the Netherlands, but it does have concrete plans to develop generation capacity in the Netherlands, most notably a large coal plant in Eemshaven.

8.4. Strategy and Investment

The RWE Group has announced plans to invest €700 million in renewable energy over the next five years. In the same period, RWE will invest a total of €25 billion in total tangible fixed assets, meaning that investment in renewables will comprise a mere 3% of total investment.

In terms of investment in new generation capacity in the Netherlands, RWE has announced the development of a large hard coal-fired plant in the Eemshaven.¹²⁰ This plant will have a capacity of 1,560 MW and has the facilities to co-fire biomass. RWE's total investment in this plant amounts to €2.2 billion, and the plant is expected to be in operation by 2012¹²¹ Aside from pledging that its new coal plant in Eemshaven will be able to co-fire biomass, RWE Power does not appear to be investing in renewable capacity in the Netherlands.

¹¹⁹ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).

¹²⁰ "RWE wil centrale bouwen in Nederland," Provinciale Zeeuwse Courant, 14-04-06.

¹²¹ RWE, Investing in Innovation and Growth; Annual Report 2006, p.38.

Table 25: RWE announced investments in new generation capacity in the Netherlands

Fuel Type	Location	Date	Amount (€)	Output Capacity (MW)
Non-renewable				
Coal and biomass	Eemshaven	Announced April 2006, operational 2012-3	2.2 billion	1,560

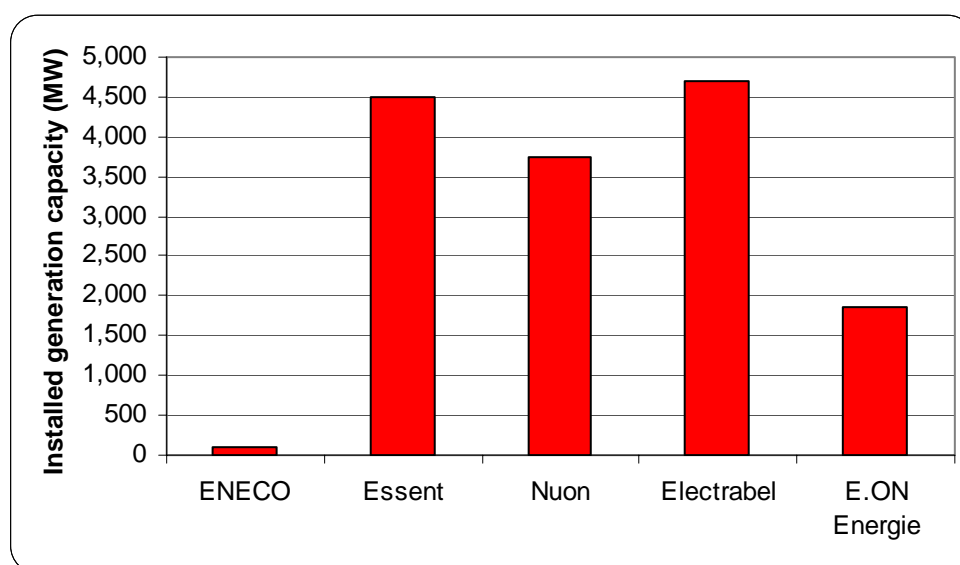
9. Comparisons and Conclusions

9.1. Electricity Production in the Netherlands

9.1.1. Electricity generation capacity

Of the companies examined in this study, Electrabel, Essent and Nuon have the most overall capacity in the Netherlands, although RWE Power and E.ON Energie have the largest installed capacity internationally (33,264 MW and 27,800 MW, respectively¹²²). Electrabel is the country's largest electricity producer with an installed capacity of approximately 4,700 MW, while Essent has a capacity in the Netherlands of 4,500 MW¹²³. Nuon is slightly smaller with approximately 4,000 MW. E.ON has approximately 2,000 MW of capacity in the Netherlands, and ENECO, although investing heavily in new capacity, currently only has around 75 MW. RWE does not yet have any operational capacity in the Netherlands, but as was mentioned in Section 8.4, the company plans to open a coal-fired plant in 2012. Figure 38 plots the companies' total installed electricity generation capacity in the Netherlands in 2006.

Figure 38: Total installed electricity generation capacity of major power companies in the Netherlands, 2006



Based on: Annual Reports and websites

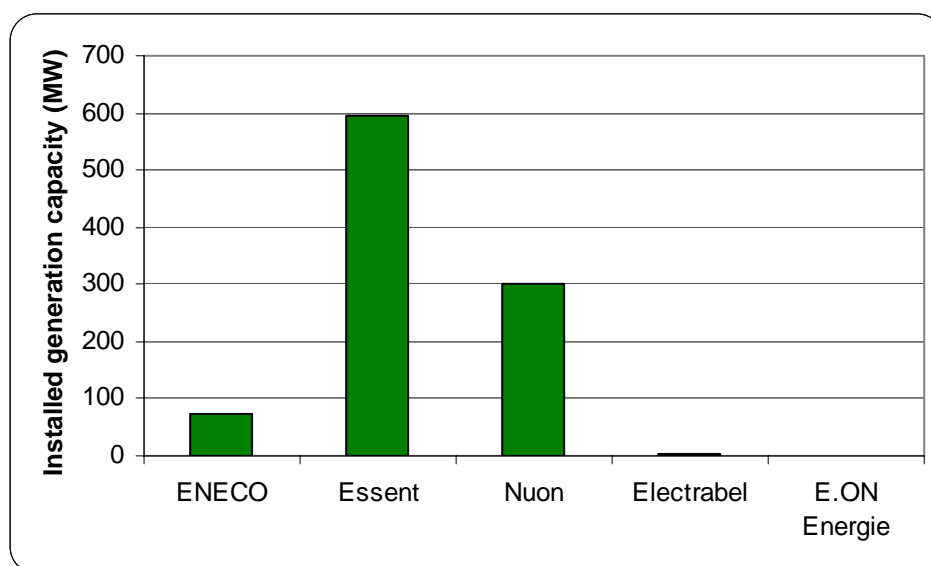
While having the second-highest amount of total installed electricity generating capacity in the Netherlands, Essent has the most generation capacity dedicated to renewables with just under 600 MW from its wind parks and biomass co-fire plants. Nuon has the second-most capacity dedicated to renewables with slightly less than 300 MW, just over half of Essent's renewable capacity. ENECO's small amount of generating capacity (75 MW) is nearly all dedicated to renewables. The non-Dutch

¹²² The difference in size between the two German companies in this study, RWE Power and E.ON Energie, and the others is even greater when one considers that RWE Power and E.ON Energie are only one business unit in their respective companies. RWE Group has one other electricity generating unit (RWE npower) and E.ON has three others (the UK, Nordic and US Midwest market units).

¹²³ Essent Annual Report 2006, p.50.

companies' performance in terms of renewable capacity in the Netherlands is considerably weaker than the Dutch companies. Although Electrabel has a good deal more renewable capacity in other countries, its capacity dedicated to renewables in the Netherlands is negligible, and E.ON Energie does not have any renewable capacity in the Netherlands at all. Figure 39 plots the companies' renewable electricity generation capacity in the Netherlands in 2006.

Figure 39: Installed electricity generation capacity dedicated to renewables of major power companies in the Netherlands, 2006



Based on: Annual Reports

In order to compare non-renewable vs. renewable capacity in the Netherlands, Figure 40 presents renewables as the percentage of total installed capacity, revealing that ENECO is far ahead of the other companies, with nearly 95% of capacity dedicated to renewables. It should be noted, however, that the small total capacity makes it difficult to compare ENECO's relative figures to those companies that are producing on a larger scale.

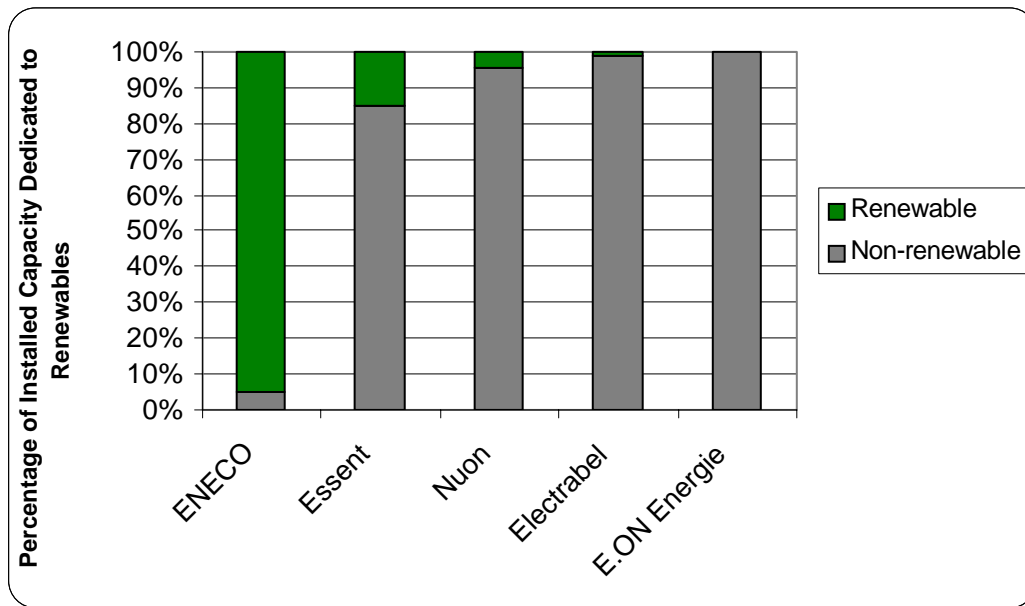
9.1.2. Investment in new production capacity

In addition to energy mixes and carbon emissions, the companies' recent and announced investment in renewable energy is an indication of their future contribution to or hindrance of sustainable development. Comparable figures for investments in renewables for each company are difficult to find, but some conclusions can be drawn from the information available.

Relative to its overall investments and net profits, ENECO appears to be investing the most in renewable energy. ENECO invested €38 million in renewables in 2005 and €110 million in 2006. The 2006 figure is 42% of the company's total investments in tangible fixed assets and approximately 35% of its net profits.

Nuon invested approximately €65 million in renewables in each of the past two years. This figure is 11% of the company's total investments in tangible fixed assets in 2006 and approximately 8.7% of its 2006 net profits. Currently, Nuon's largest single investment is its €1-1.5 billion in the "Nuon Magnum" coal plant in Eemshaven.

Figure 40: Percentage of installed capacity in the Netherlands dedicated to renewables, 2006



Based on: Annual Reports and websites

The RWE Group has announced plans to invest €700 million in renewable energy over the next five years. In the same period, RWE will invest a total of €25 billion in total tangible fixed assets, meaning that investment in renewables will comprise a mere 3% of total investment. Note that this figure is for RWE Power’s entire scale of operations. In the Netherlands, RWE is investing an enormous €2.2 billion in its mostly coal-fired power plant in Eemshaven.

E.ON Energie appears to be dedicating the smallest percentage of total investment to renewables in the coming years. For its Europe-wide operations, the company has announced that it will invest €66 million per year on average for the next three years. This amount is only 2% of its announced average investment in total tangible fixed assets over the same time span and a miniscule 1.6% of its 2006 earnings (EBIT).

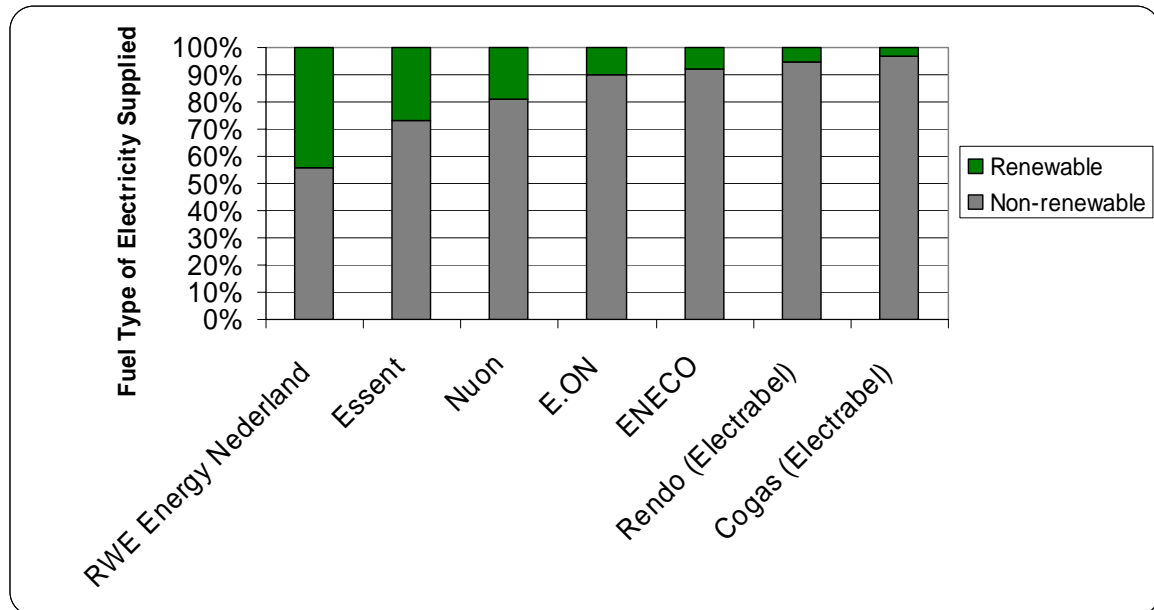
Little information was available about the investment plans of Essent and Electrabel in the Netherlands in gross financial terms, but it is clear that both companies are investing far more in non-renewable generation capacity than renewable. Essent’s largest single investment is its €1 billion coal plant in Geertruidenberg, and it has several other fossil fuel plants under construction. It is investing €125 million in renewables (see Table 11). Electrabel’s only investments in renewables appears to be through co-firing a small amount of biomass in its new coal plant in Rotterdam and a small windpark in the Eemshaven.

9.2. Electricity Supply in the Netherlands

Given RWE Power’s unsustainable fuel mix for electricity production (see Figure 36), RWE’s subsidiary for electricity supply in the Netherlands is based on a surprisingly large percentage of renewable energy. At 44%, RWE Energy Nederland has the highest percentage of renewable sources of energy in its electricity fuel mix. Electrabel’s negligible amount of renewable electricity production in the Netherlands is reflected in the fact that it is responsible for two of the least sustainable power supply companies in the Netherlands, Rendo and Cogas. These Electrabel

subsidiaries have only 5% and 3%, respectively, renewables in their energy mix respectively. Essent's electricity supply contains the second highest percentage of renewables with 27%, followed by Nuon (19%), E.ON (10%) and ENECO (8%). It is interesting to note that although ENECO generates the vast majority of its own electricity from renewable sources, the energy it supplies to customers in the Netherlands is among the least sustainable of all the companies. Figure 41 reveals that even the most sustainable electricity supply companies examined in this report still relies on fossil fuels and nuclear power for the majority of the power it supplies.

Figure 41: Renewable vs. non-renewable electricity supply of power companies in the Netherlands, 2006

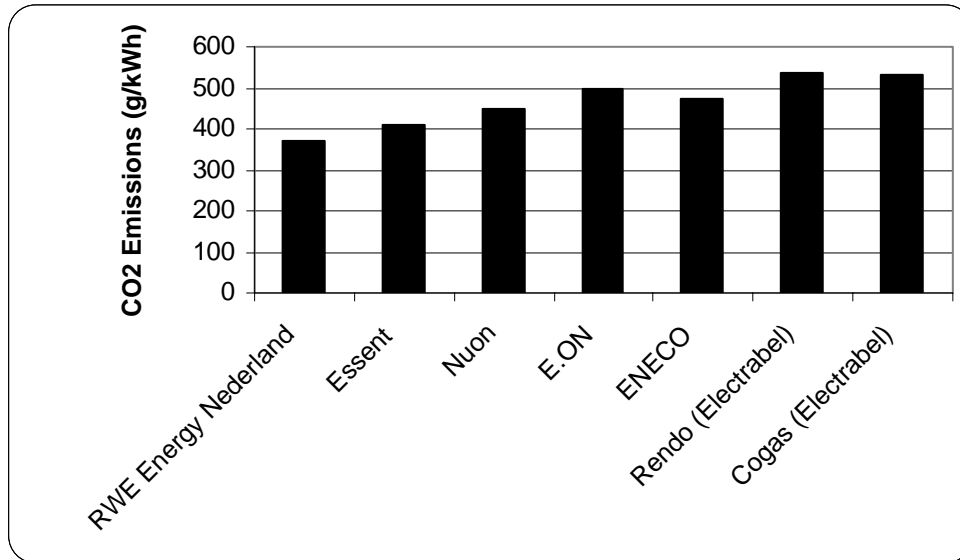


Based on: Annual Reports and websites

The percentages of renewable vs. non-renewable fuels translate directly into the amount of carbon dioxide companies are responsible for emitting per kilowatt-hour of electricity generated. As expected, RWE Energy Nederland is on the low end of the scale with 370.2 grams of CO₂ emitted per kWh of electricity generated, and Electrabel's Rendo and Cogas are at the high end of the scale with 538 g/kWh and 534 g/kWh, respectively.

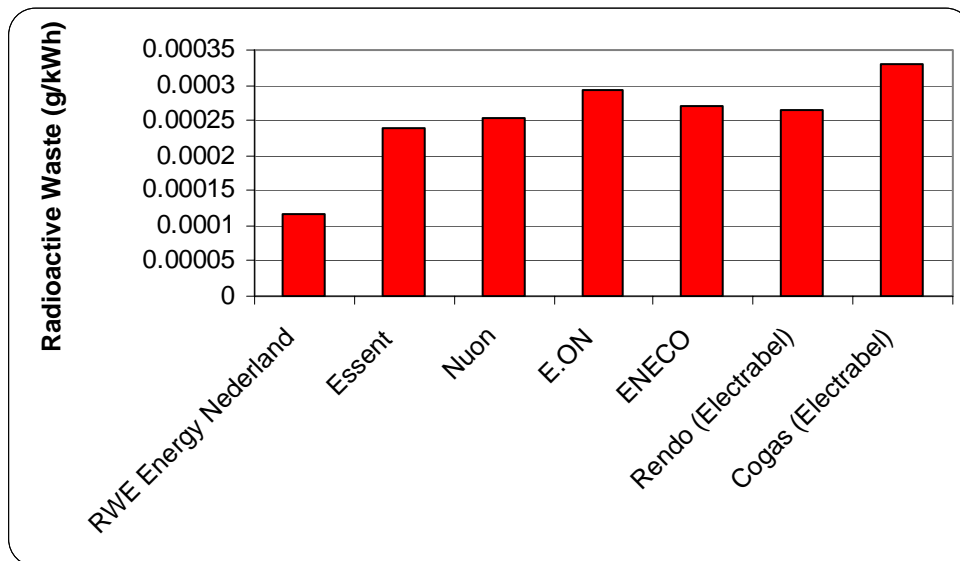
Finally, Figure 43 compares the supplying companies in terms of the radioactive waste they create per kilowatt-hour of electricity they provide. This figure is directly related to the percentage of nuclear energy in the companies' fuel mix. Again, Electrabel's Cogas is the least sustainable, closely followed by E.ON. RWE Energy is the most sustainable of the companies examined in this study with regard to nuclear fuel production.

Figure 42: CO₂ emitted per kWh of electricity by Dutch power suppliers, 2006



Based on: Groene Stroom, Ja Graag¹²⁴

Figure 43: Radioactive waste produced per kWh of electricity by Dutch power suppliers, 2006



Based on: Groene Stroom, Ja Graag¹²⁵

¹²⁴ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).

¹²⁵ Groene Stroom, Ja Graag website, <<http://groenestroomjagraag.nl/stroometiket>> (May 2007).