
Report on the Dutch power system

Version 1.1

COUNTRY PROFILE

Agora
Energiewende



Report on the Dutch power system

IMPRINT

COUNTRY PROFILE

Report on the Dutch power system
Version 1.1

WRITTEN BY

Edith Bayer and Philip Baker
The Regulatory Assistance Project
Rue de la Science 23
1040 Brussels
Belgium

ON BEHALF OF

Agora Energiewende
Rosenstraße 2 10178 Berlin
Germany
Editing: Christian Redl, Christoph Podewils

027/01-CR-2014/EN

Typesetting: Peter Pelikan
Cover: Agora Energiewende
Published in September 2014

Contents

1. Overview	7
2. Industry structure, ownership and regulation	9
2.1 Industry structure	9
2.2 Regulation	9
2.2.1 Transposition of EU energy policy	10
3. Energy production and consumption	13
3.1 Installed capacity	13
3.2 Production	13
3.3 Consumption	14
3.4 Peak demand	16
3.5 Planned conventional power plants in the pipeline	17
4. Imports and exports	19
5. Electricity market	21
5.1 Wholesale market, prices and liquidity	21
5.1.1 Electricity market design	21
5.1.2 Market liquidity	22
5.2 The retail market	23
5.2.1 Breakdown of electricity bill	24
5.3 Allocation of grid costs	24
6. Electricity balancing/reserve markets	27
7. Decarbonisation	29
8. Renewable energy	31
8.1 SDE+	31
8.2 Green Deal programme	32
8.3 Taxes	32
9. Energy efficiency	35
10. Grid infrastructure and reliability	37
10.1 Generation adequacy standard	37
10.2 Current SAIDI	38
10.3 Smart metering	38
11. Appendix	41
Comparison of Dutch and German balancing arrangements	41
References	43

Acronyms

ACM	Authority for Consumers and Markets
APX	Amsterdam Power Exchange
CAIFI	Customer Average Interruption Frequency Index
CBS	Centraal Bureau voor de Statistiek
CEER	Council of European Energy Regulators
CCS	Carbon Capture and Sequestration
CWE	Central-West European Market
DSO	Distribution Service Operators
EE	Energy Efficiency
EED	Energy Efficiency Directive
EIA	Energy Investment Allowance
ETS	Emissions Trading System
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GW	Gigawatt
HHI	Herfindal-Hirschman Index
LFC	Load Frequency Control
LOLE	Loss of Load Expectation
KWh	Kilowatt hour
KW _p	Kilowatt peak
NMa	Netherlands Competition Authority
MIA	Environmental Investment Allowance
NWE	North West Europe region
PCR	Primary Control Reserve
PRP	Programme Responsible Party
RRP	Regulating and Reserve Power
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCR	Secondary Control Reserve power
SDE	Sustainable Energy Incentive Scheme
SDE+	Revised and Updated Sustainable Energy Incentive Scheme
SEVIII	Electricity Supply Structure Plan
T&D	Transmission and Distribution
TWh	Terawatt hour
TSO	Transmission System Operator
TCR	Tertiary Control Reserve power
Vamil	Random Depreciation of Environmental Investments

Preface

Dear reader,

A glance at a map reveals a simple truth: Geographically speaking, Germany lies in the heart of Europe. Knowing that annual electricity demand in Germany is the highest in Europe, its generation fleet the largest, and its power system interconnected with ten countries with a total transfer capacity of almost 17 GW, one may wonder how anyone could claim that the Energiewende is purely a national endeavour. The opposite is true: German and European energy systems are heavily intertwined. Whatever happens in Germany has effects on its neighbours and vice versa. It is widely accepted that enhancing cooperation among European partners would create positive welfare effects for all. Sharing resources and developing joint regulatory frameworks could, for instance, help achieving system reliability at lower costs and balance variable power generation across Europe.

Cooperation starts with mutual understanding. So far, the German energy debate has been focused merely on the German power system, with very little awareness of neighbouring countries. In order to enhance the knowledge basis and prepare the ground for thinking about potential cooperation, Agora Energiewende asked the Regulatory Assistance Project (RAP) to develop a set of short, standard and readable reports on the power sectors of Germany's neighbouring countries, focusing on key features, regulatory frameworks and important political developments. Originally, the country profiles were supposed to serve internal purposes only. But, as we believe this information could be valuable for others as well, we decided to publish it and make it accessible to everyone.

This country profile on the Netherlands is the second of a series that will eventually cover twelve countries – including one on Germany. It is certainly not exhaustive. We rather consider it as work in progress that we will be reviewing on a regular basis, checking latest developments, improving the text and adding new aspects. We would thus invite everyone to send us comments and corrections that could be incorporated into the next versions to countryprofile@agora-energiewende.de.

May this country profile be helpful for your work!

Dr. Patrick Graichen
Executive Director of Agora Energiewende

Markus Steigenberger
Head of European Energy Cooperation of Agora Energiewende

1. Overview

This report explores the structure of the Dutch power sector. It looks at the fuel mix, production and consumption, ownership and market structure, cross-border trade, and energy policy.

The Netherlands is a major European gas producer and infrastructure hub. It also has electricity interconnections with Belgium, Norway, the United Kingdom, and Germany. Excellent seaport facilities and abundant cooling water have attracted significant investments in gas and coal fired generation, particularly along the coast. Installed capacity has increased in recent years, and the Netherlands has moved from being dependent on electricity imports to meet generation adequacy standards to having a capacity surplus.

The power sector is characterised by a liberalised market with moderate market concentration. The generation mix is dominated by natural gas and coal. Renewable power made up only 4.2 percent of consumption in 2011; however, the Netherlands has set the goal for 14 percent of energy consumption to come from renewables (including transport) by 2020.

The Netherlands' mid- and long-term energy policies are focused on developing the mix of resources that will assure reliable, affordable supply, while recognising the need to reduce reliance on carbon-intensive resources. The mix excludes no options. The government supports deployment of renewables, energy efficiency, and nuclear power, and depends on biomass co-firing and carbon capture and sequestration (CCS) to curb carbon emissions from coal and gas fired generators. To support decarbonisation, the Dutch government has in place a number of policies and programmes. The Green Deal programme, introduced in 2011, aims to identify and support sustainable projects, including in the power sector. There is a premium feed-in-tariff, the Sustainable Energy Incentive Scheme (SDE), which was put in place in 2008 and revised in 2011 (SDE+). There is no overarching goal for energy efficiency (EE); however, a combination of policies and programmes support EE. These include building

performance standards, long-term agreements with industry, and tax incentives.

In September 2012, the National Energy Agreement for Sustainable Growth was reached, which sets energy and climate policy objectives and measures for the period until 2020 / 2023, aiming to put the Netherlands on its way achieve a sustainable energy system by 2050.

It is important to recognise some of the forward-looking trends in the Dutch power sector. Between now and 2020, 9 GW of coal and gas fired generation are expected to come online. Interconnection capacity is expected to grow from 5.2 GW in 2013 to 8.1 GW in 2020. Several more transmission projects are planned to reinforce the grid due to increased domestic supply and imports, particularly from northern Germany.

At the same time, there are some uncertainties that may affect future investment. Chiefly, Dutch gas has not been competitive on wholesale markets, where German coal and renewables have set low market prices. Whether this trend will continue and how it will affect Dutch overcapacity remains an open question.

There is much debate over the direction of Dutch energy policy in the context of European climate and energy policy, as well as in the context of regional market integration.

2. Industry structure, ownership and regulation

Main indicators		Table 1
Total population:	16.8 million (2013)	
GDP:	599.3 billion Euro	
Average electricity consumption:	3312 kWh per annum per household (2012)	
Total consumption:	118.6 TWh (2012, estimated)	
Own research		

2.1 Industry structure

The Dutch power sector is unbundled, with a transmission system operator (TSO), eight Distribution Service Operators (DSO), over 25 producers, and 35 electricity retailers. Dutch law requires ownership unbundling for both transmission and distribution; however, the law relating to distribution unbundling has been in question following a 2010 court decision that ruled that part of the law could not be applied. The case is being appealed.¹

There are in excess of 8 million connections in the Netherlands, with a total current demand of some 118.6 TWh. Just a few large companies dominate distribution, production, and supply, as summarised below.

2.2 Regulation

The Authority for Consumers and Markets (ACM) is responsible for ensuring efficient operation of the electricity sector and for consumer protection in the Netherlands. The ACM was established in April 2013 with the merger of three government agencies: the Consumer Authority, the Competition Authority (NMa) and the Independent Post and Telecommunications Authority (OPTA). The organisation, procedures, and powers of the new regulator will be set out in detail in

¹ ACM (2013), p. 6

Ownership of renewable generation in the Netherlands			Table 2
Company	Renewable Capacity	Renewable Energy Generation	
Delta	135.5 MW (2012)	–	
E.ON	0 MW	0 MWh	
GDF Suez/Electrabel	366 MW (2009)	–	
Intergen	–	–	
RWE/Essent	4,133 MW (2012)	12.4 TWh (2012)	
Vattenfall/Nuon	411 MW (2012)	1,464 GWh (2012)	
Delta (2012), E.on website (2013), RWE (2013), N.V. Nuon Energy 2013			

a law currently under preparation, which is expected to become effective on 1 January 2014. Until then, the ACM will operate on the basis of the original individual mandates of the three now-merged entities.

The ACM is responsible for ensuring compliance with the Electricity and Gas Acts, and sets transmission and supply tariffs. The next tariff levels for the period 2014–2016 will be finalised in 2013.² The ACM also monitors prices for consumers in order to ensure consumer protection. It is also active in regional initiatives relating to framework guidelines, network codes, and market development.

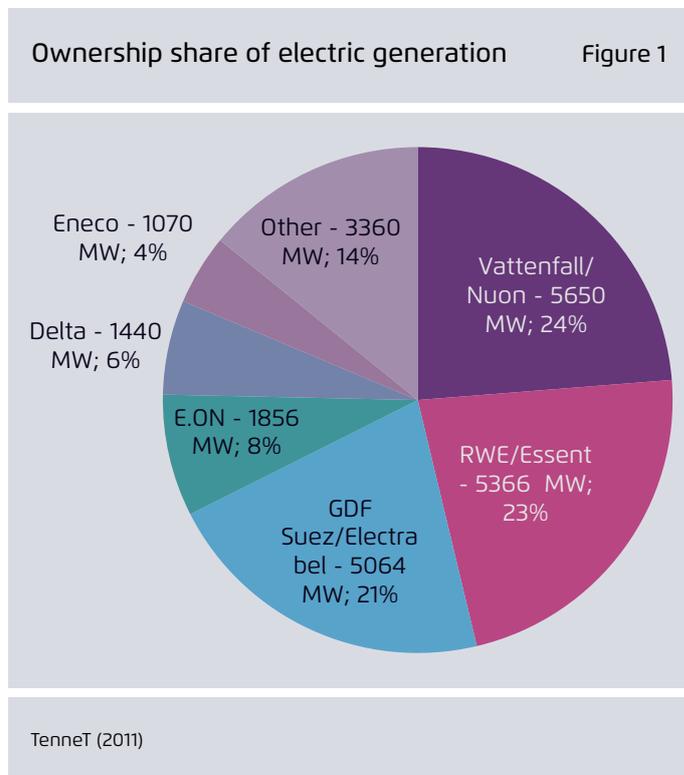
The Ministry of Economic Affairs is responsible for formulating energy policy in the Netherlands. This includes development of a long-term energy strategy as set forth in

² ACM, (2013b)

the Dutch Energy Report 2011, renewable energy policy, and energy efficiency. The ACM is required to advise the Ministry on formulation of energy policy. The Ministry is also responsible for security of supply and the TSO, TenneT, reports to the Ministry annually on the future outlook for security. If concerned about future security, the Ministry has the option of invoking the strategic reserve capacity mechanism; however, the mechanism has not been utilised to date.³

2.2.1 Transposition of EU energy policy

Following the opening of infringement proceedings for non-transposition in September 2011, the Netherlands has given notice of full transposition of the Third Package Directives into national law (July 2012). However, as of February 2013, infringement procedures for non-communication of transposition measures were still open in relation to Directives: 2009/28/EC on the promotion of the use of energy from renewable sources, 2010/31/EC on the energy performance of buildings and 2009/119/EC placing obligations on Member States to maintain minimum stocks of crude oil and/or petroleum products.⁴



Market share of Dutch electricity companies Table 3

Sector	Leading companies	Combined market share	Remaining companies
Transmission	TenneT	100 percent	None
Distribution (8 total)	Liander Stedin Enexis	>90 percent	Rendo, Cogas, Westland Infra, Delta, Endinet – 30,000–210,000 customers ⁵
Generation (~ 25)	Essent, E.ON, Electrabel, Nuon	~ 75 percent	Intergen, Delta, horticulture sector, industry sector, others ⁶
Retail (35 total)⁷	Nuon, Essent, Eneco (Stedin)	~ 80 percent	Electrabel, Greenchoice, NEM, Oxxio, others ⁸

³ NMa (2012)

⁴ European Commission (2013)

⁵ Hesmondhalgh et al. (2012)

⁶ For more details on ownership shares of generating capacity in the Netherlands, see RWE (2009).

⁷ Eurostat (2011)

⁸ For more details on ownership shares of generating capacity in the Netherlands, see RWE/Essent (2010), p.19.

Ownership of energy companies in the Netherlands

Table 4

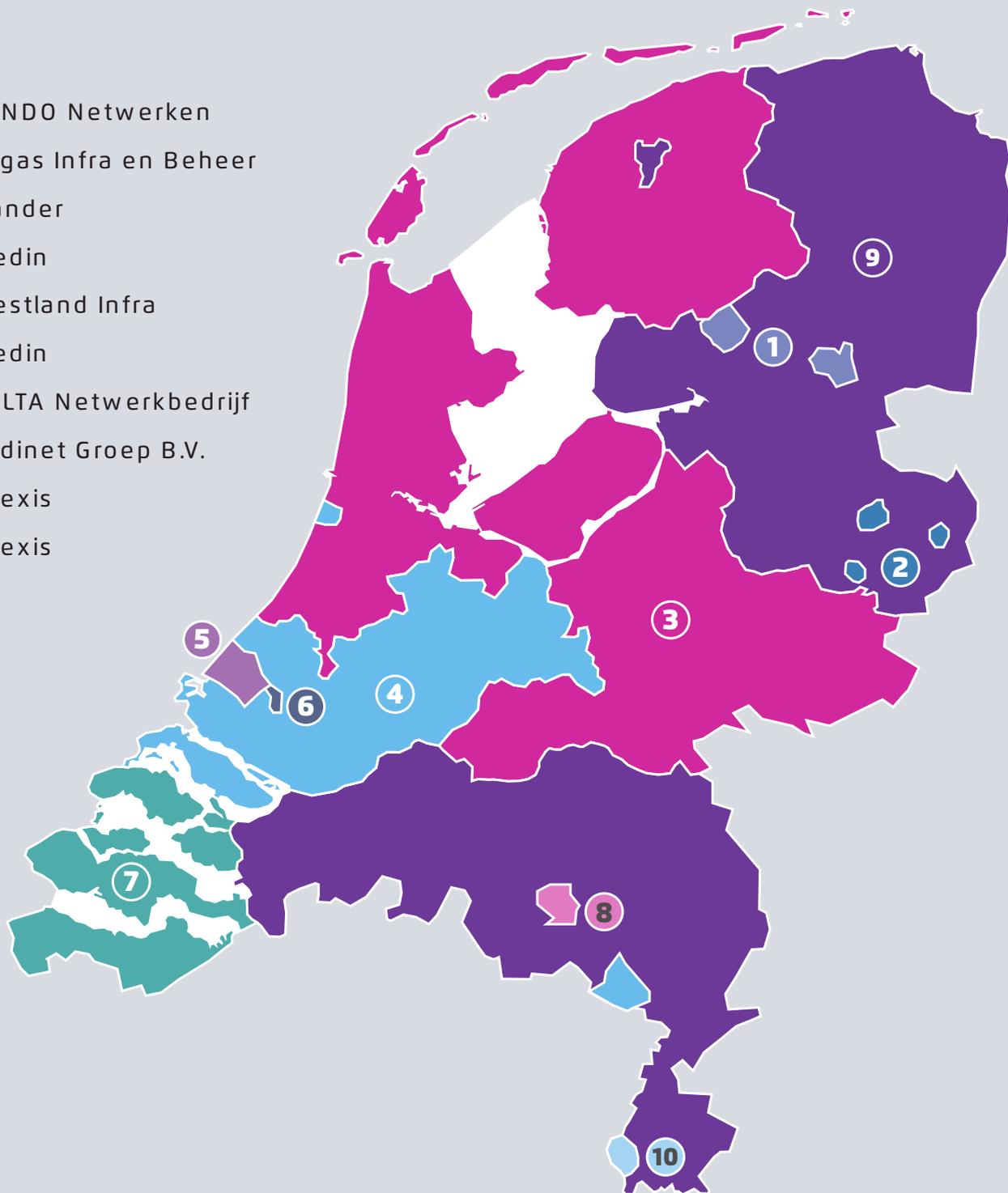
Sector	Companies	Ownership
Transmission	TenneT Holding B.V. (parent company of all TenneT subsidiaries)	100% owned by the State of the Netherlands (Ministry of Finance). The Government is considering the partial privatization of TenneT with an announcement expected early in the fourth quarter of 2013.
Distribution	Liander Stedin (Eneco) Enexis	All wholly owned by Dutch provinces or municipalities.
Generation	RWE/Essent	Essent is 100% owned by RWE, which is 86% owned by institutional investors. Until its buy-out by RWE in 2009, Essent was owned by 6 Dutch provinces.
	E.ON	100% privately owned. 75% institutional; 25% retail investors.
	Gdf Suez/Electrabel	Electrabel is 100% owned by GdF Suez, whose ownership is: 36.7% French State; 40% institutional investors; 5.1% Groupe Bruxelles Lambert; 11% individual shareholders
	Vattenfall/Nuon	Currently Nuon is 79% owned by Vattenfall, which in turn is 100% owned by the Swedish State. The remaining 21% of shares are owned by Dutch provinces and municipalities. Vattenfall plans to purchase the remaining shares by 2015.

Ayakwah (2013), N.V. Nuon, own research

DSO – Geographic Service Areas

Figure 2

- 1 RENDO Netwerken
- 2 Cogas Infra en Beheer
- 3 Liander
- 4 Stedin
- 5 Westland Infra
- 6 Stedin
- 7 DELTA Netwerkbedrijf
- 8 Endinet Groep B.V.
- 9 Enexis
- 10 Enexis

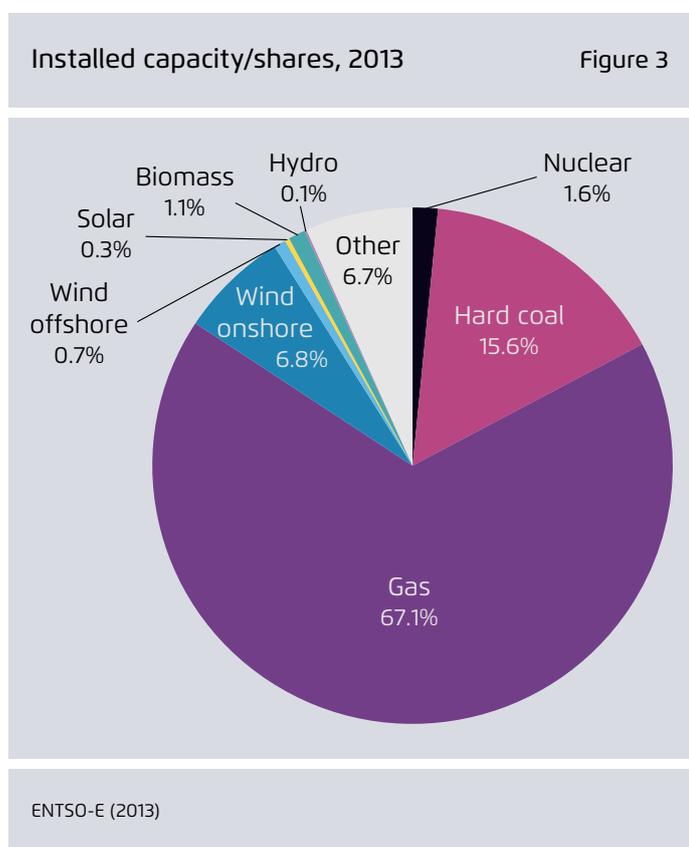


Overzicht netbeheerders Electriciteit

3. Energy production and consumption

3.1 Installed capacity

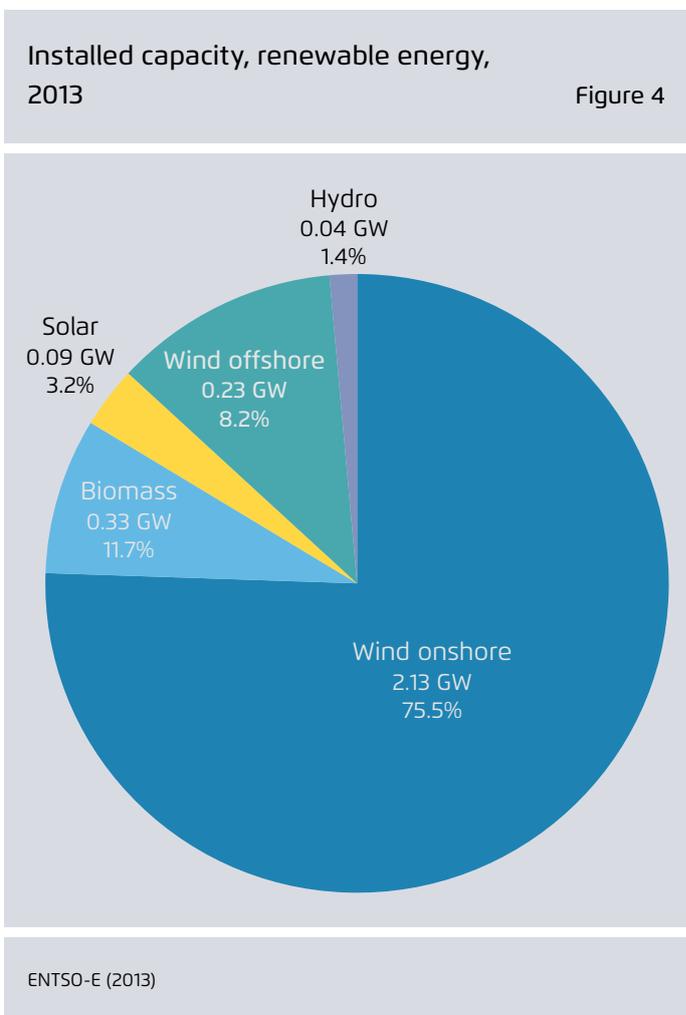
The Netherlands has approximately 31.25 GW of installed capacity. The power mix is dominated by natural gas, followed by hard coal and wind. Approximately one third of total installed thermal capacity is co-generation capacity. There is very little nuclear and solar capacity.



3.2 Production

In 2012, domestic electricity production in the Netherlands was 102 TWh. Total supply, accounting for domestic production, plus imports, minus exports, was 118.6 TWh.⁹ Domestic production was nearly 10 percent lower than in 2011. The

⁹ Statistics Netherlands (2013)



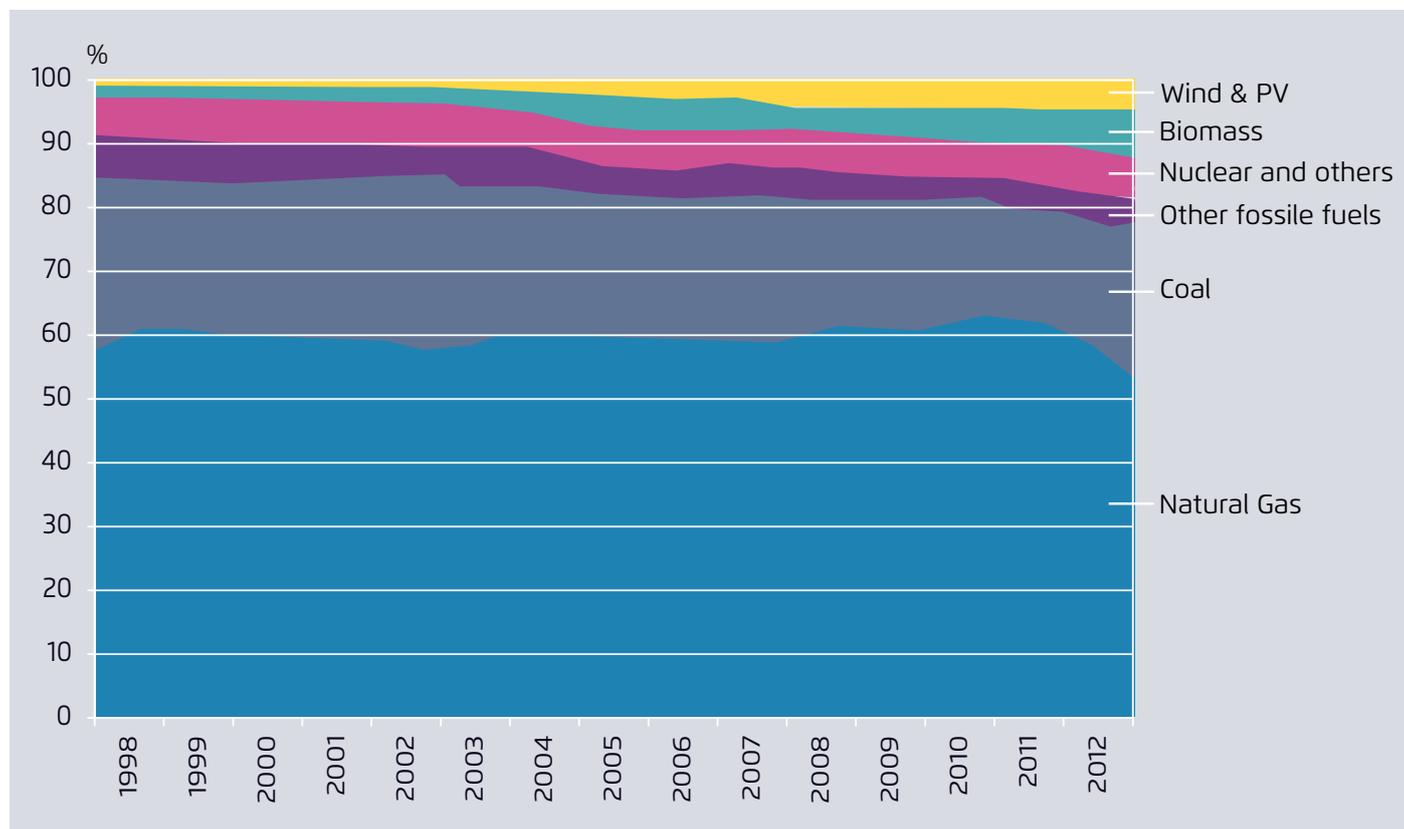
reduction was in part due to reduced demand resulting from the economic recession, but also to an increase in net imports driven by movements in the cost of primary fuels. Electricity produced from gas fell by some 10 percent to around 60 percent of total production, while electricity produced by coal increased by 15 percent.¹⁰

Electricity generated from renewable sources increased overall by about 1 percent in 2012, the lowest increase in the last half-decade. However, because of the fall in overall pro-

¹⁰ van Wezel et al. (2013)

Electricity production by energy source

Figure 5



<http://www.cbs.nl/en-GB/menu/themas/industrie-energie/publicaties/artikelen/archief/2013/2013-3868-wm.htm>

duction, the share renewable production rose by 1 percent in 2012.

3.3 Consumption

Estimated electricity consumption in 2012 was 118.6 TWh (including transmission and distribution (T&D) losses), having fallen from 122 TWh in 2011. Consumption is expected to rise in the coming years and is forecast to reach 124.7 TWh and 135 TWh in 2020 and 2028, respectively.¹¹

¹¹ Statistics Netherlands (2013)

Electricity consumption – actual and forecast

Figure 6



Statistics Netherlands (2013)

3.4 Peak demand

The peak demand occurs in the winter period when industrial/commercial and lighting loads overlap at around 18.00 hrs. There is not a particularly strong season-related com-

ponent, with a maximum/minimum demand ratio (ratio between winter peak and summer minimum demand) of around 200 percent. Fluctuations in electricity consumption mostly occur throughout the day.¹² A typical winter and summer peak demand profile is shown in [Figure 7](#).

Peak demand (in GW), 2012–2020

Table 5

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
Peak demand	18.44	18.48	18.76	19.04	19.33	19.60	19.91	20.21	20.51

Typical winter and summer electricity demand profiles

Figure 7



NMa (2012)

¹² NMa (2012b)

3.5 Planned conventional power plants in the pipeline

Most new power plants under construction, or that have been recently commissioned, are gas-fired. There are three large coal-fired stations expected to be completed in 2013–2014, Maasvlakte 3&4 and Eemshaven. The total installed capacity of 3.5 GW is expected to raise the share of installed coal-fired capacity in the Netherlands from 15 percent to 22 percent of total installed capacity.¹³

Some 2 GW of gas-fired capacity is expected to commission by this time. Over the period 2015–2020, 1 further 3.7 GW of fossil fired plant is expected to be commissioned, giving a total of 9 GW of new thermal plant commissioning between 2013 and 2020.¹⁴

¹³ Poyry (2013)

¹⁴ Poyry (2013)

4. Imports and exports

Currently, the Netherlands is interconnected with its neighbours Germany, Belgium, Norway and the United Kingdom. Exports of electricity have increased steadily over recent years while imports have tended to decline to the point that the Netherlands came close to having an electrical energy balance in 2010. Imports increased in 2011 and 2012 however, matching a decrease in domestic gas-fired generation output.

The total nominal interconnection capacity is approximately 5.0 GW and is scheduled to increase to 5.9 GW by the end of 2014 and 8.8 GW by 2020. The biggest planned cross-border project is the AC Doetinchem-Wesel line, currently in the preparatory phase.¹⁵ The construction of 0.7 GW subsea cable link with Denmark (Cobra) is under consideration with a projected commissioning date of 2017.

Available interconnection capacity for the Netherlands (in GW)

Table 6

	2012	2014	2020
Ger/Bel	3.9	4.2	6.4
NorNed	0.7	0.7	0.7
BritNed	1.0	1.0	1.0
Cobra	0.0	0.0	0.7
Total	5.0	5.9	8.8
Total (after reductions)	5.2	5.5	8.1

ACM (2013c), p. 26¹⁶

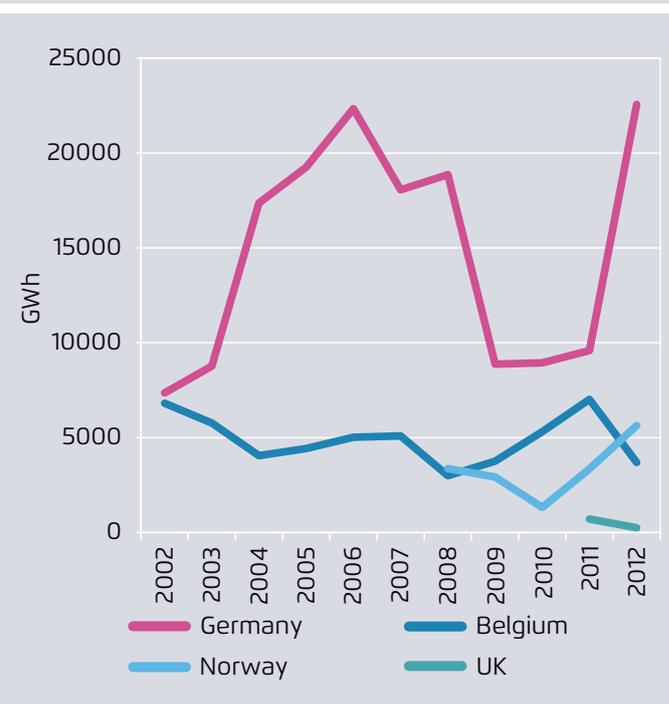
The significant interconnection capacity between the Netherlands and its neighbours has led to large volumes of imports and exports, and market coupling in the Central-

¹⁵ ACM (2013c), p 8

¹⁶ In 2012, the interconnection with Belgium was 1.7 GW. Most planned growth in interconnection capacity is expected with Germany.

Electricity imports

Figure 8



2002–2010 data: Eurostat (2013) – Imports (by country of origin).
2011–2012 data: ENTSO-E, <https://www.entsoe.eu/db-query/exchange/detailed-electricity-exchange/>

West European (CWE) market has led to price convergence in the region. In recent years, however, prices have begun to diverge somewhat. The Dutch regulator has expressed concern over the divergence, pointing to other member states' renewables policies, subsidies for coal-fired generation and contemplated capacity mechanisms as leading to market distortion.¹⁷ In fact, Dutch gas-fired capacity was less competitive on the spot markets in 2012, as it was often cheaper to import electricity generated by coal, wind, and solar (Germany) and hydro (Norway).¹⁸ According to a recent Poyry analysis of the Dutch wholesale electricity market, coal and

¹⁷ NMa (2013), p. 4

¹⁸ NMa (2013), p. 1

Net trade balances with the Netherlands (exports–imports, GWh), 2002–2012

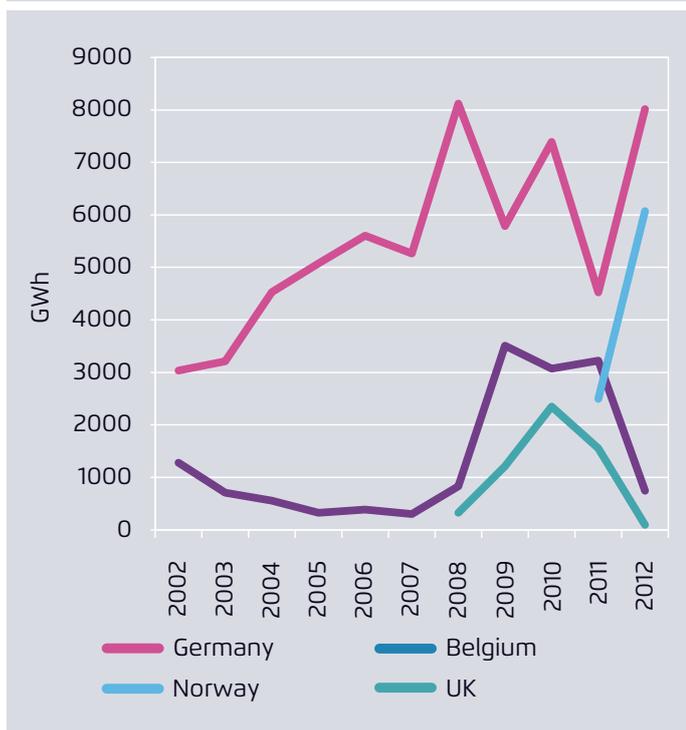
Table 7

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Germany	-6085	-8072	-16801	-18937	-21948	-17763	-18030	-5364	-5870	-6368	-21817
UK	0	0	0	0	0	0	0	0	0	1788	5819
Belgium	-3780	-2567	477	644	585	182	5114	2018	2074	-2489	4320
Norway	0	0	0	0	0	0	-3043	-1705	1018	-1809	-5552
Total	-9865	-10639	-16324	-18293	-21363	-17581	-15959	-5051	-2778	-8878	-17230

2002–2010 data: Eurostat (2013) – Imports (by country of origin). 2011–2012 data: ENTSO-E, <https://www.entsoe.eu/db-query/exchange/detailed-electricity-exchange/>

Electricity exports

Figure 9



2002–2010 data: Eurostat (2013) – Imports (by country of origin). 2011–2012 data: ENTSO-E, <https://www.entsoe.eu/db-query/exchange/detailed-electricity-exchange/>

Loop flows

The shift from nuclear generation to wind and coal in northern Germany can result in loop flows through the Netherlands and Belgium to the demand centres in the South, which under current regulations and market rules, may reduce the interconnector capacity available for normal cross border trade. As a solution to these problems, the Netherlands Authority for Consumers and Markets supports the completion of the European market integration process, an end to disruptive market interventions and the rapid integration of renewables into the electricity market.²⁰

lignite fired plants in Germany may be the price-setter for up to 50 percent of the year in the short-term.¹⁹

¹⁹ Poyry (2013), p. 21

²⁰ ACM (2013a)

5. Electricity market

5.1 Wholesale market, prices and liquidity

5.1.1 Electricity market design

The Dutch electricity market conforms to the typical liberalised West-European model with parties able to trade bilaterally via brokers using "over the counter" standard contracts, or via power exchange platforms such as the Amsterdam Power Exchange (APX).

Trading takes place in the forward, day-ahead spot and intra-day time frames up until gate closure, which occurs up to one hour before real-time. At this point, the System Operator (TenneT) assumes responsibility for achieving a final energy balance for each trading period and ensuring that power flows resulting from the trading process do not exceed the physical capabilities of the grid. Balancing is discussed in Section 6. of this report.

Wholesale energy trading by market Table 8

	Volume of energy traded
Bilateral contracts	20%
OTC market	60%
Power exchange (APX-ENDEX)	20%

NMa (2012b)

The Dutch electricity market is an "energy only" market with no explicit reward for capacity other than in the reserve markets. However, a "strategic reserve" mechanism, sometimes referred to as the "safety net" was developed in 2004 following a period of high temperatures which reduced generation capacity due to high cooling water temperatures and which also increased demand. To date, there has been no

Wholesale prices

Figure 10



APX, monthly avg. price past years. Available at <http://www.apxgroup.com/market-results/apx-power-nl/dashboard/>

APX ENDEX Exchange (2009–2012) electricity futures prices

Figure 11



ACM (2013), p. 17

need to implement the mechanism and the increasing generation surpluses forecast for the coming years would seem to make the prospect unlikely.²¹

The wholesale electricity market was deemed to be “moderately concentrated” by the European Commission in 2011,²² with a HHI index²³ for capacity of 1433. Market liquidity was 33.1 percent in 2011, measured as the annual traded volume of day-ahead power to gross electricity consumption.

21 Regulatory Commission for Electricity and Gas (2012)

22 European Commission (2011)

23 The Herfindal-Hirschman Index (HHI) is defined as the sum of the squares of the percentage market share of each market participant. The Index can range in value from 0 to 10,000, the higher the index the more concentrated the market. A market with an HHI of less than 1000 is generally considered competitive, a market with an HHI in the range 1000–1800 would be considered as moderately concentrated, while a market with an index above 1800 would be considered highly concentrated.

5.1.2 Market liquidity

The Dutch electricity market is well integrated with its neighbours, with day-ahead market coupling being achieved as part of the CWE-Region in 2010 and, more recently with Great Britain with the commissioning of the BritNed HVDC link. The creation of the North West Europe (NWE) region through the integration of the CWE, Nordic and GB/Irish regions, and its role in piloting the day-ahead market coupling methodology, places the Dutch electricity market in the vanguard of the European market integration process.

The Dutch electricity market has been coupled with day-ahead markets in Belgium and France, Germany, and Norway. In 2011, price convergence occurred 70 percent of the time between the Netherlands and Belgium, almost 90 percent of the time with Germany, and about 7 percent of the time with Norway. Because of congestion on the interconnectors, day-ahead prices in the remaining hours did not converge further. As noted earlier, prices diverged more as of 2012. In 2013, the Dutch average day-ahead price was 14 euros/MWh higher than its German equivalent.

The bulk of transactions in the Dutch wholesale power market involve annual contracts. It is worth noting that there was a significant drop in annual contracts on the Dutch market in 2011. This was primarily attributed to a shift in forward products to Germany.²⁴

congestion, rather than based on political borders.²⁵

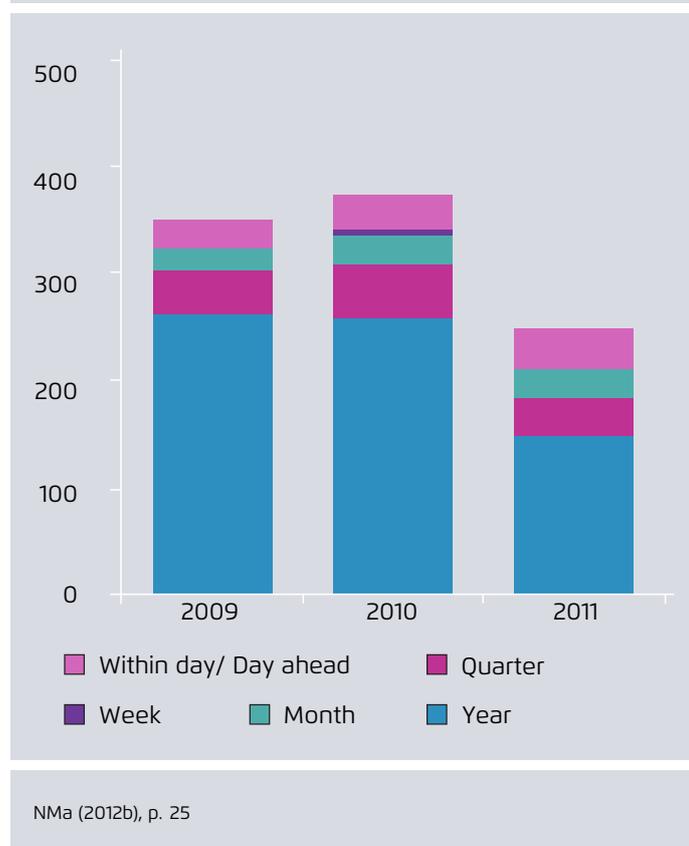
5.2 The retail market

In 2011, the industrial sector accounted for about 36 percent of all electricity consumed in the Netherlands, and the residential sector consumed about 62 percent of all electricity. The transport sector accounted for the remainder of electricity consumption.²⁶

Supply tariffs are not regulated in the Netherlands. There is however a form of tariff surveillance with regard to the retail energy market. Suppliers are required to submit all tariff proposals to ACM, who will check the reasonableness of the proposals. ACM has the authority to regulate consumer prices if thought to be excessive, although this power has yet to be used.

Distribution of volumes per product

Figure 12



The ACM is also looking forward at further market coupling initiatives. A flow-based system that takes into account the flow patterns of electricity in the network, potentially freeing up additional capacity, is expected to launch in 2014. The Regulator is also aiming for an increased liquid cross-border intra-day market. Lastly, ACM is participating in discussions regarding division into price zones for Europe that are based on geographical regions with limited or no

24 NMa (2012b), p. 25

25 NMa (2012b), p. 4

26 Eurostat (2013)

Household electricity prices per kWh (excluding taxes)

Figure 13



Eurostat (2013)

Since July 2004, 65 percent of retail consumers have either switched suppliers or contracts. The annual switch rate for small consumers has, for the past few years, hovered around 10 percent. In 2011, 9.7 percent of all small-scale electricity users switched supplier. The HHI index for electricity was 2,338 in 2012.²⁷

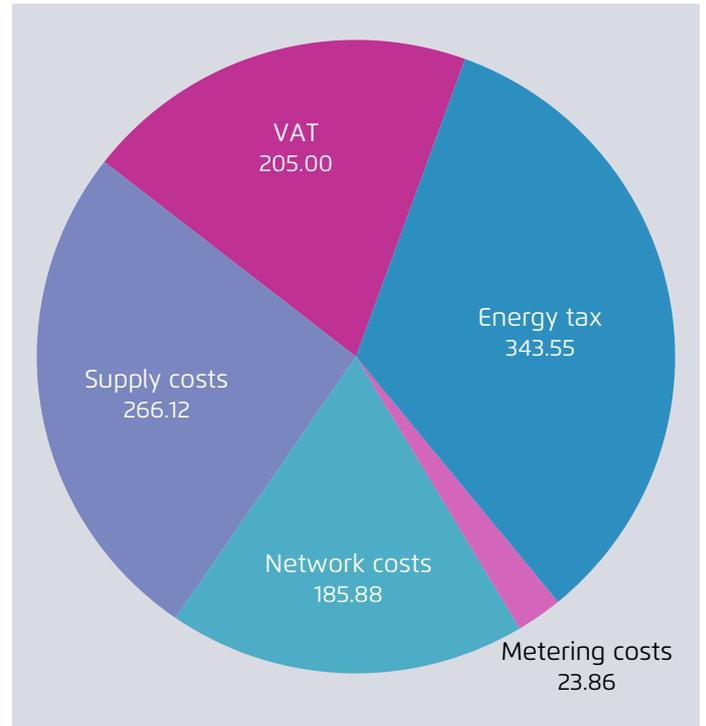
5.2.1 Breakdown of electricity bill

Figure 14 reflects the charges on a typical residential electricity bill. As of 31 December 2012 households paid on average EUR 1,024 a year for electricity. Average annual costs have declined somewhat, while electricity and gas consumption have remained relatively stable in recent years.

²⁷ ACM (2013c), p. 22

Breakdown of household electricity bill (in EUR per year)

Figure 14



Based on sample electricity bill, ACM (2013c), p. 21.²⁸

5.3 Allocation of grid costs

Customers connected to the Dutch transmission system are charged on the basis of three tariffs: a connection tariff, a transport tariff and a system services tariff.

The connection tariff covers the initial capital costs of connecting to the transmission system and an ongoing maintenance charge. For larger connections, the charge is customised, i.e. it is connection-specific, and therefore has a locational element. It is, however, shallow in nature with

²⁸ Typical VAT for residential user is between 19 percent and 21 percent, though it can vary more depending on usage volume.

only the unique costs of connecting to the transmission system included in the customer charge.

The transport tariff is split into two parts, a non-transmission tariff that covers administrative and billing costs, and a transmission tariff that covers the costs associated with the provision and maintenance of the transmission system. The charge is capacity based, i.e. it consists of a unit price per kW, but is sensitive to the number of hours during which the connected party uses the transmission system. The transmission tariff, which is a uniform or "postage stamp" charge, applies to load and not to generation.

The system services tariff covers the internal costs incurred by TenneT in operating the system, including regulating and reserve capacity, voltage control and black start. The system service charge is levied on load and not generation. Suppliers are responsible for communication with and billing Dutch domestic consumers, and both transmission and distribution network charges are allocated to consumers through their energy bill.

6. Electricity balancing/reserve markets

Energy balancing arrangements in the Netherlands have three main elements: programme responsibility, the single-buyer market for regulating and reserve power (RRP), and the imbalance settlement process.²⁹

In order to utilise the electricity network, all electricity producers or suppliers must be recognised as a Programme Responsible Party (PRP). TenneT uses information provided by PRPs to balance production and demand. It then procures the necessary balancing energy in the form of Secondary Control Reserve (SCR) power and Tertiary Control Reserve (TCR) power through a combination of annual and daily auctions. There is no obligation to provide SCR or TCR. 300 MW of "base" SCR is contracted annually. SCR is procured both via contracts negotiated bilaterally and bids into a secondary reserve price merit order or ladder.

Similarly, 300 MW of TCR (load shedding) is contracted annually with energy volume again procured on a settlement period bid and offer basis. The technical requirements of SCR and TCR, together with Primary Control reserve (PCR), which is used to contain frequency deviations, is described below.

Reserve and regulating power is primarily provided by fossil-fired generation, including co-fired generation using biomass. Demand also participates in the balancing process, with all connected parties in excess of 60 MW (both generation and demand) obliged to offer available regulating capability.

A high level comparison of the Dutch balancing arrangements with those of Germany is given in [Appendix A](#).

Electricity balancing/reserve markets

Table 9

Primary control reserve power	Secondary control reserve power	Tertiary control reserve power
Delivered automatically via governor response/load frequency control (LFC) in order to contain frequency deviations within prescribed limits. PCR needs to be fully activated within 30 seconds. As of January 2014, the mandatory reservation of PCR ceased to exist and TenneT procures PCR by means of a market based auction.	An automatically called service which is to be available within 5 minutes and maintained for 15 minutes. The service is used to replace PCR and restore frequency to its nominal level.	A manually dispatched reserve product, which needs to be fully available after 15 minutes and maintained for 4 hours.

Frontier Economics (2011) and TenneT (2011)

²⁹ Programme responsibility is defined by the Dutch Electricity act (2007), while the rules for RRP and imbalance settlement are set out in the Grid and System Codes, which form part of secondary legislation.

7. Decarbonisation

Under the EU Emissions Trading System (ETS) Directive, the Netherlands is part of the EU-wide cap requiring covered sectors in the EU to cut GHG emissions 21 percent below 2005 levels by 2020. Furthermore, under the Effort Sharing Decision, the Netherlands is expected to reduce emissions in non-ETS sectors 16 percent compared to 2005 levels by 2020.³⁰ The latest policy documents describing the Dutch climate and energy policy are the Dutch Energy Report 2011, the Climate Letter 2050, also published in 2011, and the National Energy Agreement for Sustainable Growth ("Energieakkoord voor duurzame groei"), which was reached in September 2012. Both the Dutch climate mitigation strategy and long-term energy strategy are based on four areas of activity: reducing demand for energy, biomass, CCS, and CO₂-free electricity (including nuclear).³¹ The Government aims to reduce dependence on fossil fuels while maintaining a strong energy sector that is both reliable and affordable to customers. According to the Dutch Energy Report 2011, "[a]ll forms of safe and reliable grey and green energy options are essential to achieve this." CCS plays a central role here, as natural gas is part of the long-term strategy. The Ministry for Infrastructure and the Environment has commissioned several scenario studies to identify decarbonisation pathways.

The energy and climate strategies include several specific strategies for biomass, nuclear power, and European-level action. The Dutch Energy Report calls for mandatory co-firing of biomass in coal-fired power plants, though whether such a requirement will materialise is unclear given recent plans to mothball old coal-fired power plants built in the

1980s.³² The energy strategy also calls for construction of nuclear power plants, though it is important to note that plans to build a nuclear power plant stalled in 2012 due to difficulties securing financing.³³ Other priorities of a low-carbon pathway include investing in a sound European energy market and promotion of cross-border energy flows.

The recent National Energy Agreement for Sustainable Growth sets policy objectives and measures to achieve the Dutch energy and climate target in the context of the EU's 2020 goals (as well as some domestic targets for 2023). Ten basic components are listed in the Energy Agreement to, amongst others, reach a share of renewables in the energy mix of 16 percent by 2023, and achieve final energy savings of 1.5 percent p.a. Concrete renewables deployment targets comprise a wind onshore capacity of 6000 MW in 2020 and 4450 MW of wind offshore in 2023. A review of the Energy Agreement will take place in 2016, which could also include the assessment of potential additional measures.

³⁰ The EU-wide GHG target calls for a 20 percent reduction in GHGs from 1990 levels by 2020. The EU Emissions Trading Scheme (ETS), which covers about 45 percent of total GHG emissions, requires covered sectors to cut GHG emissions 21 percent below 2005 levels by 2020. There are no national targets under the ETS; however, the Effort Sharing Decision does set national targets for non-ETS sectors.

³¹ Ros et al. (2011)

³² Argus Media (2013)

³³ van Tartwijk (2012)

8. Renewable energy

Under the Renewable Energy Directive, the Netherlands must achieve a renewable energy share of gross energy consumption of 14 percent by 2020, including at least 10 percent renewable energy in final consumption of energy in transport by 2020. In 2011, the share of gross final consumption of renewable energy in the Netherlands was 4.3 percent. The share of installed renewables capacity in the power sector was 9.0 percent in 2013. It is not clear whether the Netherlands will be able to meet its 2020 target if it continues with its current policies.³⁴

There are several mechanisms supporting renewable energy in the Netherlands, including:

- The Sustainable Energy Incentive Scheme Plus (SDE+)
- Green Deal programme
- Tax incentives
- Guarantees of origin

8.1 SDE+

SDE+ is the primary renewable support mechanism in the Netherlands.³⁵ Like its predecessor the SDE, the SDE+ is a premium feed-in tariff. It provides producers of renewable energy with a subsidy payment up to a maximum predetermined strike price, on top of the returns the producer receives from the wholesale market. The subsidy is broadly equivalent to the difference between the average price of renewable energy (referred to as the "correction amount") and the average price of conventional energy (referred to as the "base amount") and will be paid for 5, 12, or 15 years depending on the technology.

The subsidy that a renewable energy producer will receive is

³⁴ Rabobank (2012)

³⁵ The SDE+ is an amendment of the previous Sustainable Energy Incentive Scheme (SDE) which was introduced in 2008. It is expected to be extended to 2020. (Poyry (2013), p. 23)

determined by the following formula:

$$\begin{aligned} & (\text{base amount} - \text{base energy price}) \times \\ & \quad \times \text{subsidy period} \times \text{nominal capacity} \times \\ & \quad \times (\text{maximum}) \text{ full load hours per year.} \end{aligned}$$

The maximum full load hours per year are the maximum number of hours for which a given technology is eligible to receive the feed-in premium. If the expectation is that the production installation will produce less than the nominal capacity \times maximum number of full load hours, the decision and the budget claim are adapted in line with actual production over the subsidy period.³⁶

An annual budget ceiling is set for all renewable categories together. For 2013, a total of EUR 3 billion has been made available for SDE+, a significant increase over the EUR 1.7 billion available in 2012.

The SDE covers:

- renewable electricity
- renewable (bio)gas fed into the Dutch natural gas network
- renewable heat or a combination of renewable heat and electricity (i.e., combined heat and power, CHP)

It does not cover small-scale photovoltaics, offshore wind, hydro power, and osmosis.³⁷

The SDE+ has been introduced in phases, with each phase open for tender bids with a higher subsidy amount than the

³⁶ Ministry of Economic Affairs (2012)

³⁷ Under the previous SDE scheme a subsidy tender procedure for offshore wind was initiated, leading to support for three projects with a combined capacity of 875 MW. These projects are now under construction. There are no similar arrangements under the amended scheme and, although offshore wind projects can compete against other renewable technologies under a "free category," it is unlikely that future offshore projects would be granted a subsidy given current technology costs.

previous phase in order to encourage bidders to submit the lowest tender prices. A “first-come-first-served” approach favours established renewable technologies and is consistent with the Government’s aim of its renewable obligations at minimum costs. Table 10 provides base subsidy amounts for 2012 for several renewable technologies, along with maximum subsidy period (years), maximum number of full load hours, and the period within which a generator has to begin producing energy (latest period of bringing into use).

8.2 Green Deal programme

The Green Deal programme was introduced in 2011 with the aim of identifying sustainable projects (not only energy) that would benefit from streamlined planning and permitting processes and public-private funding. Some 150 projects have been identified to date, ranging from large-scale geothermal research projects, industrial heat utilisation projects, to smaller biomass projects in the horticultural industry.

8.3 Taxes

A number of tax incentive schemes for smaller sustainable projects also exist. The Random of Depreciation of Environmental Investments (Vamil), Energy Investment Allowance (EIA) and Environmental Investment Allowance (MIA) together provided 276 million Euro of additional support by allowing investors in sustainable assets (including energy) to deduct up to 41.5 percent from their taxable profits.³⁸ It is also worth noting that electricity generated for solar for own use is exempt from energy taxes.

38 For more on RES in the Netherlands, see: Government of the Netherlands and Centraal Bureau voor de Statistiek (2012); see also <http://english.agentschapnl.nl/subsidies-programmes/mia-vamil/about>.

SDE+ 2012 figures

Table 10

		Phase 1 – 13 March 09:00 hours to 1 May 2012 17:00 hours	Phase 2 – 1 May 17:00 hours to 18 June 2012 17:00 hours	Phase 3 – 18 June 17:00 hours to 3 September 2012 17:00 hours	Phase 4 – 3 September 17:00 hours to 5 November 2012 17:00 hours	Phase 5 – 5 November 17:00 hours to 27 December 2012 17:00 hours	Provisional correction amount over 2012 (EUR/kWh)	Maximum subsidy duration (years)	Maximum number of full load hours (hours/years)	Latest period of bringing into use (years)
Renewable electricity		base amount per phase (EUR/kWh)								
Wind energy	Onshore wind energy <6 MW (1,760 full load hours)	0.088	0.113	0.120	0.120	0.120	0.058	15	1,760	4
	Onshore wind energy <6 MW (2,120 full load hours)	0.088	0.106	0.106	0.106	0.106	0.059	15	2,120	4
	Onshore wind energy ≥6 MW	0.088	0.113	0.120	0.120	0.120	0.060	15	2,400	4
	Wind in a lake	0.088	0.113	0.138	0.154	0.154	0.060	15	2,480	4
	Offshore wind energy	0.088	0.113	0.138	0.163	0.188	0.060964	15	3,200	5
Hydro power	Hydro power ≥5 m and <5 m	0.070	0.090	0.110	0.118	0.118	0.052	15	7,000	4
	Hydro power ≥5 m	0.070	0.071	0.071	0.071	0.071	0.052	15	4,800	4
	Free flowing energy <5 m	0.070	0.090	0.110	0.130	0.150	0.052	15	2,800	4
Osmosis	Osmosis	0.070	0.090	0.110	0.130	0.150	0.052	15	8,000	4
Solar-PV	Solar-PV ≥5 kW _p and <5 m	0.070	0.090	0.110	0.130	0.150	0.057	15	1,000	3
Water treatment installation	Water treatment installation with thermal pressure hydrolysis	0.070	0.090	0.096	0.096	0.096	0.052	12	8,000	4

Ministry of Economic Affairs (2012)

9. Energy efficiency

Energy efficiency policy in the Netherlands consists of a number of individual policies and programmes. There is no overarching national energy efficiency policy or target.³⁹ Rather, on a high-level, energy efficiency is expected to be realised as a part of the broader goal of achieving cost-effective GHG emissions reductions and increasing the share of renewable energy in the economy. It is unclear how the Netherlands will implement the Energy Efficiency Directive (EED). It has not yet set an indicative national target for energy savings to 2020, due April 2013 under the EED.

The main energy efficiency policies in place in the Netherlands include a combination of sector-specific and cross-cutting measures, among them:

- **Building performance standards** for new and existing buildings in the residential and tertiary sectors.
- **Long-term EE agreements** with industry to achieve energy savings over time. Over the period 1989–2000 an average efficiency saving of 22.3 percent was achieved. The current agreements run to 2020, and include agreements between the central government and large- and medium-sized companies, the services sector, and the agricultural sector.
- **Green deals**, covering every sector. The Dutch Government began its “Green Deal” programme in 2011. The idea is to support energy saving and renewable energy projects that, without support, may not get off the ground. Projects in every sector are eligible to apply. The Ministry of Economic Affairs evaluates submissions.⁴⁰
- **Energy tax**, levied on electricity and gas consumption, and covering all sectors, introduced 1 January 1996 as “Regulating Energy Tax”. Large energy consumers pay

a lower level of tax.⁴¹ The tax is charged by the energy supplier. The income from the energy tax is fed back to the taxpayer through measures such as reduced wage and income tax.

- **Energy investment allowance**, which enables companies to deduct 41.5 percent of the investment amount for investments in EE equipment from their taxable profits. Eligible equipment is listed by the government, and as a general rule must be more efficient than available conventional equipment. The list is updated annually.⁴²

³⁹ The previous government had set a goal of 2 percent incremental annual improvement in EE between 2011 and 2020. However, the government that entered in 2010 did not set a national EE target. (ECN (2012), p. 8)

⁴⁰ Government of the Netherlands

⁴¹ Second NEEAP, Ministry of Economic Affairs (2011), p. 31

⁴² Ministry of Economic Affairs (2011), p. 33

10. Grid infrastructure and reliability

10.1 Generation adequacy standard

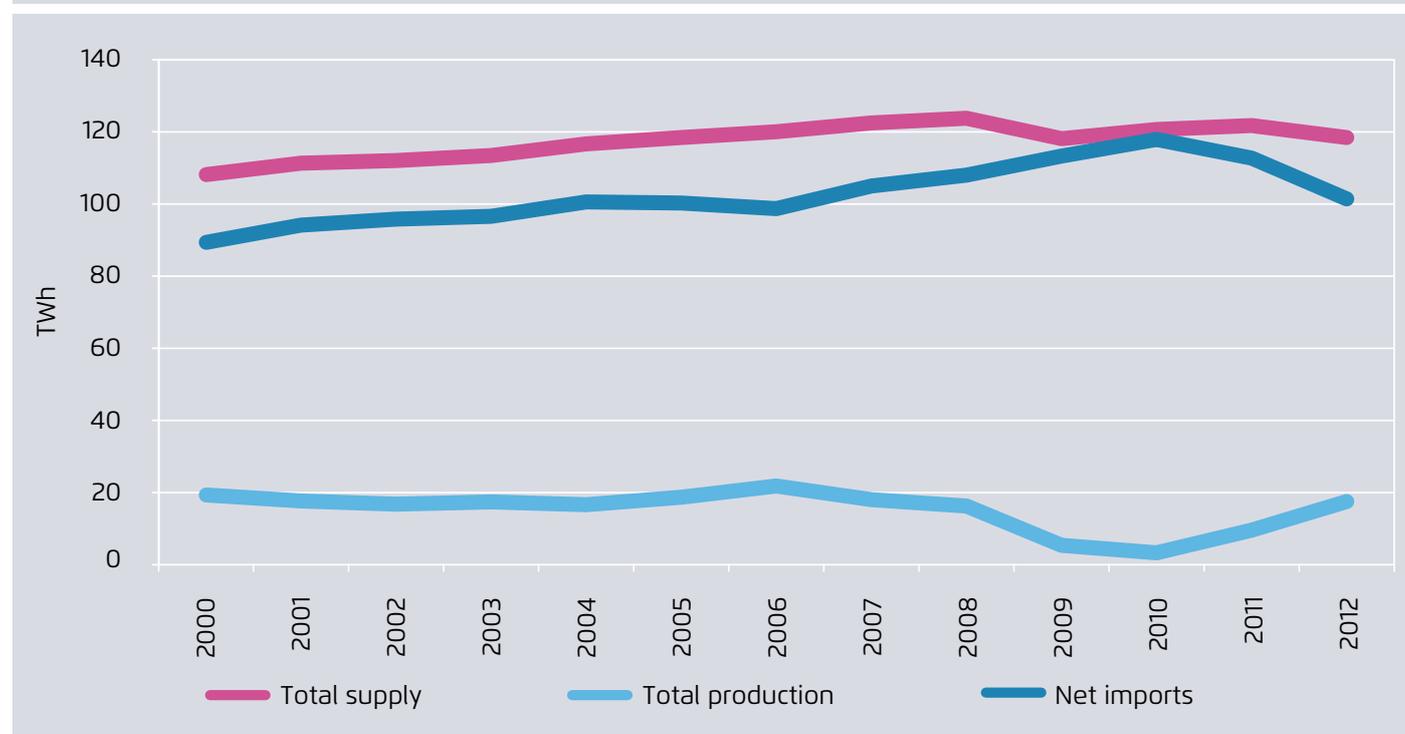
Until 2009, the Netherlands had insufficient domestic generation capacity to meet its generation adequacy standard of LOLE (Loss of Load Expectation) four hours per annum and was therefore dependent on energy imports to maintain security. However, with the increase in generation capacity since that time, the Netherlands has moved into capacity surplus and this trend seems likely to continue over the coming years with an additional 9 GW of generation capacity scheduled to commission by 2020. Net imports of energy declined with the growth in domestic generation capacity, however movements in gas and coal prices together with the increasing availability of renewable energy from neighbouring countries has caused net electricity imports to increase

in recent years.

Over recent years, decommissioning of existing generation capacity and the commissioning of new plants has seen a steady migration of capacity towards the coastal production areas designated by the Electricity Supply structure Plan (SEVIII), which are well served in terms of access to sea ports and cooling water. This, together with increased imports from northern Germany, has resulted in the need to reinforce the transmission system. In addition to the Doetinchem-Wesel interconnector with Germany, major transmission projects currently under development include the Doetinchem-Niederrhein, Eemshaven-Diemen, Borssele-Geertruidenberg, and Maasvlakte-Beverwijk 380 kV circuits.

Production, supply and net imports

Figure 15



Statistics Netherlands (2013)

10.2 Current SAIDI

The Netherlands has historically seen high levels of distribution system reliability, probably in part due to the lack of very rural regions and the fact that almost all the low- and medium- voltage network, together with around 40 percent of the high-voltage network, is underground. The number of minutes lost due to unplanned transmission and distribution outages (SAIDI) has averaged around 29 minutes per

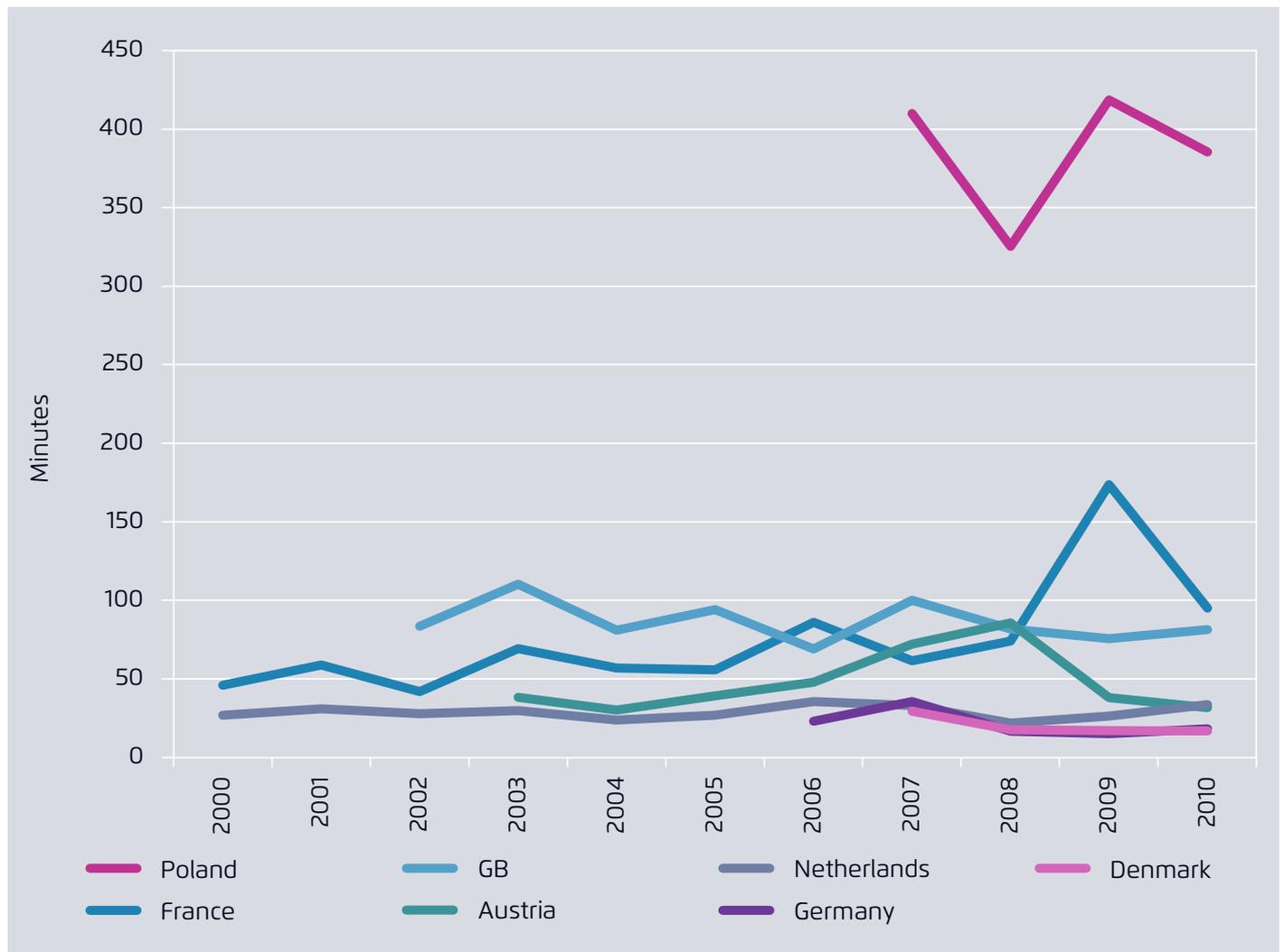
year during the last decade, with an average frequency of around 0.34 incidents per year (SAIFI) and an average duration of around 85 minutes (CAIFI). A comparison of average SAIDI with neighbouring countries is shown in Figure 16.

10.3 Smart metering

The introduction of smart meters in the Netherlands was first envisaged in 2006, with the aim of smoothing the

SAIDI – Unplanned interruptions including all events

Figure 16



CEER (2012a)

introduction of a competitive retail market.⁴³ The introduction was also a consequence of the compulsory introduction of the Energy Efficiency Directive, which prescribes that end users have energy meters that provide information about actual use.⁴⁴ Concerns over privacy issues delayed legislation underpinning the introduction of smart meters. Legislation finally passed into Dutch law in 2008 with amendments that required consumer consent for the transfer of energy consumption readings and ensured that the acceptance of a smart meter would no longer be compulsory. The roll-out of smart meters began in January 2012 for a range of customers and most SMEs (Smart Metering Entities), and it is expected that, from 2014, DSOs will become required by law to offer smart meters to all customers.⁴⁵

Customers in the Netherlands have the choice of not accepting a smart meter, or accepting a meter that can be administratively shut down without penalty, a meter with a restricted functionality or a fully-functional smart meter. The voluntary nature of smart meter introduction in the Netherlands introduces a possible conflict with EU Directives 2009/72/EC and 2009/73/EC, which require an 80 percent roll out if the cost benefit analysis for a member state is positive.

The results of a large smart meter feedback research programme involving over 30,000 households is to be presented to the Ministry of Economic Affairs in the second half of 2013.

43 Parliamentary Documents Second Chamber (2005/06), 28 982, No. 51

44 Directive 2006/32/EC. See supra s. 2.1. The Directive had to be implemented by 17 May 2008.

45 CEER (2012b)

11. Appendix

Comparison of Dutch and German balancing arrangements

Although conforming to ENTSO-E (formally UCTE) protocols and specifications, differences in both technical requirements and process design can be observed between the Dutch and German imbalance management systems.

Energy imbalances occur due to imperfections in the energy market outcome due to market participants incorrectly forecasting generation availability or demand and/or because of unforeseen circumstances following energy market closure, i.e. generating plant failures. Imbalance management involves the utilisation of both contracted Secondary Control reserve (SCR) and Tertiary Control Reserve (TCR) and, in the Netherlands, balancing bids and offers made by market participants.

Table 11 focuses on the procurement and utilisation of SCR and TCR together with basic balancing market design, and highlights some high-level differences between Dutch and German practise. The procurement of Primary Control Reserve (PCR), whose role is the containment of sudden frequency deviations rather than resolving energy imbalances as such, is not discussed.

However, it is worth to point out that as of January 2014, the Dutch TSO TenneT procures PCR via a weekly tender where reserve providers receive a capacity remuneration. In fact, parts of the Dutch PCR needs are acquired through a common Dutch/German auction platform where both Dutch and German reserve providers can participate.

As can be seen, there are some significant differences in balancing market design. In the Netherlands, activated control energy volumes are paid at marginal price while in Germany many activated control energy volumes are paid at bid. In Germany, imbalance prices reflect the average cost of all activated energy volume, while in the Netherlands imbalance energy prices reflect the marginal cost of activated energy actions. The Dutch model, where imbalance prices reflect the actual costs of balancing actions, balancing revenues shout net to zero except when the incentive component is activated. In the German model, non-zero revenues arise.

In the Dutch balancing model, the publication of Control Area market length and imbalance prices in near real-time gives market participants the opportunity to voluntarily contribute to the TSO's efforts in maintaining an energy balance. This so-called "passive" contribution is believed to result in a substantial reduction in the need for control energy.⁴⁶

⁴⁶ For a more detailed analysis of the differences between the Dutch and German balancing arrangements, see TenneT (2011).

Imbalance market characteristics		Table 11
	Netherlands	Germany
Secondary control reserve	Annual tender for 300 MW of base capacity supplemented by daily energy bids for each settlement period.	Weekly tender, specifying capacity and energy price
Tertiary control reserve	Annual tender for 300 MW of demand disconnection, supplemented by a daily energy auction for each settlement period. Bids can be changed up to gate closure. Selection by energy bid.	Daily tender, specifying capacity and energy price. Selection is by capacity price
Remuneration for capacity	Pay as bid	Pay as bid
Remuneration for control energy	Marginal price	Pay as bid
Published data	Bid-ladder published day-ahead, but bids may change intra-day. Bid activation is published near real-time, along with control area market length.	Bid-ladder is known with auction results and cannot change. No information published on activated bids or market length.
Imbalance prices	Single imbalance price if only positive or negative reserve is called in a programme time unit. Dual imbalance prices if both positive and negative reserve is called. Imbalance price(s) reflect marginal price of activated energy bids	Single imbalance price, based on average of all activated energy bids
Balance responsibility	With balance-responsible parties	With balance responsible parties but TSO is balance-responsible for a large share of the market (i.e., wind power)

Own research

References

- Argus Media (2013). Dutch energy policy to limit biomass co-firing. Available at <https://www.argusmedia.com/News/Article?id=858455>.
- ACM (2013a). European market integration needed because of increase in wind and solar energy in Germany. Available at <https://www.acm.nl/en/publications/publication/11369/European-market-integration-needed-because-of-increase-in-wind-and-solar-energy-in-Germany/>.
- ACM (2013b). Key Priorities for 2013 of the Netherlands Authority for Consumers & Markets. Retrieved from <https://www.acm.nl/en/publications/publication/11301/Key-Priorities-for-2013-of-the-Netherlands-Authority-for-Consumers-en-Markets/>.
- ACM (2013c). Authority for Consumers and Markets National Report on energy regulation in 2012 (Forthcoming).
- Ayakwah, K. (2013). Dutch minority electricity and gas company privatisation plan expected by Q4, ICIS, Aug 9, 2013. Retrieved from <http://www.icis.com/heren/articles/2013/08/08/9695643/dutch+minority+electricity+and+gas+company+privatisation+plan+expected+by+q4.html>.
- Centraal Bureau voor de Statistiek (2012). Renewable energy in the Netherlands 2011. Available at <http://www.cbs.nl/NR/rdonlyres/E1D0D58B-B4B7-43E6-8E1C-66F4C3DD1ACF/0/2012renewableenergy2011.pdf>.
- CEER (2012a). 5th CEER Benchmarking Report on the Quality of Electricity Supply 2011. Available at http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Electricity/Tab/CEER_Benchmarking_Report.pdf.
- CEER (2012b). CEER Benchmarking Report on Meter Data Management. C12-RMF-46-05. Available at http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Customers/Tab3/C12-RMF-46-05_BR_MDM_07Nov2012.pdf.
- Delta (2012). Annual Report 2012. Available at http://www.delta.nl/Media/pdf/over_DELTA/73322/annual_report_2012.
- Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC (Text with EEA relevance). Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0085:EN:PDF>.
- ECN (2012). Energy Efficiency Policies and Measures in the Netherlands in 2012. Available at http://www.odyssee-indicators.org/publications/PDF/netherlands_nr.pdf.
- E.ON website (2013). E.ON in the Benelux Countries. Retrieved from <http://www.eon.com/en/sustainability/regional-activities/benelux.html>.
- ENTSO-E (2013). Scenario Outlook and Adequacy Forecast, 2013–2030. Available at <https://entsoe.eu/about-entsoe/system-development/system-adequacy-and-market-modeling/soaf-2013-2030/Pages/default.aspx>
- European Commission (2011). Factsheet, The Netherlands. Retrieved from http://ec.europa.eu/energy/gas_electricity/doc/nl_energy_market_2011_en.pdf.
- European Commission (2013). Table of infringement procedures open for non-communication of national transposition measures. Retrieved from http://ec.europa.eu/energy/infringements/doc/infringements_energy.pdf.

- Eurostat (2011). Total number of electricity retailers to final consumers. Retrieved from http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Total_number_of_electricity_retailers_to_final_consumers_2011.png&filetimestamp=20130304150939.
- Eurostat (2013a). Consumption of electricity by industry, transport activities and households/services. Available at <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00094>.
- Eurostat (2013b). Imports (by country of origin) - electricity - annual data, code nrg_125. Available at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_125a&lang=en.
- Eurostat (2013c). Exports (by country of destination) - electricity - annual data, code nrg_135a. Available at http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_135a&lang=en.
- Frontier Economics (2011). Qualitative assessment of balancing market design for the Netherlands. A report prepared for Energiekamer. Available at <https://www.acm.nl/download/documenten/nma/103542%20Rapport.pdf>.
- Government of the Netherlands. Green Deal. Accessed on 11 September 2013. Available at <http://www.government.nl/issues/energy/green-deal>.
- Government of the Netherlands. Progress report: Energy from renewable sources in the Netherlands 2009–2010 – EC Renewable Energy Directive (2009/28/EC). Available at <http://www.agentschapnl.nl/sites/default/files/Progress%20report%20energy%20from%20renewable%20sources%20in%20the%20Netherlands%202009-2010.pdf>.
- Hesmondhalgh et al. (2012). Hesmondhalgh, S., Zarakas, W., and Brown, T., Approaches to setting electric distribution reliability standards and outcomes. The Brattle Group. Available at http://www.brattle.com/system/publications/pdfs/000/004/670/original/Approaches_to_Setting_Electric_Distribution_Reliability_Standards_and_Outcomes_Hesmondhalgh_Zarakas_Brown_Jan_2012.pdf?1378772119.
- Ministry of Economic Affairs (2011). Second National Energy Efficiency Action Plan for the Netherlands. Available at <http://www.buildup.eu/publications/20818>.
- Ministry of Economic Affairs (2012). Get to know the SDE+ 2012. Available at: <http://english.rvo.nl/sites/default/files/2013/11/Brochure%20SDE%20English%202012.pdf>.
- NMa (2012). 2012 National Report to the European Commission. Retrieved from http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/NATIONAL_REPORTS/National%20Reporting%202012/NR_En/C12_NR_Netherlands-EN_0.pdf.
- NMa (2012b). 2012 Liquidity Report, Wholesale markets for natural gas and electricity. Office of Energy Regulation, Netherlands Competition Authority, The Hague. Available at <https://www.acm.nl/en/download/attachment/?id=10444>.
- N.V. Nuon. Legal Structure. Retrieved from <http://www.nuon.com/corporate-governance/general/legal-structure.jsp>.
- N.V. Nuon Energy (2012). Annual Report 2012. Available at http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202012_interactief_tcm185-258098.pdf.
- Office of Energy Regulation (2012). 2012 Liquidity Report- Wholesale markets for natural gas and electricity. Available at <https://www.acm.nl/en/publications/publication/10857/2012-Liquidity-Report--Wholesale-markets-for-natural-gas-and-electricity/>.
- "Overzicht netbeheerders Electriciteit" [Overview of electricity grid]. Retrieved from <http://www.energieleveranciers.nl/netbeheerders/elektriciteit>.

Parliamentary Documents Second Chamber 2005/06, 28 982, No.51.

Poyry (2013). Outlook for New Coal-fired Power Stations in Germany, the Netherlands and Spain. Prepared for DECC. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/194335/Poyry_Report_-_Coal_fired_power_generation_in_Germany.pdf.

Rabobank (2012). An Outlook for Renewable Energy in the Netherlands. Rabobank Industry Note #320. Available at <http://www.dekoepel.org/wp-content/uploads/2013/02/An-Outlook-for-Renewable-Energy-in-The-Netherlands.pdf>.

Regulatory Commission for Electricity and Gas (2012). Study on capacity remuneration mechanisms. Study number (F)121011-CDC-1182. Available at <http://www.creg.info/pdf/Etudes/F1182EN.pdf>.

Ros et al. (2011). Ros, J., Koelemeijer, R., Elzenga, H., Peters, J., Hekkenberg, M., and Bosch, P., Exploration of pathways towards a clean economy by 2050: How to realise a climate-neutral Netherlands. PBL Netherlands Environmental Assessment Agency. Available at <http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2011-exploration-of-pathways-towards-a-clean-economy-by-2050.pdf>.

RWE (2009). Overview of Essent. Retrieved from <http://www.rwe.com/web/cms/mediablob/en/326310/data/188322/6/rwe/investorrelations/events/Factsheet-Essent.pdf>.

RWE (2013). Fact Book Renewable Energy. Available at <http://www.rwe.com/web/cms/mediablob/en/108824/data/114404/27/rwe/investorrelations/factbook/RWE-Fact-Book-Renewable-Energy-March-2013.pdf>.

RWE/Essent (2010). Facts & Figures. Retrieved from www.rwe.com/web/cms/mediablob/de/424264/data/417630/4/rwe/investor-relations/events/essent-capital-market-day/Facts-Figures-Essent-Capital-Market-Day-nur-in-englischer-Sprache-.pdf.

Statistics Netherlands (2013). Electricity Balance Sheet; supply and consumption. Available at <http://statline.cbs.nl/StatWeb/publication/?DM=SLLEN&PA=00377ENG&la=en>.

TenneT (2011). Imbalance Management TenneT Analysis Report. Version 1.0. Available at <http://www.tennet.eu/nl/nl/over-tennet/nieuws-pers-publicaties/publicaties/technische-publicaties/imbalance-management-analysis-tennet.html>.

van Tartwijk, M. (2012). Utility Shelves Nuclear Plans in the Netherlands. The Wall Street Journal. Available at <http://online.wsj.com/article/BT-CO-20120123-707288.html>.

van Wezel et al. (2013). van Wezel, B., and Kloots, J., Electricity production dramatically down. Statistics Netherlands. Available at <http://www.cbs.nl/en-GB/menu/themas/industrie-energie/publicaties/artikelen/archief/2013/2013-3868-wm.htm>.

Publications by Agora Energiewende

IN GERMAN

12 Thesen zur Energiewende

Ein Diskussionsbeitrag zu den wichtigsten Herausforderungen im Strommarkt (Lang- und Kurzfassung)

Brauchen wir einen Kapazitätsmarkt?

Dokumentation der Stellungnahmen der Referenten der Diskussionsveranstaltung am 24. August 2012 in Berlin

Die Zukunft des EEG – Evolution oder Systemwechsel?

Dokumentation der Stellungnahmen der Referenten der Diskussionsveranstaltung am 13. Februar 2013 in Berlin

Ein radikal vereinfachtes EEG 2.0 und ein umfassender Marktdesign-Prozess

Konzept für ein zweistufiges Verfahren 2014–2017

Ein robustes Stromnetz für die Zukunft

Methodenvorschlag zur Planung – Kurzfassung einer Studie von BET Aachen

Entwicklung der Windenergie in Deutschland

Eine Beschreibung von aktuellen und zukünftigen Trends und Charakteristika der Einspeisung von Windenergieanlagen

Erneuerbare Energien und Stromnachfrage im Jahr 2022

Illustration der anstehenden Herausforderungen der Energiewende in Deutschland. Analyse auf Basis von Berechnungen von Fraunhofer IWES

Kapazitätsmarkt oder Strategische Reserve: Was ist der nächste Schritt?

Eine Übersicht über die in der Diskussion befindlichen Modelle zur Gewährleistung der Versorgungssicherheit in Deutschland

Kostenoptimaler Ausbau der Erneuerbaren Energien in Deutschland

Ein Vergleich möglicher Strategien für den Ausbau von Wind- und Solarenergie in Deutschland bis 2033

Lastmanagement als Beitrag zur Deckung des Spitzenlastbedarfs in Süddeutschland

Endbericht einer Studie von Fraunhofer ISI und der Forschungsgesellschaft für Energiewirtschaft

Kritische Würdigung des Netzentwicklungsplanes 2012

Kurzstudie des Büros für Energiewirtschaft und technische Planung (BET)

Reform des Konzessionsabgabenrechts

Gutachten vorgelegt von Raue LLP

Steigende EEG-Umlage: Unerwünschte Verteilungseffekte können vermindert werden

Analyse des Deutschen Instituts für Wirtschaftsforschung (DIW)

Strommarktdesign im Vergleich: Ausgestaltungsoptionen eines Kapazitätsmarkts

Dokumentation der Stellungnahmen der Referenten für die Diskussionsveranstaltung am 10. Juni 2013 in Berlin

Wie wird sich die Windenergie in Deutschland weiterentwickeln?

Dokumentation der Diskussion zur Kurzstudie *Entwicklung der Windenergie in Deutschland* am 5. Juli 2013

Zusammenhang von Strombörsen und Endkundenpreisen

Studie von Energy Brainpool

IN ENGLISH

12 Insights on Germany's Energiewende

A Discussion Paper Exploring Key Challenges for the Power Sector

Cost Optimal Expansion of Renewables in Germany

A comparison of strategies for expanding wind and solar power in Germany

Load Management as a Way of Covering Peak Demand in Southern Germany

Summary of intermediate findings from a study conducted by Fraunhofer ISI and Forschungsgesellschaft für Energiewirtschaft

Report on the Polish power system

How do we accomplish the Energiewende?

Which legislation, initiatives, and measures do we need to make it a success? Agora Energiewende helps to prepare the ground to ensure that Germany sets the course towards a fully decarbonised power sector. As a think-&-do-tank, we work with key stakeholders to enhance the knowledge basis and facilitate convergence of views.



Agora Energiewende

Rosenstraße 2 | 10178 Berlin | Germany

T +49. (0)30. 284 49 01-00

F +49. (0)30. 284 49 01-29

www.agora-energiewende.org

info@agora-energiewende.de

