THE NETHERLANDS

1.1 Introduction

1.1.1 Objective of the case study

The present case study is developed as part of the European Environment Agency (EEA) project 'Energy Support and Innovation'. The key objective of this case study is to explore in some depth the relationship between support measures applied to all forms of energy and the innovation process in the renewable energy sector. More specifically, the key research question is: How do energy support measures affect the market conditions for renewable energy technologies and hence innovation in the renewable energy sector?

Within this project, the effect on innovation is mainly measured in terms of the market deployment of renewable energy technologies, although other indicators have been used to describe the state of play concerning other phases of the innovation process such as research and market development. The structure of the case study is as follows:

Sub-sections 1.1.2 and 1.1.3 provide a brief overview of the key features of the country's economy and energy system and overall market conditions for renewable energy technologies. Section 1.2 includes a quantitative overview of the energy support measures in place, distinguishing between conventional fossil and nuclear energy sources and renewable energy sources (RES) and their development over time during the period 2005 to 2011. Sub-section 1.3.1 discusses progress concerning the deployment of renewable energy technologies and the 2020 outlook. Because a successful innovation process presupposes that effective and efficient policies are in place, an assessment of the effectiveness and efficiency of renewable policies is provided in Sub-sections 1.3.2 and 1.3.3. Subsequent sections provide additional insights on the innovation process in the renewable sector (research and development (R&D), employment, etc.). Finally, for a successful innovation process, the economic, innovation and sector-specific policy objectives need to be coherent and reinforce each other. Therefore, a brief analysis of policy coherence is included in Section 1.5. The analysis covers the period from 2005 to 2011. Relevant developments prior to 2005 and more recent ones are reflected as much as possible.

1.1.2 Key features of the Dutch energy system

The Dutch energy system is heavily influenced by the high share of energy-intensive industries. Due to its favourable geographical location, the Netherlands has had a comparative advantage for the location of industries that require bulky intermediate products, such as the refineries, iron and steel, and chemical sectors. The refineries and chemical sectors in particular are relatively large compared to the overall size of the economy. About three quarters of energy imports are in the end not intended for domestic use. Feedstocks consist of 20 % of total energy demand. The share of heating in total primary energy supply is relatively high (56 %). About 45 % of this is used for heating in the residential sector and nearly 30 % for high-temperature industrial heating processes. These features of the energy system represent a challenge to increase the share of renewables in final energy consumption to 14 % in 2020 as required by the Renewable Energy Directive (2009/28/EC), because the amount of feedstocks and high temperature needs in industry can be regarded as energy consumption components for which few renewable alternatives exist (with the exception of biomass).

When it comes to the electricity sector, the share of industrial combined heat and power (CHP) plants is quite dominant. About one third of total electricity production is generated in industrial CHP. The Netherlands used to import about 10 % of its electricity demand in 2005; however, this has become considerably less over recent years, partly because of the economic crisis.

Table 1 shows some key parameters for the Dutch economy. Energy intensity, measured in terms of gross inland consumption divided by gross domestic product (GDP), remained more or less constant between 2005 and 2010. The growth of GDP per capita has declined since the economic crisis (2008) while unemployment has increased.

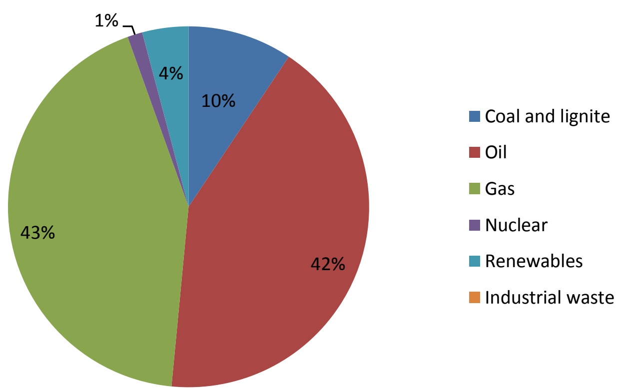
Table 1 Key economic parameters

	2005	2006	2007	2008	2009	2010	2011
Energy intensity (gross inland consumption, kg oil equivalent, per €1 000 of GDP)	161	151	156	149	151	158	
GDP per capita, real (€2 005)	31 500	32 500	33 700	34 200	32 700	33 100	33 300
Unemployment as % labour force	5 %	4 %	4 %	3 %	4 %	5 %	4 %
GDP share agriculture, forestry, fishing, mining (% GVA)	5 %	5 %	5 %	6 %	5 %	5 %	5 %
GDP share industry (% GVA)	16 %	16 %	16 %	15 %	15 %	16 %	16 %
GDP share commercial services (% GVA)	73 %	73 %	73 %	73 %	74 %	74 %	73 %

Source: Eurostat (2013)

Primary energy consumption in 2011 was dominated by natural gas (43 %), followed by oil (42 %) and coal (10 %) (see Figure 1).

Figure 1 Primary energy consumption by share of fuel in 2011



Source: EEA (2013)

1.1.3 Overall market conditions for renewable energy technologies

The three main instruments of the Dutch Government to stimulate investments in renewable energy are the so-called Stimulering Duurzame Energieproductie + (SDE+), which is a feed-in premium (FIP), the Energy Investment Allowance (EIA) and the biofuel blending requirement (bijmengverplichting), which applies specifically for transport. In terms of quantitative support, the SDE+ accounts for the bulk of the available subsidies.

Although renewable energy generation from biomass and wind in particular increased steadily over the period 2005–2011, the available SDE+ budget has been underspent. There has been a significant difference in budgeted and realised capacity due to several market barriers that exist for renewable energy generation, including the following.

- For biomass, which received a large share of SDE+ funding, analysts of the Dutch Rabobank estimated that the amount of subsidies has been in many cases too low to cover the difference between cost price and market price, resulting in a sizable gap between budgeted and realised capacity (Van der Elst and Bosch, 2012).
- For onshore wind energy, several circumstances have hampered the installation of new capacity. Due to the high population density in the Netherlands, there is a relatively strong opposition (Not In My Backyard (NIMBY) syndrome) to wind projects. Only 52 % of approved onshore wind projects are actually built (Van der Elst and Bosch, 2012). Furthermore, an important barrier is that project developers can only apply for SDE+ subsidies once the permit has been obtained. This increases the financial risks for project developers as they face substantial upfront costs before being able to apply for SDE+ funding, which is limited to an overall cap and therefore not guaranteed for all wind developers (Van der Elst and Bosch, 2012).
- Offshore wind projects are only eligible for SDE+ support under the so-called 'free category' since 2012 ([1]). All technologies in this category compete equally for support as the government wishes to stimulate the cheapest sustainable energy projects on the market. By being included in the free category, it means that offshore wind projects are unlikely to be granted a subsidy under the SDE+ as cheaper technologies will have an advantage over offshore wind.
- For solar photovoltaics (PV), SDE+ subsidies are only available for large-scale solar projects, but the support was too low to bridge the gap between the generation cost and the electricity price (Warringa et al., 2013). The share of solar PV in electricity generation therefore remains negligible in the Netherlands. Small-scale solar projects (< 0.6 kilowatt-peak (kWp)) that cannot apply for SDE+ funding receive a tax exemption.

Grid access has not been a major barrier for renewables as RES installations benefit from guaranteed access to the grid (Spitzley et al., 2011).

In the Dutch system, the difference in expected and realised electricity volumes has to be bought on the so-called 'balancing market' to ensure grid balance. Electricity prices in the balancing market are generally higher than in the 'normal' electricity market. Renewable electricity producers are compensated for these higher prices in the SDE+ regulation. Since 2008, this premium has been 11 % of the market price ([2]). Balancing requirements therefore neither disadvantage nor advantage electricity from RES (RES-E) as compared to other generators ([3]).

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[1] See http://www.nortonrosefulbright.com/knowledge/publications/66148/european-renewable-energy-incentive-guide-the-netherlands online.
[2] See http://www.windunie.nl/SDE-regeling2013.aspx online.
[3] RES-E producers are compensated for the difference between costs price and the market price. As balancing requirements are part of the cost price, the SDE+ subsidy compensates for these costs. In well functioning markets, conventional power producers would integrate costs for balancing requirements in their cost prices.

1.2 Quantitative overview of public support to all energy forms

1.2.1 Direct transfers

Direct transfers in the Netherlands include the SDE+ subsidy (precursors are the SDE and Milieukwaliteit van de Elektriciteitsproductie (MEP)), investment subsidies for solar PV to households for PV installations with a capacity > 0.6 kWp, subsidies for research and development (R&D), and investment subsidies for heat projects in homes (solar thermal, geothermal). The SDE+ can be considered as a FIP, which is not constant over the lifetime of a renewable electricity technology as the average electricity price each year is deducted from the support. The SDE+ subsidy is granted for a period of between 12 and 15 years (depending on the technology).

The SDE+ funding is disbursed in six phases based on a competitive tendering process. Each phase is opened with a higher maximum subsidy amount than the former phase to encourage generators to submit the most competitive offer. This implies that there is a risk–return trade-off. Developers applying in early phases will have a higher chance of receiving subsidies. Developers applying in later phases receive higher subsidies, but there is a higher chance that SDE+ resources are exhausted in that year, which means they will need to wait for the next year to apply.

SDE+ includes differentiation for wind projects since 2013. The subsidy is dependent on the amount of wind at the site — the fewer full-load hours a turbine operates, the higher the basic sum. From 2013, wind energy gets the opportunity to compete in the SDE + by differentiating the number of full-load hours in the free category (see Sub-section 1.1.3). This implies that wind projects can tender for SDE+ subsidies based on the expected amount of full-load hours. For a higher amount of full-load hours, the total amount of subsidies is lower but the chance to receive these subsidies is higher (comparable to the six phases).

Since 2013, the SDE+ is partially financed by a special tax imposed on the electricity price (Rijksoverheid, 2014). Before 2013, the premium was totally financed by central government budgets.

The special tax will be relatively low in the beginning and will not cover all SDE+ expenditures in the first period after being implemented. The tax is expected to collect EUR 100 million in 2013 and increase to EUR 300 million in 2015. In comparison, total SDE+ expenditures in 2011 were EUR 713 million. In the long term (2028), the tax will cover expenditures in full and should raise EUR 1.4 billion each year.

Households (50 %) and companies (50 %) will evenly contribute to the funding of the SDE+. For a typical household (3 500 kilowatt-hours (kWh)), the electricity bill is expected to increase by EUR 8 per year in 2013, by EUR 25 in 2015, and by up to EUR 120 in 2028. The tax for households and small companies (EUR cents per kWh (ct/kWh)) ([4]) is presented in Table 2.

Table 2 Tax for renewable energy

Energy commodity	2013	2014	2015
Electricity (0–10 000 kWh, € ct/kWh)	0,11	0.23	0.34

Under this assumption, conventional producers are compensated for these costs by the consumer (as the market price increases when cost price increases).

[4] Consuming between 0 and 10 000 kWh.

Gas (0–5 000 m^3, € ct/m^3)	0.2	0.4	0.59

Source: Rijksoverheid (2012)

For larger consumers (larger companies and industry), the amount of tax is dependent on gas and electricity use. In 2013, taxes for electricity range from EUR 0.11 ct/kWh ([5]) to zero ([6]). For gas, taxes range from EUR 0.31 cents per cubic metre (ct/m^3) ([7]) to EUR 0.02 ct/m^3 ([8]).

In 2011, after correction for the electricity price, the maximum SDE+ subsidies were EUR 7.3 ct/kWh (wind), EUR 1.9 ct/kWh (biogas from wastewater), EUR 4.9 ct/kWh (fermentation of manure), EUR 9.9 ct/kWh (fermentation of manure with maximal heat production) and EUR 4.6 ct/kWh for solar (Agentschap NL, 2012).

The yearly amounts involved in direct transfers (including SDE+) are presented in Table 3.

Table 3 Yearly amounts spent via direct transfers (*million EUR*)

Programme	2009	2010	2011	2012
SDE+ total (precursors SDE/MEP)	677	691	713	686
SDE+ wind	339	307	326	324
SDE+ solar	1	4	7	12
SDE+ hydro	-	7	4	7
SDE+ geothermal		-	-	-
SDE+ biomass	321	372	371	343
SDE+ biogas	7	1	4	n.a.
Investment subsidy solar	n.a.	n.a.	n.a.	51
RD&D subsidy renewable energy	n.a.	55,8	n.a.	n.a.
RD&D subsidy conventional energy sources	19	n.a.	n.a.	n.a.
Investment subsidy renewable heat in housing	n.a.	26.5	n.a.	n.a.

Note: n.a. = No data available.

Sources: Agentschap NL (2010, 2011 and 2012), RES Legal (2013) and De Visser et al. (2011)

1.2.2 Fiscal preferences

Fiscal preferences include energy tax exemptions for renewable energy consumption generated on site (in Dutch this is called salderen), EIAs, deduction of investment costs from taxable profits, the so-called Milieu InvesteringsAftrek and Vrije/willekeurige Afschrijving Milieu-investeringen (MIA/VAMIL), energy tax rebates for religious institutions and non-profit organisations, reduced energy tax rates for horticulture, aid for exploitation of offshore marginal gas fields, differentiated tax rates on gas oil (lower for non-transport use, expired since January 2013), lower tax rates for large gas consumers and exemption of energy taxes for the energy-intensive industry. The yearly amounts involved in the fiscal preferences are presented in Table 4.

[5] 10 000–50 000 kWh.
[6] >= 10 million kWh.
[7] 5 000–170 000 m^3.
[8] >= 10 million m^3.

Table 4 Yearly amounts involved in fiscal preferences (*million EUR*)

Measure	Energy source	2005	2006	2007	2008	2009	2010	2011
Energy tax exemption	Renewa-bles	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Energy investment allowance/ MIA/VAMIL	Renewa-bles	22	12	9	5	6 (e)	7 (e)	15 (e)
Tax exemption coal for electricity generation	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tax exemption gas for electricity generation	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Energy tax rebate for religious institutions and non-profit organisations	Fossil	9	10	11	15	20	20	20
Reduced energy tax rate for horticulture	Fossil	59	81	78	98	86	83	91
Aid for exploration of offshore marginal gas fields	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Differentiated tax rates gas oil	Fossil	212	209	221	228	208	222	228
Differentiated gas rates (reduced tax rates large gas consumers)	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	1 499	n.a.
Exemption energy taxes energy intensive industry	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	88	n.a.
Reduced tax rate LPG	Fossil	n.a.	n.a.	n.a.	n.a.	n.a.	223	n.a.

Sources: OECD (2012b), RES Legal (2013), De Visser et al. (2011) and CBS (2012b)
Notes: (e) refers to own estimates of EIA based on data from Agentschap NL (2010), Agentschap (2011), Agentschap (2012) and CBS (2012b)

1.2.3 Transfer of risk to government

The gas exploration industry and nuclear energy producers benefit from the transfer of risk to government. According to the 1998 Gas Act, the gas company Gas Terra (50 % owned by the Dutch Government) is obliged to buy gas from small fields at the prevailing market price (although companies are not obliged to sell to Gas Terra). This eliminates (price) uncertainties for suppliers and Gas Terra's position as the only market player.

The Dutch Government also reimburses damages from nuclear accidents up to EUR 2.3 billion. Governmental costs for securing nuclear transport amounted to up to EUR 5 million in 2010 (De Visser et al., 2011).

For geothermal heat production, the government bears the risk in case production is lower than expected (Garantieregeling Aardwarmte). If a project fails, 85 % of the costs can be reimbursed. For 2013, EUR 43 million is available in this fund for geothermal heat production (Agentschap NL, 2013).

1.2.4 Other financial measures

Other financial measures are tax benefits for consumers who invest in green funds and net metering.

Table 5 Yearly amounts involved in other financial measures (*million EUR*)

Measure	2005	2006	2007	2008	2009	2010	2011	2012
Regulation green projects	8	7	6	4	6	7	5	n.a.
Net metering	2	2	2	2	4	6	10	n.a.

Sources: OECD (2012b) and RES Legal (2013)

1.2.5 Non-financial measures

The biofuels quota scheme is a non-financial measure. It obliges companies to ensure that biofuels make up a defined percentage of their total annual sale of fuel (petrol, gas or diesel fuels). Extra costs for the consumer due to this measure were estimated to be EUR 215 million in 2010.

1.2.6 Support to renewables versus conventional sources

Table 6 provides a summary overview on support measures for all energy sources for the period 2005–2011.

Table 6 Yearly amounts allocated to the energy sector through various support measures over the period 2005–2011 (*million EUR*)

	2005	2006	2007	2008	2009	2010	2011
Renewable support							
SDE+ total (precursors SDE/MEP)	532	630	455	628	677	691	713
Investment subsidy solar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
R&D subsidy renewable energy	n.a.	n.a.	n.a.	n.a.	n.a.	55.8	0
Investment subsidy renewable heat in housing	n.a.	n.a.	n.a.	n.a.	n.a.	26.5	n.a.
Energy tax exemption	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EIA/MIA/VAMIL	22	12	9	5	6[e]	7[e]	15[e]
Regulation green projects	8	7	6	4	6	7	5
Net metering	2	2	2	2	4	6	10
Risk transfer geothermal heat	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Biofuels quota obligation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Support to conventional sources							
Tax exemption coal for electricity generation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tax exemption gas for electricity generation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Energy tax rebate for religious institutions and non-profit organisations	9	10	11	15	20	20	20
Reduced energy tax rate for horticulture	59	81	78	98	86	83	91
Aid for exploration of offshore marginal gas fields	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Obligation gas purchase	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Reimburse in case of nuclear accidents	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Securing nuclear transport	n.a.	n.a.	n.a.	n.a.	n.a.	5	n.a.
R&D subsidy conventional energy sources	n.a.	n.a.	n.a.	n.a.	19	n.a.	n.a.
Differentiated tax rates gas oil	212	209	221	228	208	222	228
Differentiated gas rates (reduced tax rates large gas consumers)	733*	864*	972*	931*	901*	1 035*	1 053*
Exemption electricity taxes energy intensive	n.a.	n.a.	n.a.	n.a.	n.a.	8	n.a.

industry							
Reduced tax rate LPG	n.a.	n.a.	n.a.	n.a.	n.a.	223	n.a.
Other support measures that cannot be allocated with certainty to renewables or conventional sources							
Differentiated tax rates electricity	n.a.	n.a.	n.a.	n.a.	n.a.	252	252**

Notes:

([e]) refers to own estimates of EIA/MIA/VAMIL ([9])

* Value estimated based on own calculation. Actual tax incomes in the given year were compared with tax incomes if companies (consuming more than 170 000 m^3) would have paid the marginal tax rate of enterprises consuming between 5 000 m^3 and 170 000 m^3. Sources on marginal tax rates and gas consumption were extracted from the database from the National Statistical Office (CBS, 2013a, CBS, 2013b and CBS, 2013c).

** Value assumed to be the same as 2010

Because the dataset is incomplete due to unavailable information, it is difficult to draw with certainty any definite conclusion regarding the trends in allocation of support to various energy sources over the considered period in the Netherlands. While information gaps do exist in relation to all sources, information concerning the support allocated to conventional sources tends to be more difficult to collect. Should the transparency in reporting such payments increase, the overall conclusion may change.

Source: EEA

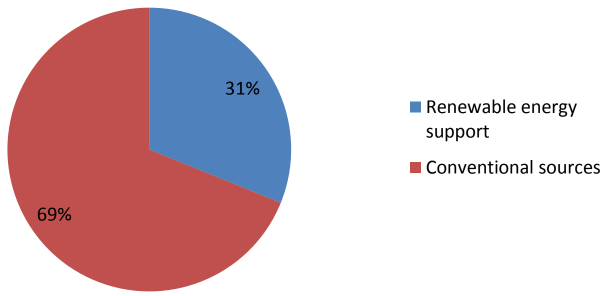
Figure 2 shows that the support for conventional sources was twice as large as the support for renewables over the period 2005–2011 in the Netherlands.

In the year 2011, the total renewable support sums up to EUR 743 million versus total support for conventional sources, which amounts to EUR 1.644 million.

In addition, EUR 252 million (estimated for the year 2010) represents revenue forgone by the Dutch Government due to tax exemptions for electricity consumption (De Visser et al., 2011). This support could not be allocated to one specific type of energy source and therefore was not included in Figure 2. This type of measure will obviously favour the dominant technology (ies) in electricity production.

[9] For 2005–2008 estimates from the national environmental accounts, that specify (alongside the MEP) additional support measures for renewable energy were included. Since no other programmes were running in these years to support renewables, the full amount was allocated to EIA/MIA/VAMIL. For 2010, an extrapolation of values in 2011 and 2009 was made based on the proportion of renewable support in the total EIA budget. For 2011, the EIA reports where the share of renewables in applications can be extracted were investigated. To estimate the value of support for 2011 from EIAs, it has been assumed that all applications for renewable support were granted.

Figure 2 Support for renewable energy versus conventional energy sources in the Netherlands for the year 2011 (in EUR)

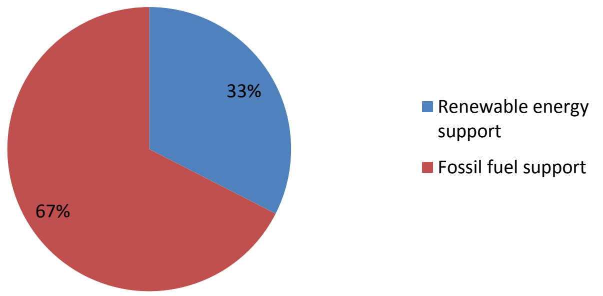


Source: EEA

In quantitative terms, SDE+ was the single most important measure for stimulating renewable energy (95 % of the total support for renewables), while lower tax rates for large gas consumers were the most important policy measure for conventional energy sources (64 % of total support for conventional sources).

Figure 3 presents the support for renewable energy versus conventional energy for the period 2005–2011. The figure shows that the relative share of renewable energy in the period 2005–2011 does not substantially differ from the year 2011.

Figure 3 Support for renewable energy versus conventional energy sources in the Netherlands added up over the years 2005–2011 (in EUR)



Source: EEA

The data presented in this study may differ from other studies mainly because of the focus chosen. For example, the amounts presented here differ from De Visser et al. (2011). In that study, a relatively larger support for renewables (EUR 1.5 billion in the year 2010) and especially conventional fossil energy sources are estimated (EUR 5.6 billion in 2010 for conventional fossil energy sources support). The most important reasons for these differences are:

- subsidies for air transport (EUR 1.7 billion in 2010) and shipping (EUR 440 million in 2010) are not taken into account in this study, hence the amount of support to conventional sources is lower in this study;
- furthermore, in contrast to De Visser et al. (2011), tax exemptions for electricity consumption (EUR 252 million in 2010) have not been allocated to specific sources in this study. Grandfathered emission rights (EUR 1.2 billion in 2010) are not included as a support measure for conventional energy sources in this study.

When comparing support for conventional fossil and nuclear energy sources with the support for renewable technologies, the discussion should also take into account past support for conventional sources. Decades of support for these sources (albeit for political reasons that may have been legitimate at the time) led to an energy system designed based on the characteristics of such sources. In addition, a whole support infrastructure (including institutional) was put in place underpinning this development. Therefore, RES do not only have to compete at the technological level with well-established conventional technologies but also at the level of support infrastructure (including institutional). In this context, support measures such as FIPs for RES are one element to help level the playing field for renewable energy.

Furthermore, the size of the FIP support may have also been influenced by the level of support for conventional sources as it compensates for the difference in cost price between renewable energy and conventional energy sources. This difference in cost price can be influenced if support allocated to conventional sources reduces the marginal cost price of the energy produced from these sources. This 'subsidised' lower market price for energy increases the difference between cost price and market price of renewables, hence triggering the need to put in place subsidies for these sources to ensure a level playing field with conventional sources. For example, the tax exemption for conventional energy sources (gas, coal) for electricity production has probably lowered electricity prices in the Netherlands. However, it has not been possible to quantify this effect.

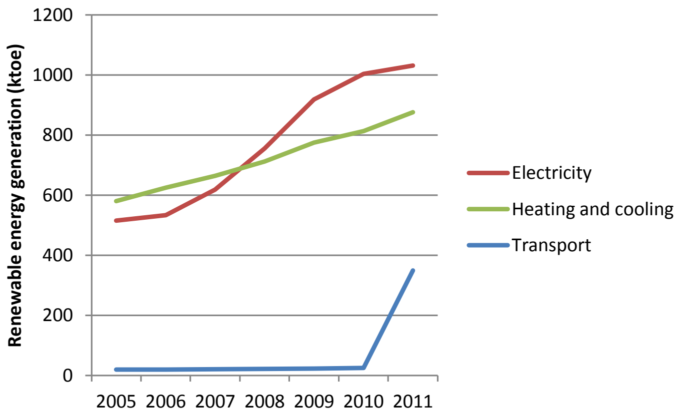
1.3 Effectiveness and efficiency of national support schemes for renewable energy

Before analysing the effectiveness and efficiency of the national support schemes for renewable energy, the following sub-section outlines key developments in renewable energy deployment between 2005 and 2011.

1.3.1 Development in deployment of renewables

Renewable energy generation from heating and cooling increased from over 580 thousand tonnes of oil equivalent (ktoe) in 2005 to 876 ktoe in 2011. Since 2008, renewable electricity has had the largest share in renewable energy generation (see Figure 4).

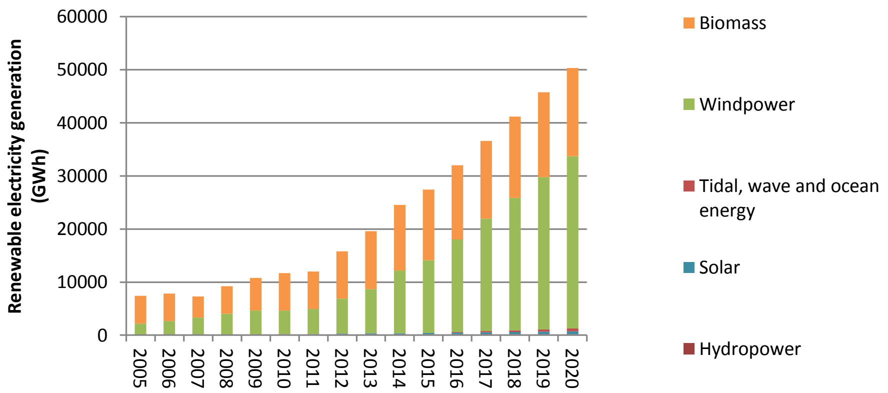
Figure 4 Renewable energy generation, 2005–2011 (*ktoe*) ([10])



Source: EEA indicator ENER 28 based on Eurostat data extracted on 28 February 2013

Wind energy and biomass have the main share in renewable electricity generation. Wind energy and biomass are also expected to increase most in order to reach the 2020 target of 14 % share of renewables in gross final energy consumption (see Figure 5).

Figure 5 Renewable electricity generation in the Netherlands: historic trends over the period 2005–2011 and National Renewable Energy Action Plan (NREAP) projections (2012–2020) (*GWh*)



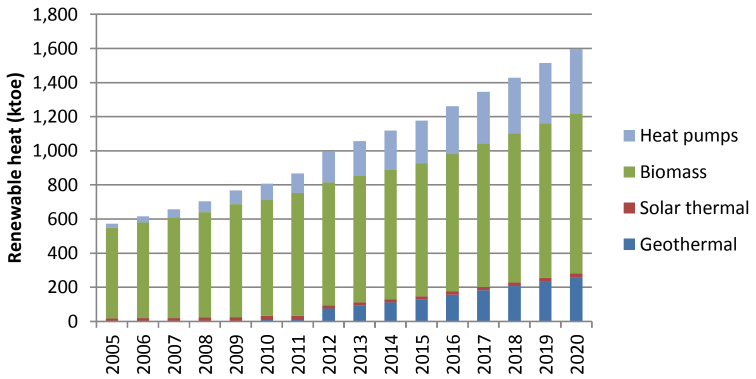
Note: GWh = gigawatt-hours

Source: EEA indicator ENER 28 based on Eurostat data extracted on 28 February 2013 and Dutch NREAP (2011)

In the heating and cooling sector the highest contribution by far comes from solid biomass, which is expected to grow further to reach the 2020 target (see Figure 6).

[10] Data for transport are incomplete for the years 2005–2009.

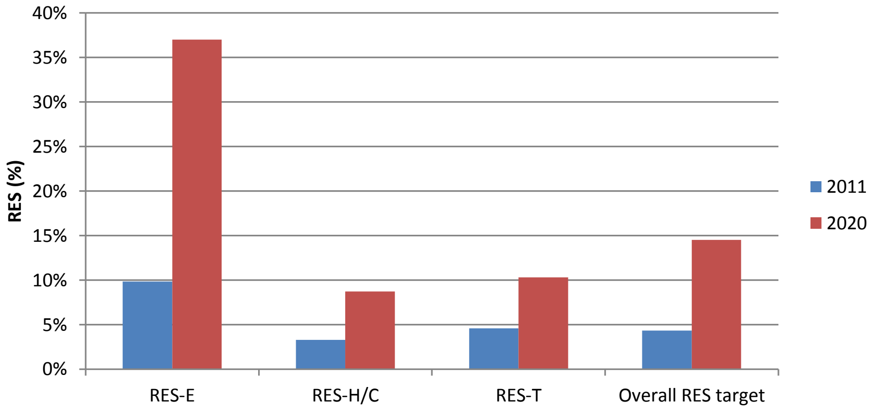
Figure 6 Renewable heating and cooling generation in the Netherlands: historic trends over the period 2005–2011 and NREAP projections (2012–2020) (*ktoe*)



Source: EEA indicator ENER 28 based on Eurostat data extracted on 28 February 2013 and Dutch NREAP (2011)

In 2011, the share of RES in gross final energy consumption was around 4 %. Renewable electricity had a share of 10 %, renewable heating and cooling of 3 %, and renewable transport of around 5 % (Eurostat, 2013). Given the remaining time frame, this compares rather poorly with the binding renewable energy target for the Netherlands of 14 % under the Renewable Energy Directive and sectoral targets of 37 % for renewable electricity, 9 % for renewable heating and cooling, and 10 % for transport (see Figure 7).

Figure 7 Share of renewable energy in gross final energy consumption for electricity, heat and transport: state of play in 2011 vs. 2020 target



Source: Eurostat (2013)

This section (Sub-section 1.3.1) provided an overall picture of developments of renewable energy in the Netherlands. The effectiveness and efficiency of the Dutch support schemes for RES are analysed in more detail in the following sub-sections.

1.3.2. Policy effectiveness

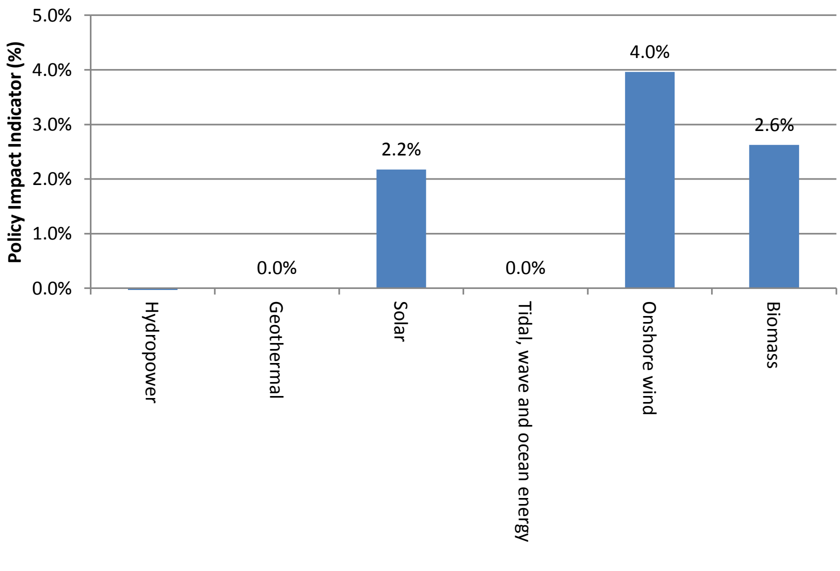
The Policy Impact Indicator (PII) shows to what extent the remaining gaps to a future target for RES has been covered per year. The indicator is defined as follows:

Policy Impact Indicator = additional generation in a given year divided by the difference between the generation in 2005 and the potential defined by the policy target.

As the generation in 2005 is used as a basis to calculate the remaining gap against the target set for 2020, an average yearly policy impact of over 6.5 % during the 15 years between 2005 and 2020 would be required to meet the 2020 target.

For the Netherlands, the policy impact is measured against the 2020 renewable energy targets for each technology as specified in the Dutch National Renewable Energy Action Plan (NREAP) under the Renewable Energy Directive. For renewable electricity, the average PII between 2006 and 2011 shows that the highest impact in terms of additional electricity generation per year was achieved for onshore wind energy. However, for all of the technologies the PII is much lower than 6.5 % (see Figure 8), indicating that the current effort is insufficient to reach policy targets in 2020. For wind energy and biomass in particular, higher policy effectiveness needs to be achieved given the important role allocated to these technologies in the Dutch NREAP.

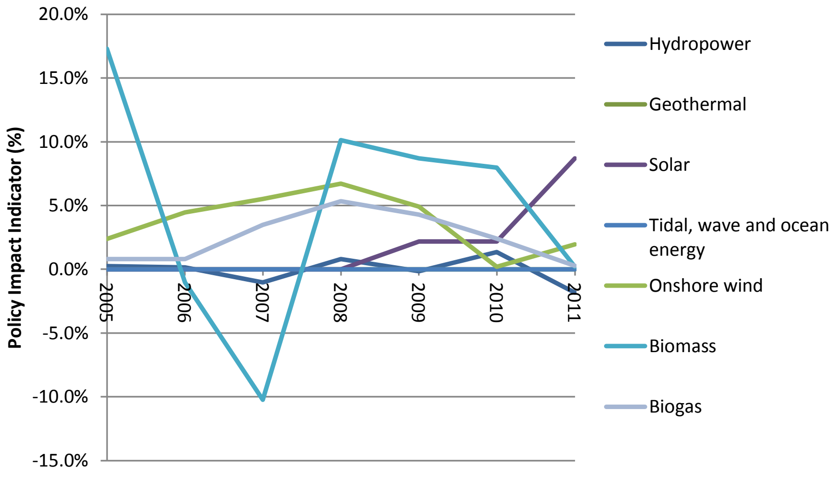
Figure 8 Average Policy Impact Indicator for renewable electricity technologies, 2006–2011



Source: EEA

The PII varies quite strongly on a yearly basis during the time period analysed. Figure 9 shows the PII in the time period 2006–2011 for each single year. The figure gives insight into the additional renewable energy generation each year, relative to the renewable energy generation difference between 2005 and the 2020 target.

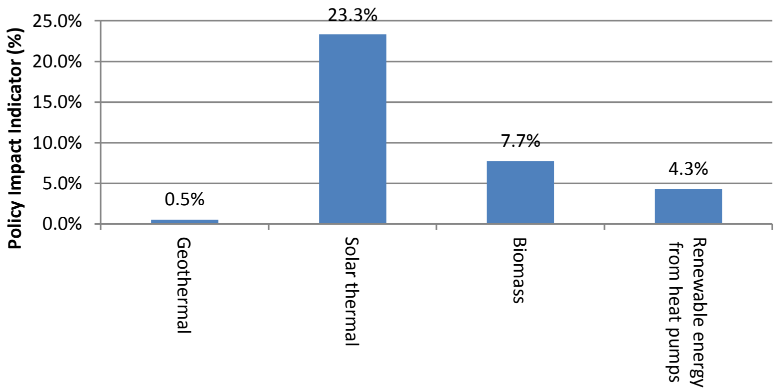
Figure 9 Yearly Policy Impact Indicator for renewable electricity technologies, 2006–2011



Source: EEA

In 2007, the subsidies to bioliquids from the MEP were cut down by 50 % due to public concerns related to the sustainability of bioliquids input in electricity generation (palm oil was used as an input). This explains the drop in 2007 related to the PII. For the heating and cooling sector, the average PII between 2006 and 2011 was around 0.5 % for geothermal, 23.3 % for solar thermal, 7.7 % for biomass and 4.3 % for renewable energy from heat pumps. No progress was made towards increasing the share of bioliquids. These calculations show that while there is good progress for solar thermal and biomass in the cooling and heating sector, further efforts are necessary to meet the 2020 target. The improvement of the policy effectiveness is of particular relevance for heat pumps as this technology is expected to contribute significantly to the renewable heating and cooling target in 2020 (see Figure 10).

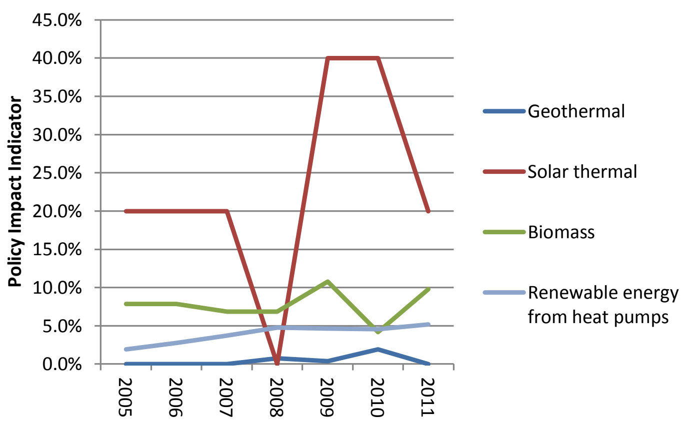
Figure 10 Average Policy Impact Indicator for renewable heating and cooling technologies, 2006–2011



Source: EEA

The yearly PII for renewable heating and cooling shows an increase in policy effectiveness for solar thermal in 2010 albeit a decrease in 2011. The yearly PII for biomass varied strongly.

Figure 11 Yearly Policy Impact Indicator for selected renewable heating and cooling technologies, 2006–2011



Source: EEA

Overall, for the heating and cooling sector the Dutch renewable energy policy can be considered as rather effective for the analysed period. However, this is certainly not the case for the electricity sector. None of the key technologies in the electricity sector were on average higher or close to the rate needed to reach the 2020 targets.

1.3.3 Total Cost Indicator

Whereas the PII shows how the overall policy and regulatory framework in place stimulates renewable energy deployment against a set target, the Total Cost Indicator (TCI) shows the cost for a specific renewable energy support scheme. It is defined as follows:

Total Cost Indicator = how much a country spends in addition to the market price for energy to get an x amount of additional generation from a renewable technology.

For this purpose, the amounts of annual FIP payments are compared to the wholesale electricity value. The yearly average wholesale price in the Netherlands varied quite strongly between 2005 and 2011 (see Table 7). This affects the calculations of the TCI with respect to the value of total annual electricity generation.

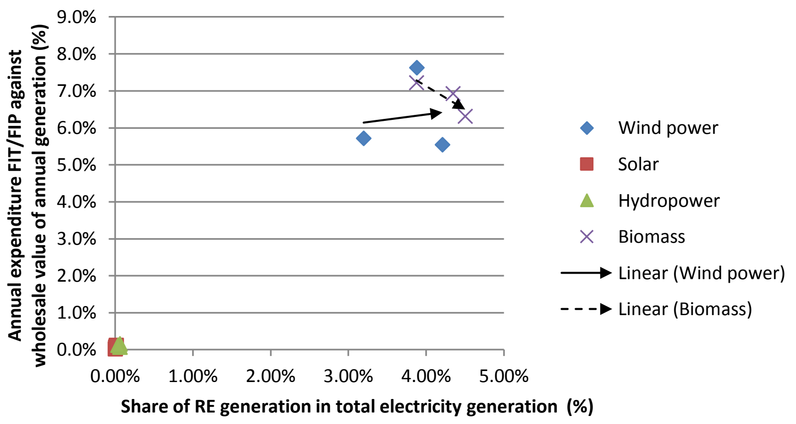
Table 7 Average wholesale price per (€/MWh, real prices, APX)

2005	2006	2007	2008	2009	2010	2011
52.39	58.1	41.92	70.06	39.16	45.43	52.03

Source: EMOS (DG ENER), 2013

The TCI for the Netherlands is illustrated in Figure 12. It shows that electricity produced from onshore wind and biomass was relatively cost efficient and the support efficiency improved over the three years for which data are available, particularly for biomass. For solar energy and hydropower, the share of FIP payments compared to the wholesale value of total electricity generation is negligible compared to wind and biomass (see Figure 12).

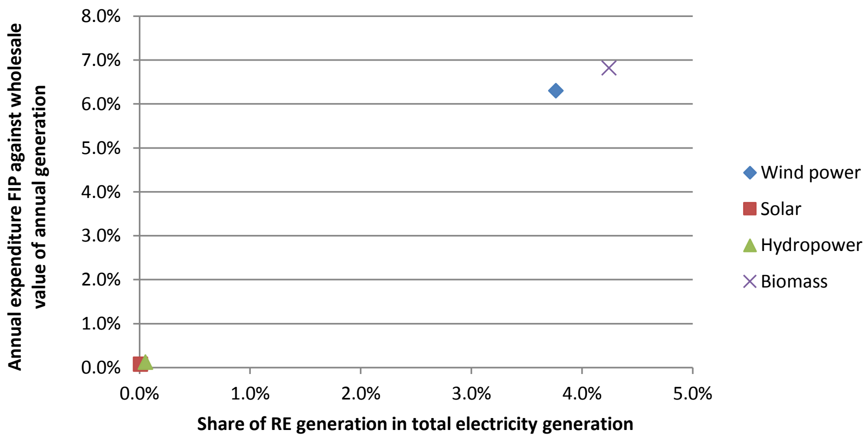
Figure 12 Total Cost Indicator for renewable electricity in the Netherlands, 2009–2011



Source: EEA

The TCI has been calculated for the years 2009, 2010 and 2011. An important issue here is that the Dutch office responsible for the FIP payments reports yearly payments that cannot be directly related to the production in a given year. The reason is that reported FIP payments represent a combination of upfront payments and correction payments for a year earlier. Producers receive a subsidy for their expected production, which is corrected for a year later based on actual production and the actual electricity price in that year. Due to this discrepancy, the average TCI for the period 2009–2011 is also included (Figure 13). Over a longer period, the relationship between the reported payments and actual production figures is more exact as the upfront payments and correction payments are added over several years, together representing the actual paid FIPs for the period.

Figure 13 Average Total Cost Indicator for renewable electricity in the Netherlands, 2009–2012



Source: EEA

It is important to note that the calculation of the TCI does not specifically show the lowering of wholesale prices that occurs due to the higher penetration of renewable electricity, also known as the 'merit order effect'. This is a weakness of the TCI (IEA, 2011) since the merit order effect can have a significant impact on wholesale electricity prices (e.g. Würzburg et al., 2013). A further investigation of the merit order effect is, however, outside the scope of this report.

1.3.4 Impact on the renewable sector

According to the Dutch statistical office, the sustainable energy sector (SES) ([11]) can still be regarded as an infant industry. In 2010, smaller enterprises grew more strongly than their larger counterparts, indicating that the pre-exploitation phase still holds opportunities for 'newcomers', which is a typical feature of an emerging industry (CBS, 2012a).

While production value decreased between 2008 and 2009, both employment and value added grew in the same period. R&D expenditure as a share of business turnover grew by 20 % in a 2-year period (2008–2010) and 16 % of the companies in the pre-exploitation phase ([12]) applied for one or more patents in the period 2003–2009. This share is much higher than average for the Dutch economy, where approximately 1 % of companies submitted 1 or more patent requests in the last 10 years.

[11] The sustainable industry sector defined in CBS (2012a) comprises more than renewable energy. These figures also include energy savings, smart grids, electric transport and carbon dioxide (CO_2) capture and storage.
[12] Companies active in value chains preceding the exploitation phase, such as the production of renewable energy systems, R&D focusing on sustainable energy technologies, transport of windmills and trade in biomass.

Table 8 Key figures of the sustainable energy sector

	2008	2009	2010
Employment sustainable industry, Full-Time Equivalents (FTE)	17,300	*18,057*	*18,814*
Employment energy savings, CCS and electricity transport (FTE)	6,200	*6,471*	*6,743*
Employment renewable energy industry (FTE)	11,100	*11,586*	*12,071*
Value added sustainable industry(mln €)	1,710	1,750	n.a.
Import of goods sustainable industry (mln €)	2,232	2,300	n.a.
Exports of goods sustainable industry (mln €)	2,300	2,200	n.a.
Investments pre-exploitation phase sustainable industry (mln €)	234	261	n.a.
Innovation sustainable industry (RD&D expenditures per euro turnover in %)	2	n.a.	2.4

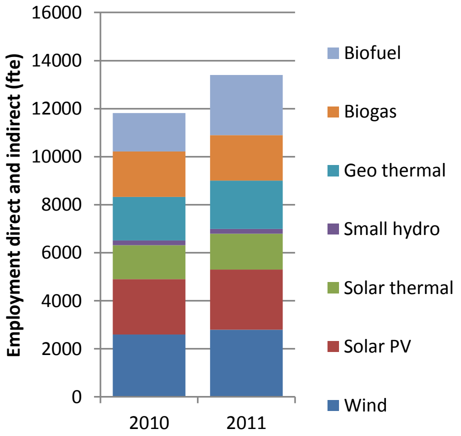
Notes: Figures in italics are own calculations (CE Delft). CCS = carbon capture and storage.
Source: CBS (2011) and CBS (2012a)

Data on employment in both the exploitation phase and the pre-exploitation phase are only available for the year 2008 (CBS, 2011). For the year 2009 and 2010, data are available for the pre-exploitation phase for the renewable energy industry (CBS, 2012a). Based on the growth in total employment in the pre-exploitation phase, we have calculated total employment in pre-exploitation phase and exploitation phase in the renewable energy industry. The results show that total employment increases to 11 586 full-time equivalent (fte) ([13]) in 2009 to 12 071 fte in 2010. Most of the employment in the sustainable industry is concentrated in the supply, assembly and construction phases (roughly 50 % of employment in 2009). R&D-related employment made up 13 % of total employment in 2009 (CBS, 2012a).

Data from EurObserv'ER for 2010 and 2011 show more or less comparable figures for total employment in the renewable energy industry (see Figure 14).

[13] Full-time equivalent is a unit that indicates the workload of an employed person. An FTE of 1.0 means that the person is equivalent to a full-time worker.

Figure 14 Direct and indirect employment in the renewable energy sector in 2010 and 2011



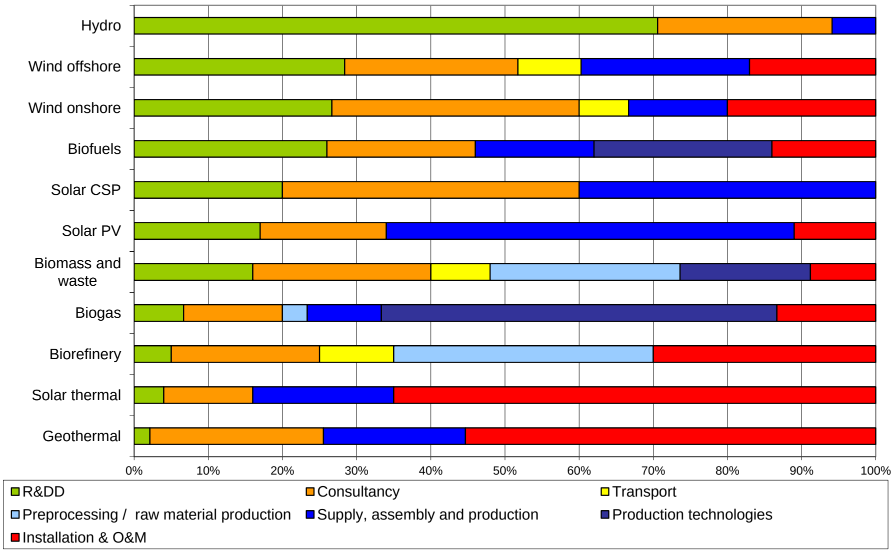
Source: EurObserv'ER (2012)

For most of the technologies, the level of market concentration in the Netherlands is low. Many companies are active across the value chain. Exceptions are geothermal energy (a few companies with highly specialised knowledge) and the onshore and offshore wind value chains. For offshore wind, the three largest players have a market share of nearly 100 %. For onshore wind, one player (Danish Vestas) has an estimated market share of 60–70 % (Rademaekers et al., 2010).

Figure 15 presents the estimated share of the number of companies in the value chain for each of the technologies ([14]). The figure shows that companies focusing on R&D activities have a relatively large share in the value chain in hydro energy, wind (onshore and offshore) and biofuels. In absolute terms, most companies are active in R&D activities for biomass and waste, wind offshore, biofuels, solar PV and hydro.

[14] Products pass through activities of a chain in order, and at each activity the product gains some value.

Figure 15 Structure of the value chains (in terms of number of companies)



Note: CSP = concentrated solar power.

Source: Rademaekers et al. (2013)

1.4 Assessment of innovation processes in the renewable energy sector

1.4.1 Rationale and objectives of innovation policies

The basic rationale for the enterprise/innovation policy in the Netherlands is that entrepreneurs, rather than the government, can exploit economic opportunities (resulting from societal challenges such as climate change and scarcity of raw materials) and create economic growth, jobs and wealth. Therefore, the government identifies problems and opportunities in close cooperation with representatives from businesses and research institutes in order to make concrete proposals for policy agendas. This interactive policy process is carried out for nine so-called top sectors (agri-food, horticulture and propagation materials, high tech, energy, logistics, the creative industry, life sciences, chemicals and water) (Rijksoverheid, 2013c).

The top sector energy has defined several focus areas that are considered to have the highest level of knowledge in an international benchmark, to have good market prospects and of potential importance to implement a low-carbon economy:

- energy efficiency in industry and buildings;
- gas;
- solar PV;
- offshore wind;
- smart grids.

For each of these areas, innovation contracts between private companies and research institutes have been concluded (Boersma et al., 2013). For each specific innovation area, a process has been put in place to formulate specific goals with regard to short-term improvements (2020/30: number of jobs to be expected, cost decrease in major technologies, exports) and long-term (2050) potentials. Each contract will have a Baseline and tries to define additional results compared with the Baseline. The essential question is: In which field could the Netherlands make a difference? Most new clean technology could be bought. To make/produce technologies only in specific circumstances makes a real difference as the Netherlands is a small country. For the energy sector, where shortages in many skills are expected, human capital development has also been considered. This is often carried out on a regional basis (Boersma et al., 2013).

According to the Innovation Union Scoreboard (IUS), the performance of the Netherlands is above the EU-27 average. Ranking 5th out of 27 EU countries, the Netherlands is categorised as an innovation follower. The IUS provides a comparative assessment of the performance of the EU-27 Member States based on 25 different indicators such as scientific publications, venture capital and sales of innovations (EU, 2013 ([15])). Research intensity measured by gross domestic expenditures on R&D (GERD) decreased from 1,90 % of GDP in 2005 to 1,76 % in 2008 and increased to 1,85 % in 2010. GERD per capita was (in current USD purchasing power parity (PPP)) increased from 668 in 2005 to 771 in 2010 (OECD, 2012a).

The overall longer-term policy ambition (for all the top sectors) of the Dutch government is to attain status as one of the top five knowledge economies in the world (in 2020) and achieve an increase of R&D expenditures to 2.5 % of GDP (in 2020). Furthermore, the ambition is to create top consortia for knowledge and innovation (TKIs) in which public and private parties participate for more than EUR 500 million. At least 40 % should be funded by the business sector (in 2015).

1.4.2 Drivers for innovation in the RES sector

Most companies are active in RD&D activities for biomass and waste, wind offshore, biofuels, solar PV and hydro. In terms of patent application, RD&D activities are most successful for biomass and solar PV. According to Rademaekers et al. (2010), one of the explanations is that there are many opportunities for technological development in these sectors. It is argued that, in contrast, biogas, biorefinery and geothermal are considered to be more standard technologies with less opportunities for innovation.

Dedicated R&D funds are an important driver for innovation. These funds are driven by specific demands of (mostly larger) private industry in the top sector energy innovation contracts. In the past, the Ministry of Economic Affairs largely defined the content of the energy R&D portfolio based upon market research and advisory councils. Now, this process has been replaced by the innovation contracts where demands from the business sector play an important role.

There is no direct evidence that market deployment at a national level (the Netherlands) has been the most important driver for RD&D activities. For instance, the share of solar electricity in Dutch electricity generation was only 0.09 % in 2011, but this did not prevent the Netherlands from developing a vibrant solar industry. The focus of the Dutch solar industry sector has been on export (EUR 270 million) and the growth of the solar PV sector is determined almost solely by international

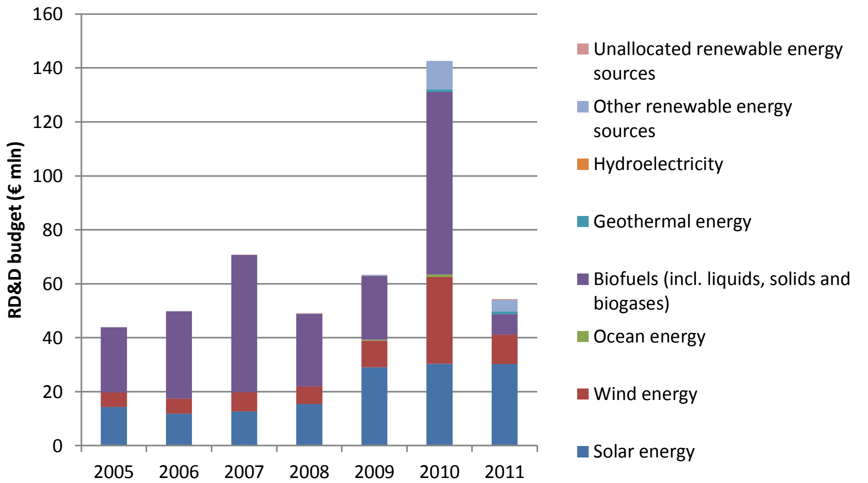
[15] The Innovation Union Scoreboard report, annexes and the indicators' database are available at http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm online.

market circumstances. An important driver for the successful R&D sector for solar PV is the existence of a strong PV cluster in the south-east of the Netherlands (Limburg and Noord-Brabant) consisting of producers, suppliers and equipment factories. These are partly the same companies supplying the automobile sector and the semiconductor industry.

In contrast, while the deployment of renewable energy from wind was a factor 50 larger in 2011 (the second largest source of renewable electricity generation), the RD&D industry for wind was less successful than for solar energy in terms of patent applications. Furthermore, RD&D companies for wind energy have received less public funding for RD&D activities than those, for instance, for solar PV.

Biomass has the largest share of renewable electricity in the Netherlands. Market deployment (home market advantage) could have played a role in stimulating innovation in this sector. However, other factors are likely to be equally important. Many research institutes are active in the bioenergy chain (Wageningen University, ECN, TU Delft, TNO, Eindhoven University and Groningen University). Furthermore, there is much (industrial) activity related to the value chain of bioenergy (petrochemistry, chemistry, agro, pharma and logistics) and Rotterdam is the largest 'fuel port' in the world. Figure 15 shows that R&D expenditures have increased from EUR 43 million in 2005 to EUR 129.8 million in 2010. Most of the R&D budget is spent on biofuels, followed by solar and wind energy. Public R&D spending on ocean energy and geothermal is very small in comparison to that on biofuels, wind and solar energy.

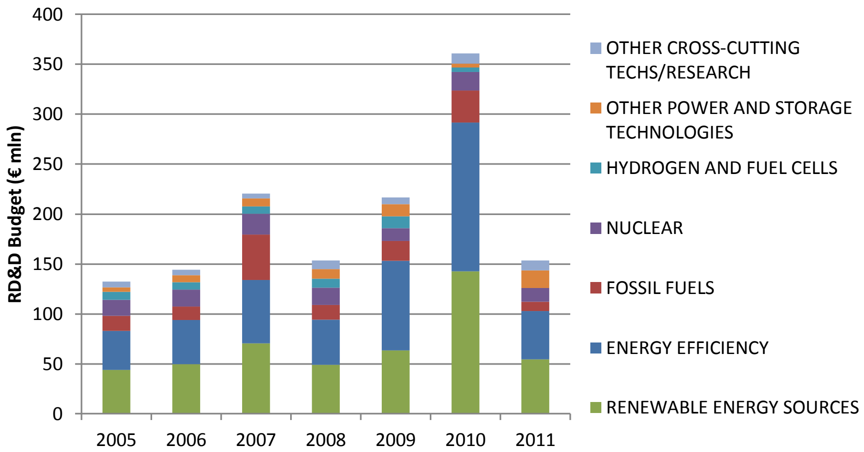
Figure 16 Total RD&D budget per renewable energy technology (*million EUR*)



Source: IEA (2013)

It is worth comparing the RD&D budget for RES to the RD&D budget for other energy technologies to better understand its value and relevance. The comparison shows that since 2005 renewable energy technologies had a large share (ranging between 29 % and 40 %) among all energy technologies. In comparison, the share of conventional fossil energy sources expenditures ranged between 6 % and 21 %, and nuclear energy between 5 % and 12 %.

Figure 17 Energy R&D budget per technology group, 2005–2011 (*million EUR*, 2012 prices and exchange rates)

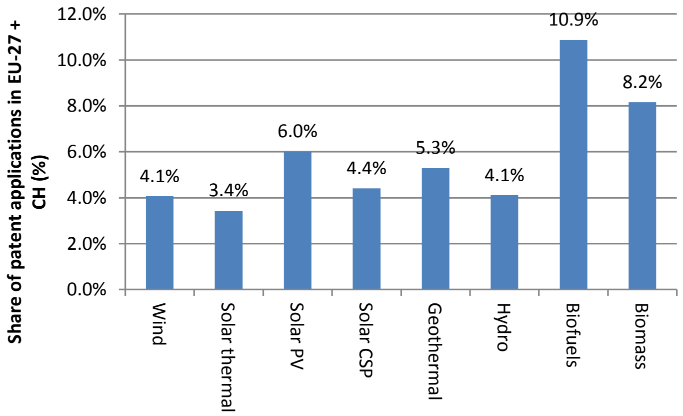


Source: IEA (2013)

Data on business/firm RD&D on renewable energy technologies are unreliable. An estimation of the leverage of public RD&D is 1:1 — i.e. each euro of public RD&D would incentivise another euro in private RD&D (Van Ommeren et al., 2012).

The focus on biomass, solar and wind is also reflected in the amount of patent applications. Figure 18 shows the Dutch share of applications related to the EU-27 and Switzerland. Based on this parameter, R&D activities in the categories biomass, biofuels and solar PV were most successful. It is remarkable to notice that geothermal and hydro had a significant share in patent applications even though these technologies received hardly any government support.

Figure 18 Share of renewable energy technology patent application in EU-27 +Switzerland, 2006–2010 (%) ([16])



Source: OECD stat (2013)

1.5 Coherence of renewable energy policies with other relevant policies

In this section we discuss the coherence of energy policies with other relevant policies. Coherence is assessed in terms of the degree to which there is an absence of major conflicts between policy areas concerning objectives/targets and the degree to which policies reinforce their effects (i.e. synergies) and minimise negative trade-offs.

1.5.1 Energy and renewable energy policy objectives

A new energy agreement — the National Energy Agreement for Sustainable Growth — has been adopted on 6 September 2013. This is an agreement between the Dutch Government, enterprises, trade unions and non-governmental organisations (NGOs) to deliver, among other objectives, an increase in energy efficiency of 1.5 % per year up to 2020, an increase of the share of renewable energy in final energy consumption to 14 % in 2020 and 16 % in 2023, and 15 000 new jobs ([17]).

The national government will take the initiative in developing, implementing and evaluating the policy measures set out in the agreement. In relation to the objectives of the Europe 2020 strategy, the National Reform Program NRP-NL (2013) refers to the objectives of energy conservation and a 16 % share of renewables in energy consumption in 2020 as laid down in the governmental coalition agreement. This objective has been postponed for 2023 in the new energy agreement adopted in September 2013 (see above), while for 2020 the minimum target of 14 % as per the Renewable Energy Directive has been maintained.

[16] Patent applications filed under the Patent Cooperation Treaty (PCT). 2010 is the latest year for which data were available.
[17] The agreement is available (in Dutch) at http://content1b.omroep.nl/urishieldv2/l27m60216e220cec918200523ff4d8000000.274bcfadbdef96783eda87ffc456c7bb/nos/docs/270813_energieakkoord.pdf (accessed 23 September 2013).

1.5.2 Coherence (renewable) energy and economic policy objectives

The Dutch NRP 2013 (NRP-NL, 2013) outlines the Dutch economic objectives in relation to the five objectives specified by the European Commission ([18]):

1. pursuing differentiated, growth-friendly fiscal consolidation;
2. restoring normal lending to the economy;
3. promoting growth and competitiveness for today and tomorrow;
4. tackling unemployment and the social consequences of the crisis;
5. modernising public administration.

In relation to the first economic policy objective, the NRP-NL states ‘The government is designing the spending cuts in a manner that is conducive to growth and friendly to the environment’ (2013). At the level of this first objective, there is no inconsistency with energy and renewable energy policy objectives in the Netherlands.

Concerning the second objective, the restoration of normal lending to the economy, the Dutch Government aims at ‘supporting lending to business with guarantees, such as the Business Loan Guarantee scheme (Garantie Ondernemingsfinanciering) and the SME Loan Guarantee scheme (Borgstelling MKB Kredieten)’ (NRP-NL, 2013: 4). There is no apparent inconsistency of this objective and the energy and renewable energy policy objectives of the Dutch Government.

In relation to the third priority of the Annual Growth Survey, to promote growth and competitiveness, the Dutch Government ‘endorses this priority’ (NRP-NL, 2013: 4). There is no contradiction between the promotion of growth and the energy and renewable energy policy objectives. There is also no immediate inconsistency between promoting competitiveness, green growth and an increased share of renewables in final energy consumption.

Regarding unemployment and the social consequences of the crisis, the NRP-NL only notes that the Dutch ‘Government recognises the importance of this priority and is introducing various reforms’ (2013: 4). Therefore, it cannot be assessed whether there is an inconsistency or not.

On the fifth priority of modernising public administration, the NRP-NL notes that this is ‘clearly reflected in government policy’ and that ‘The Government is endeavouring to create a central government that operates more cheaply, more flexibly and more efficiently. Its aim is to decentralise a large number of the government’s tasks, which will allow for a more tailored approach and increase the engagement of citizens. Another of the Government’s objectives is a structural reduction of the administrative burden for companies, professionals and citizens by 2.5 billion euro in 2017’ (2013: 4). There is no incoherence of these objectives with the energy and renewable energy policy objectives.

Overall, no incoherences could be found at the level of the Netherlands’ economic, energy and renewable energy policy objectives. Several elements of economic policy promote renewable energy technologies. Examples include spending cuts that are friendly to the environment, a strong support of green public procurements, a strategy of green growth and a Green Deal (with energy savings and sustainable energy being important elements of this deal). Moreover, in relation to green public procurements, the Dutch public authorities aim to purchase 100 % sustainable products by 2015 (EC, 2012: 4). This objective potentially supports the renewable energy policy objectives.

[18] In its communication ‘2013 European Semester: Country-specific recommendations — Moving Europe beyond the crisis, the European Commission specified five priorities under the Annual Growth Survey (EC, 2013).

Finally, the NRP-NL defines the objective of the Dutch Government ‘to pursue a realistic and ambitious strategy of green growth, with due regard for space and security. This strategy combines the pursuit of economic growth and greater competitiveness with improvement of the environment, making use of social initiatives’ (2013: 23). This objective is equally not incoherent with the Dutch energy and renewable energy policy objectives.

1.5.3 Coherence (renewable) energy and innovation policy objectives

In relation to innovation policy, the NRP-NL describes the ‘top sector approach’ as ‘promoting closer cooperation between knowledge institutes, businesses and public authorities in the programming of fundamental and applied research, with special attention to the challenges facing society in the near future, including issues relating to sustainability’ (2013).

Considering these objectives, there is no incoherence of innovation policy objectives with energy and renewable energy policy objectives of the Netherlands. The focus on sustainability points towards potential support of innovation policies for renewable energy technologies.

In conclusion, there appears to be no incoherence between policy objectives in the energy, renewable energy, economics and innovation policy domains. Official documents considered in this analysis point towards energy support schemes that would promote clean energy sources, including innovative renewable energy technologies.

Annex I presents a detailed inventory of energy, renewable energy, economic and innovation policy documents and objectives reviewed for the purpose of this study.

1.6 Conclusions

The Netherlands has made progress in recent years in the field of sustainable energy by putting in place a number of supporting policy frameworks. Although still in its infancy, a SES is emerging as one possible pillar of economic growth in the Netherlands. The newly adopted energy agreement is likely to support this development to some extent.

Over the period 2005–2011, the Netherlands spent twice as much on conventional energy sources than on RES. In addition, EUR 504 million represents revenue forgone by the Dutch Government due to tax exemptions for electricity consumption. The finding, however, needs to be considered with caution since significant data gaps exist for all energy sources but particularly for conventional sources. The SDE+ support programme (precursors MEP and SDE) has been the most important public support measure in the Netherlands in terms of quantitative support for renewable electricity, representing 95 % of the total support allocated to these energy sources. Lower tax rates for gas consumers was the most important support measure for conventional sources, representing 72 % of the total support for these sources.

The effectiveness of the Dutch policy framework for renewable electricity was more pronounced for onshore wind, followed by biomass and solar, but the PII was below the 6.5 % threshold (necessary to meet the 2020 targets) for all technologies. The PII for onshore wind compares well with that of the Czech Republic but is well below the one for Spain. For biogas, the PII is slightly higher than the PII for Spain but well below the one for the Czech Republic. For solar and hydro technologies, the PII in the Netherlands is the lowest compared to the Czech Republic and Spain, while for biomass the Netherlands is placed in between Spain with a higher PII and the Czech Republic with a negative PII (see full report for details). For the heating and cooling sector, the policy has been very effective in the case of solar thermal and biomass. For these technologies, the PII was above the necessary threshold to meet the 2020 targets. Other technologies such as heat pumps or geothermal received much less attention and the PII for these sources is consequently below the threshold. Further efforts may be necessary for heat pumps in particular as they are expected to significantly contribute to meeting the 2020 renewable targets. The PII for all technologies — except geothermal — compares rather well with the PIIs for the Czech Republic and Spain. For solar thermal and biomass, the PII for the Netherlands is highest, while for the heat pumps it is below the PII for the Czech Republic (see full report for details). The TCI shows that support for wind and biomass has been relatively efficient in the Netherlands compared to the Czech Republic and Spain, and improved over the observation period (see full report for details).

There is no empirical evidence that market deployment in the Netherlands has been the most important driver for RD&D activities. For instance, while the deployment of renewable energy from wind was a factor 50 larger in 2011 than that from solar energy (the second largest source of renewable energy in electricity generation), the RD&D in the wind sector was less successful than in the solar sector in terms of patent applications. Furthermore, RD&D companies for wind energy have received less public funding for RD&D activities than those, for instance, for solar PV. In 2010, smaller enterprises grew more strongly than their larger counterparts, indicating that the pre-exploitation phase still holds opportunities for 'newcomers', which is characteristic of an emerging industry.

A new energy agreement — the National Energy Agreement for Sustainable Growth — has been adopted. The Agreement links deployment of renewable energy, innovation policy (including the human capital agenda) and export opportunities in renewable technologies. No potential incoherence of energy, renewable energy, economic and innovation policies could be found at the level of policy objectives.

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Annex I Inventory of energy, renewable energy, economic and innovation policy objectives

Thematic area	Policy objective	Coherence between policy objectives	Source
'internal' coherence between different energy policy objectives			
Energy	- 'strategy of green growth will be applied', in particular in relation to the areas of climate and energy;	+	NRP-NL, 2013
	- 'energy conservation'	+	
	- 'Providing scope for all energy options towards 2050 … [by way of] a balanced mix of green and conventional energy in an integrated energy market. …'	O	Government of the Netherlands, Ministry of Economic Affairs, Agriculture and Innovation, 2011
	- 'Investing in a sound European energy market with a good infrastructure. Cross-border integration of national network administrators to be facilitated … the government is aiming for a well-functioning north-west European market by promoting cross-border energy flows.'	+	Government of the Netherlands, Ministry of Economic Affairs, Agriculture and Innovation, 2011
coherence with energy policy objectives			
Renewable Energy	- 16 % 'share of renewables in energy consumption in 2020';	+	NRP-NL, 2013
	- 'local generation of renewable energy, green gas and energy conservation in the built environment';	+	NRP-NL, 2013
	- 'Expanding the share of renewable energy … [by] promoting the use of technologies that are cost effective and applying innovation policy to other technologies'.	+	Government of the Netherlands, Ministry of Economic Affairs, Agriculture and Innovation, 2011
coherence with energy and renewable energy policy objectives			
Economic policy	1. Differentiated, growth-friendly fiscal consolidation: 'The government is designing the spending cuts in a manner that is conducive to growth and friendly to the environment'; 2. Restoring normal lending to the economy: 'support[ing] lending to business with guarantees, such as	+ O	European Commission, 2012

	the Business Loan Guarantee scheme (Garantie Ondernemingsfinanciering) and the SME Loan Guarantee scheme (Borgstelling MKB Kredieten)'; 3. Promoting growth and competitiveness for today and tomorrow: the Dutch government 'endorses this priority'; 4. Tackling unemployment and the social consequences of the crisis: the Dutch 'Government recognises the importance of this priority and is introducing various reforms'; 5. Modernising public administration: 'The Government is endeavouring to create a central government that operates more cheaply, more flexibly and more efficiently. Its aim is to decentralise a large number of the government's tasks, which will allow for a more tailored approach and increase the engagement of citizens. Another of the Government's objectives is a structural reduction of the administrative burden for companies, professionals and citizens by 2.5 billion euro in 2017.';	 O O O	
	- The Dutch public authorities aim to purchase 100 % sustainable products by 2015;	+	
	- Modern industrial policy, strengthening the competitiveness of the Dutch energy sector;	O	Government of the Netherlands, Ministry of Economic Affairs, Agriculture and Innovation, 2011
	- Green Deal, with energy savings and sustainable energy being important elements of it.	+	
coherence with energy and renewable energy policy objectives			
Innovation	The 'top sector approach', already described in the draft country case study, aims at 'promot[ing] closer cooperation between knowledge institutes, businesses and public authorities in the programming of fundamental and applied research, with special attention to the challenges facing society in the near future, including issues relating to sustainability'.	+	NRP-NL, 2013