Economic Radar of the Sustainable Energy Sector in the Netherlands

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Statistics Netherlands

Explanation of symbols

.	data not available
*	provisional figure
**	revised provisional figure (but not definite)
x	publication prohibited (confidential figure)
–	nil
–	(between two figures) inclusive
0 (0.0)	less than half of unit concerned
empty cell	not applicable
2011–2012	2011 to 2012 inclusive
2011/2012	average for 2011 up to and including 2012
2011/'12	crop year, financial year, school year etc. beginning in 2011 and ending in 2012
2009/'10–2011/'12	crop year, financial year, etc. 2009/'10 to 2011/'12 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Economic Radar of the Sustainable Energy Sector in the Netherlands

Employment, production, investments, innovation, value added, trade: trends and references 2009/2010

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Remarks:
The views expressed in this paper are those of the authors and do not necessarily reflect the policies of Statistics Netherlands.

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Key messages 'Economic radar of the sustainable energy sector in the Netherlands'

Key messages

The sustainable energy sector (SES) is still an infant industry. Trends of most figures show a gradual increase of importance of SES over 2008-2010 for the Dutch economy and energy supply. Figures can change due to impact of specific industry developments. This study is still in the learning phase. Caution is recommended in interpreting year-to-year developments. Monitoring trends in SES over 3-4 year period is most valuable and robust. The Economic radar is a device to analyse economic trends of SES in the on going energy transformation, both national and international.

-Employment growth of the sustainable energy sector, measured in FTE's, in 2009 and 2010 was equal to approximately 4 percent. Employment of the total Dutch economy, decreased in the period 2008-2010. Share employment of sustainable energy sector in total employment grew over time to 0.26 percent in 2010.

-Contribution of sustainable energy sector to GDP is growing over time to 0.31 percent in 2009.

-While production decreased between 2008 and 2009, both employment and value added grew in the same period. One explanation for this may be the long-term expectations of companies. Some companies in the pre-exploitation phase of the sustainable energy industry may have opted to hold on to staff. Positive long-term prospects partly explain these ambiguous developments.

-Value added growth of two percent is solely the result of more value added in the exploitation phase (energy production) of the sector. Pre-exploitation phase encountered a negative development in value added.

-Top sector Energy themes 'energy saving', 'solar energy' and 'bio energy' play biggest role in sustainable energy sector. Production of 'energy saving' products decreased in 2009 compared to 2008. Especially the economic crisis in construction led to less demand for energy saving products, also from abroad. Also production of solar products was under pressure in 2009. Manufacturing of panels suffers from changing market conditions. Exports of solar products by wholesale traders increased compared to 2008.

-Growth in value of exports of goods has led to an improvement of the trade balance of the sustainable energy sector. Trade in Port of Rotterdam was important for the sustainable energy sector. Approximately 24 percent of exports were re-exported in 2009 (mainly bio fuels)

-Sustainable energy companies in the pre-exploitation phase are, generally speaking, relatively more innovative than Dutch economy as a whole.

-Share of Dutch patent applications related to sustainable energy in total world patent applications declining over time (1999-2008). Partial recovery is measured from 2005 onwards.

Later in 2012 and in 2013 the Radar will be further updated with more recent economic indicators and extended with economic figures on foreign investments in the SES in the Netherlands, span of control and depreciation. Also population dynamics will be further investigated in next studies.

Summary

This monitor of the sustainable energy sector published by Statistics Netherlands (CBS) in 2012 is a follow-up to the study conducted in 2011. This 2012 study was commissioned by the Ministry of Economic Affairs, Agriculture and Innovation (EL & I). Detailed economic indicators for the sustainable energy sector are presented for 2008 and 2009. Efforts for the compilation of more recent economic indicators are discussed, and the results for these more up-to-date figures are presented.

The relevance of monitoring the sustainable energy sector lies in evaluating economic opportunities of the Netherlands in the global transformation towards a renewable energy supply and demand system and more attention for energy conservation. Several geopolitical, economic and environmental developments motivate policies focused on promoting the energy transformation in the Netherlands. These motives include:

- Imports dependence: despite the extraction of natural gas within its own national territory, in 2010 the Dutch economy still depended on imports for 54 percent of its energy consumption[1]. (CBS, *Environmental accounts of the Netherlands 2010,* 2011)
- Decreasing national reserves of natural gas: assuming that the net annual production (extraction) remains constant at its 2010 level, the Dutch natural gas reserve will last about another 15 years. (CBS, *Environmental accounts of the Netherlands 2010,* 2011)
- Energy transformation and new economic growth opportunities: it is envisaged that new markets will develop in energy demand and energy production worldwide. According to several recent studies The Netherlands have comparative advantages for 'earning-potential' in specific product profiles (Energy report 2011, ministry EL&I, modern industry policy, also Ecorys 2010)
- Climate change: there is substantial scientific evidence (IPCC, 2007) that global critical boundaries such as climate change have been exceeded. The consumption of fossil fuels is an important source of carbon emissions.

Renewable energy contributes to securing supplies, diversification of energy supply, reduction of greenhouse gas emissions and creation of green jobs. The sustainable energy sector – which cuts across all industries of the Standard Industrial Classification (NACE) – consists of companies and institutions that physically produce renewable energy, as well as those active in the value chains that precede this physical production. Apart from renewable energy, the sustainable energy sector also includes companies and institutions that focus on energy conservation activities.

[1] In the calculation of the energy dependency it is assumed that the imported energy cannot be substituted by energy extracted from the national territory. If complete substitution is assumed, the energy dependency would be lower. For example, the Netherlands extract more natural gas than is needed for domestic use. If this surplus gas could be substituted for crude oil or oil products (which have to be imported), the energy dependency would be around 25 percent.

As this monitor contains only figures on the recent past, it is not a tool for identifying future opportunities. It is more a tool for evaluating policies aimed at promoting economic opportunities in the sustainable energy sector.

The physical data on the production of renewable energy (Protocol monitoring renewable energy[2]) and the data derived from the 'Economic radar for the sustainable energy sector' can be very valuable in supplementing each other. Between 1990 and 2011, the share of renewable energy in total energy consumption in the Netherlands grew from 1.2 percent to 4.25[3] percent (CBS, *StatLine*). This is still well below the European objective of 14 percent by 2020. Developments urging a transition towards renewable energy resources are relevant for many countries worldwide. Promoting a sustainable energy sector which produces innovative products and technologies can be accompanied by opportunities for future economic growth.

Concepts and definitions

The sustainable energy sector is defined as described by Ecorys (2010):

"Sustainable energy is the energy we can use indefinitely without compromising the environment and the possibilities for future generations. Sustainable energy, better called pure renewable energy, is not generated by using fossil fuels or chemical minerals, which are all finite. We assume that the sun, water and the air are infinite sources. From an economic perspective and the 'Trias Energetica' we also look at activities with a direct impact on sustainable energy policy in manufacturing.. So energy saving will be dealt with(less energy consumption means less energy production) but we also examine activities such as developing the grid, electric transport, hydrogen technology, and capture and storage of CO2 (CCS)." (Ecorys, 2010).

The sustainable energy sector (SES) in this study is broken down into:

The exploitation phase (E-SES): The actual production of renewable energy

The pre-exploitation phase (P-SES): 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, trade in biomass. Also included are companies and institutions dealing with energy saving.

For the pre-exploitation phase figures are available for the variables employment, production, value added, international trade, investments and innovation. No figures are available on innovation and international trade for the entire the exploitation phase.

[2] This protocol was set up to calculate the share of renewable energy in the energy production in the Netherlands (CBS, Hernieuwbare energie in Nederland, 2011)
[3] 2011 share is a provisional figure.

The sustainable energy sector is broken down into 16 product profiles and 7 process profiles. The various product profiles are 'solar PV', 'solar CSP', 'solar thermal energy', 'biogas', 'biomass (solid) & waste', 'biofuels', 'bio-refining', 'wind on land', 'wind at sea', 'heat & geothermal energy', 'energy from water', 'energy saving', 'electric transport', 'smart grids', 'hydrogen technology' and 'CO2 capture and storage'. The process profiles are 'R&D', 'consultancy', 'transport', 'preparation/raw material production', 'supply, assembly and construction', 'production of energy carriers', 'installation and maintenance'. In this study we calculate economic indicators for these profiles.

In the presentation of the figures for the P-SES a distinction is made between specialised and non-specialised companies. Specialised companies are companies within which all activities are directed at a sustainable energy product. Non-specialised companies produce sustainable energy goods or services, but also other products, which are not relevant for this study.

Results

Table 1 provides a summary of our results. Not all figures are available for reference year 2010, as the required data sources are not yet available in the required format. Most results represent the total SES, including both the exploitation and the pre-exploitation phase.

Key economic indicators

In 2009 there was a strong decrease in production value (- 7 percent). It is important to note that all monetary figures are in current prices. This means that the development over time of these figures includes both changes in the quantities produced or traded, and in the prices of the goods or services concerned. In 2009 prices for renewable energy carriers decreased, along with prices of conventional energy carriers, as a result of the global financial crisis.

While production decreased between 2008 and 2009, both employment and value added grew in the same period. These key indicators show an ambiguous development. One explanation for this may be the long-term expectations of companies, and government support schemes. Some companies in the pre-exploitation phase of the sustainable energy industry may have opted to hold on to staff, in some cases with government support, in spite of cutbacks in short- term demand. Positive long-term prospects and support schemes partly explain these ambiguous developments.

Production and value added figures for 2010 are not yet available, but employment is estimated to have grown by 4 percent between 2009 and 2010.

Profiles in sustainable energy sector highlighted

For employment, production and value added, energy saving is the most important product in the P-SES. Both production and value added decreased between 2008 and 2009. These decreases are stronger for specialised than for non-specialised companies. Manufacturers of insulation materials are an important part of this profile. Since construction suffered significantly from the recession, the demand for insulation materials also decreased. Other companies important in this profile are research institutes, consultancy firms and technical service providers.

The production, trade and refining of bio fuels are most relevant for international trade. The Port of Rotterdam is important as a production, storage and transhipment location of bio fuels. Despite the strong decrease (-23 percent) in production value of the bio fuels profile, employment grew (15 percent) in 2008-2009. The change in production value includes both developments in quantities produced and in relevant prices. The decrease in prices of fossil fuels had a downward effect on the price of renewable energy carriers in this period.

In 2009 solar companies were important employers within the P-SES. Value added and production decreased, while the number of employees (fte) grew slightly (4 percent).

Trade balance improvement

Our figures on international trade by SES companies show that exports (2.2 billion euro) almost equalled imports (2.3 billion euro) in 2009. The trade balance improved as imports exceeded exports by more than 400 million euro in 2008. Our measurement of foreign trade is limited to trade in goods; services sold or bought abroad by P-SES companies are not included. The foreign trade figures are dominated by the bio fuels product profile (Rotterdam port). The share of re-exports in total exports of the SES in 2009 was 24 percent. Trade is thus an important feature of the SES in the Netherlands.

Gross fixed capital formation

For both the exploitation and the pre-exploitation phase the figures on gross fixed capital formation are published separately in table 1. Just as the methodology applied and the scope differs for the two phases, so does the interpretation of the results. For the exploitation phase the scope is limited to projects reported to the EIA scheme[4]. In 2009, a year heavily affected by the global financial crises, fixed capital formation in the exploitation phase decreased strongly compared to 2008. In 2010 the figures show a partial recovery.

[4] The EIA scheme is a tax reduction scheme for companies investing in the production capacity of renewable energy or energy savings.

Scope and regulation of the EIA scheme changes over time. Developments over time in figures reflect both changes of the investment climate for the exploitation phase as well as changes to the scheme itself. Temporary extensions of the scheme are reflected as well. One should be carefull in intrepreting these data.

Gross fixed capital formation increased by 12 percent in the pre-exploitation phase in 2008-2009. This gross fixed capital formation has an incidental character: a few large projects determine the distribution of growth over the different product profiles. Gross fixed capital formation for the economy as a whole decreased in the period 2008-2009.

Innovation and R & D

Figures on research and development (R&D) are available at two-year intervals. Table 1 shows that expenditure on R&D as a share of turnover (companies with more than 10 employees) grew in the P-SES. Successful R&D can result in a patent application. Figures provided by the Dutch Patent Office show that most patents are requested in solar, wind and fuel cell technologies. The number of annual patent applications related to renewable energy decreased in the Netherlands from 1999 to 2005, while it increased in the European Union and worldwide. After 2005 the number grew yearly in the Netherlands, until 2008

Almost 120 companies in the P-SES requested one or more patents in 2003-2009. This share is quite high compared to the average for the Dutch economy, where approximately 1 percent of companies submitted one or more patent applications in the last ten years. About one third of the requests are directly related to sustainable energy technology, while over half have no relation to either sustainable energy or the environment. This share is not surprising, considering the fact that many companies in the P-SES in 2009 have activities both within and outside the scope of SES (non-specialised companies). Innovation activity (in terms of patent applications) is more intensive in the SES than on average in the Dutch economy. Patent applications do not necessarily lead to more economic growth, employment or profits.

Key figures for Sustainable Energy Sector (SES)		2009	2010
%-change			
Employment [1]		4	4
Production		-7	na
Value added		2	na
Import of goods		3	na
Export of goods		22	na
Gross fixed capital formation:			
Demand side exploitation phase		-38	37
Pre-exploitation phase		12	na
Innovation (R&D expenditures per euro turnover, change 2008-2010)			20
	2008	**2009**	**2010**
absolute values			
Employment[2] (FTE, rounded)	16 000	16 700	17 400
Production (mln euro, rounded)	5 160	4 800	na
Value added (mln euro, rounded)	1 710	1 750	na
Import of goods (mln euro, rounded)	2 232	2 300	na
Export of goods (mln euro, rounded)	1 806	2 200	na
Gross capital formation:			
Demand side exploitation phase (mln euro, rounded)[3]	1 400	870	1 190
Investments pre-exploitation phase	234	261	na
Innovation (R&D expenditures per euro turnover[4], %)	2.0	na	2.4

[1] 2010 growth figure for P-SES equal to 5 percent

[2] Includes only employees on the payroll of SES companies. Employees hired from temp. agencies are not included

[3] Includes only projects reported to the EIA scheme, based on financial reports by A-NL

[4] 2008 figure has changed compared to previous Radar results because of comparabilty reasons. This figure includes only companies of ten or more employees. Figures only representative for medium-sized and large companies

Table 1: Key figures for the sustainable energy sector 2008-2010

Share of the sustainable energy sector in the Dutch economy

The sustainable energy sector accounted for 0.25 percent of total employment in 2009. In 2008 this was 0.24 percent, and in 2010 0.26 percent. The share in gross domestic product is slightly larger, 0.31 percent in 2009. This share has also grown over time, see figure 1. The indicators share in employment (fte) and share in gross domestic product (GDP) are potential indicators for the green growth framework.

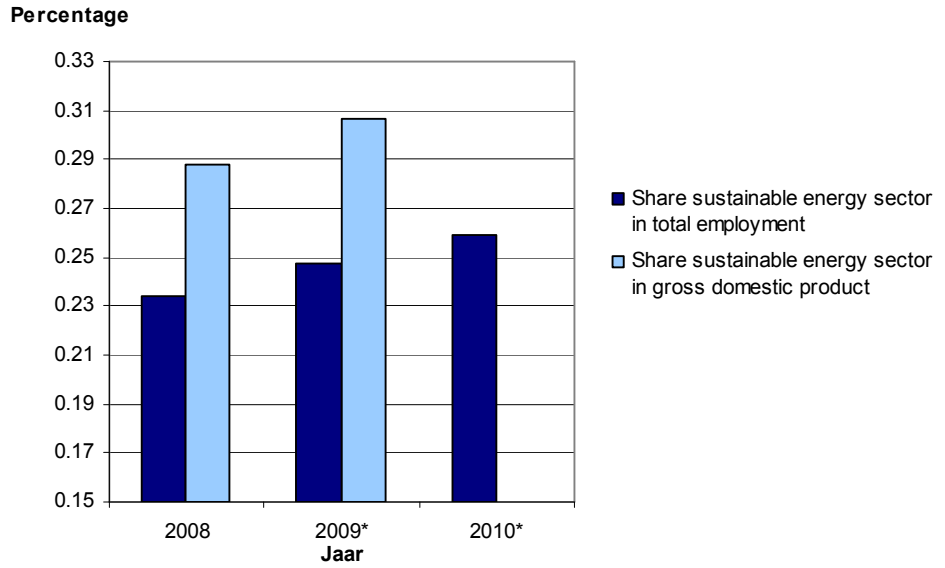


Figure 1: Share of the SES in the Dutch economy

Comparison with conventional energy sector

The sustainable energy sector can be compared to the conventional energy sector. The conventional energy sector can be defined as the sum of the NACE classes: Mining and Quarrying (B), Manufacture of coke and refined petroleum products (19) and Electricity, gas, steam and air conditioning supply (35)[5]. In terms of employment, the conventional energy sector is more than twice as large as the sustainable energy sector (figure 2). It is important to note that the figures for the sustainable energy sector are not directly comparable with those of the conventional energy sector because of some concept differences affecting the figures of both sectors. The sustainable energy sector uses the so called 'value chain approach' while the presented figures for the conventional energy sector are based on the NACE scope concept. The NACE classification system does not use the value chain concept. The conventional energy sector as defined here includes only the exploitation phase (production of energy carriers) and not the pre-exploitation (conventional) activities.

Activities of the sustainable energy sector by companies assigned to NACE classes of the conventional energy sector are excluded from the conventional energy sector.The overlap in figures has been corrected. There is as a consequence no double counting.

[5] Other definitions for the conventional energy sector are possible.

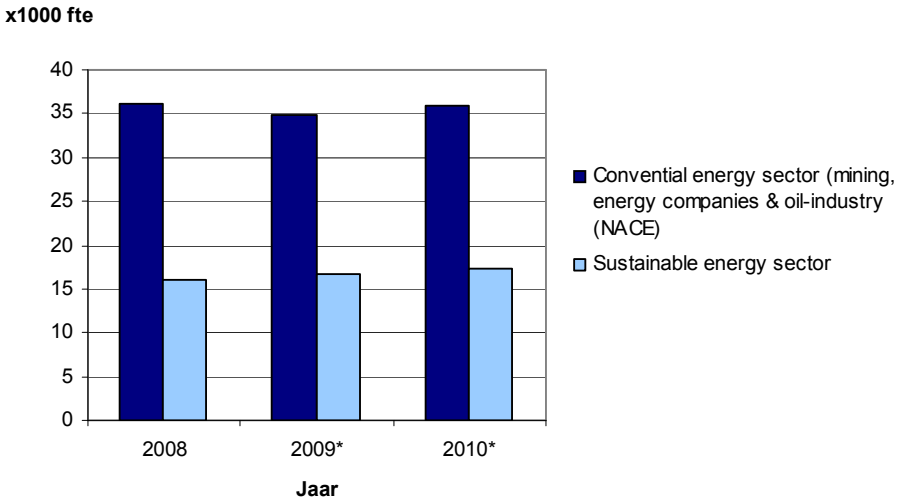


Figure 2: Employment (fte) in the SES (exploitation + pre-exploitation) and the conventional energy sector (exploitation only) 2008-2010 (figures for 2009/2010 are preliminary)*

Innovation themes of Topsector Energy

Recent economic policy in the Netherlands focuses on nine so called 'top sectors'. This study includes figures relevant for the top sector Energy. For this top sector seven themes have been formulated for the compilation of innovation contracts. The selection of these themes is to a large extent based on 'energysector experts' expectations regarding export and employment growth opportunities. Six of the seven themes are elements of the sustainable energy sector (see Annex A). The theme Gas is only partly included in the P-SES, new gas (bio gas product profile) is included while natural gas is not. Two themes concern energy saving: energy saving in the built environment and energy saving in manufacturing. As product profiles used in the E-SES do not facilitate this distinction, table 2 includes only one single figure combining these profiles. One should be careful in interpreting the small numbers of certain profiles.

Themes Topsector Energy	2009		
	Employment (fte)	Production (x million euro)	Value added (x million euro)
Energy saving 1.Built environment and 2. Manufacturing	7,300	1,520	560
3. Gas (natural gas excluded)	400	120	30
4. Smart grids	500	120	40
5. Wind offshore	600	160	50
6. Solar Energy	1,300	410	70
7. Bio-energy	2,200	940	190
Innovationthemes of Topsector Energy	**12,300**	**3,270**	**940**
Other pre-exploitation SES not in top sector themes	1,900	620	210
Total pre-exploitation SES	**14,200**	**3,890**	**1,150**

Table 2 Key figures for the top sector Energy.

The economic figures in table 2 do not include the production of energy carriers other than biofuels. Only pre-exploitation phase (P-SES) activities are included. Energy from water, electric transport, hydrogen technology, onshore wind, solar CSP, solar thermal energy and carbon capture and storage are part of the P-SES, but not of the seven 'themes' within the top sector Energy. Approximately 87 percent of employment in the P-SES is very relevant for the themes of the top sector Energy. Part of the employment is relevant for topsector High Tech Systems and Materials (esp. electric transport) and Water.

Methodology

The results are largely based on readily available data sources within Statistics Netherlands. Using existing data means that there is no additional administrative burden for companies, but also that certain information is lacking.

For the P-SES, information on the extent to which companies actually produce relevant goods and services is based on expert knowledge (so-called specialisation factor). These factors are based on expert estimations by Statistics Netherlands, ECN, Agentschap NL, PBL and EL&I. Once the companies have been identified, multiple registers and surveys were merged to compile the figures of the P-SES. Data from Agentschap NL on patents and subsidy schemes are also used in this monitor.

Specialised companies are included in full for all economic indicators. For non-specialised companies the specialisation factor, estimated by experts, is applied consistently for all economic variables. As the accuracy of the share is not known and may differ per variable, the results are more reliable for specialised than for non-specialised companies.

Unlike the results of the P-SES, the E-SES figures are not based on data of individual companies; information on quantities of energy produced by renewable technologies is used for these statistics.

The methods and sources used have resulted in figures with a reasonable level of reliability for the sustainable energy sector. The figures for production, value added and employment are more reliable than the figures for the other variables such as investments, exports, imports and R&D.

This study, conducted by Statistics Netherlands, is still in a development stage, and requires improvement in certain areas. By monitoring we can gain experience and complete the gradual learning curve. Any future adaptations as a result of changes in methodology will be applied retrospectively, ensuring sequential comparability of the data.

Future developments of this monitor

Supplements to this monitor planned for the second half of 2012 include depreciation and internationalisation. Depreciation is highly relevant, especially for the E-SES, because of the capital intensive nature of these activities. Internationalisation will be measured in terms of Foreign Direct Investment and (foreign) company control.

In 2013 the population of companies in the P-SES will be revised and updated. Monitoring new companies as well as the dynamics of companies already included is essential for compiling accurate figures.

It is recommended that the bio fuels profile in the P-SES be re-assessed. This profile currently includes the production of bio fuels, which could be characterised as an E-SES activity.

Samenvatting

Deze economische radar duurzame energiesector is een vervolg op het rapport dat het Centraal Bureau voor de Statistiek (CBS) in 2011 heeft gepubliceerd. Het voorliggende onderzoek is opnieuw uitgevoerd in opdracht van het Ministerie van Economische Zaken, Landbouw en Innovatie (EL&I). Voor 2008 en 2009 worden gedetailleerde economische cijfers over de activiteiten in de duurzame energiesector gepubliceerd. Daarnaast is voor een aantal economische kerncijfers onderzoek gedaan naar de mogelijkheden voor het samenstellen van meer actuele cijfers.

Deze radar is relevant voor de onderbouwing (ex post) van de kansen voor de Nederlandse economie bij de wereldwijde transitie naar een duurzame energievoorziening en de toenemende aandacht voor energiebesparing. Meerdere geopolitieke en milieu-economische ontwikkelingen vergroten de aandacht voor de energietransitie in het overheidsbeleid. Belangrijke ontwikkelingen zijn:

- Importafhankelijkheid: ondanks het aardgas dat in het noorden van Nederland en op het Nederlands Continentaal Plat op de Noordzee wordt gewonnen, was Nederland in 2010 voor 54 procent afhankelijk van het buitenland voor de energievoorziening[6] (CBS, *Environmental accounts of the Netherlands 2010,* 2011) .
- De Nederlandse aardgasreserve krimpt: de bekende gasreserve in Nederland zal bij het huidige extractieniveau (2010) over ongeveer 15 jaar uitgeput zijn (CBS, *Environmental accounts of the Netherlands 2010,* 2011).
- De introductie van nieuwe energiesystemen wereldwijd biedt volgens diverse studies economische kansen: Nederland heeft volgens deze studies comparatieve voordelen in bepaalde productprofielen op de Europese markt en kan van daaruit inspelen op nieuwe markten (Energierapport 2011, ministerie EL&I, modern industriebeleid, zie ook Ecorys 2010)
- Klimaatverandering: er bestaan wetenschappelijke studies (IPCC, 2007) die aantonen dat het overschrijden van kritische grenzen in het ecosysteem klimaatveranderingen veroorzaken. Het gebruik van fossiele brandstoffen is een belangrijke bron van CO_2 emissie.

Hernieuwbare energie levert een bijdrage aan de zekerheid en diversificatie van de energievoorziening. Tevens kan hernieuwbare energie een bijdrage leveren aan de reductie van de emissies van broeikasgassen en creëert de Duurzame Energiesector ‘groene’ banen. De Duurzame Energiesector bestaat uit bedrijven en instellingen die zich bezighouden met de fysieke productie van hernieuwbare energie en uit bedrijven die actief zijn in waardeketens die hiervoor liggen. Naast hernieuwbare

[6] Bij het berekenen van de importafhankelijkheid is aangenomen dat de geïmporteerde energie niet gesubstitueerd kan worden door energie die binnen het Nederlandse grondgebied (incl NCP) kan worden gewonnen. Het aardgas dat in Nederland wordt gewonnen is deels bestemd voor de export. Als het geëxporteerde gas ruwe aardolie of aardolieproducten zou kunnen substitueren dan wordt de importafhankelijkheid ongeveer 25 procent.

energie bestaat de Duurzame Energiesector ook uit bedrijven en instellingen met activiteiten gericht op energiebesparing.

Deze radar bevat informatie over economische ontwikkelingen in het recente verleden en kan door beleidsmakers worden gebruikt om stimuleringsmaatregelen uit het verleden gericht op de Duurzame Energiesector te evalueren. Deze radar geeft geen inzicht in de toekomstige kansen voor de Duurzame Energiesector in Nederland.

De economische indicatoren in dit rapport en de fysieke gegevens die het CBS jaarlijks publiceert in de publicatie 'Hernieuwbare energie in Nederland' vullen elkaar aan. Tussen 1999 en 2011 is bijvoorbeeld het aandeel duurzame energie in het totale energiegebruik in Nederland toegenomen van 1,2 naar 4,25[7] procent. (CBS, *Statline*). De Europese doelstelling is een aandeel van 14 procent in 2020. De genoemde ontwikkelingen, die de transitie naar een meer duurzame energievoorziening meer op de voorgrond zetten, zijn voor vele landen in de wereld van belang. Het stimuleren van een Duurzame Energiesector, die innovatieve producten en technieken voortbrengt, kan bijdragen aan toekomstige economische groei.

Concepten en definities

Voor de duurzame energiesector geldt een afbakening gehanteerd zoals beschreven door Ecorys (2010):

"*Duurzame energie is die energie waarover we voor onbeperkte tijd kunnen beschikken en waarbij het leefmilieu en de mogelijkheden voor toekomstige generaties niet worden benadeeld. Duurzame energie of beter de zuivere hernieuwbare energie wordt dus uiteindelijk niet opgewekt door of samen met fossiele brandstoffen of scheikundige mineralen die allen eindig zijn. We gaan er dus vanuit dat de zon, water en lucht oneindige bronnen zijn. Vanuit een economisch perspectief en de 'Trias Energetica' wordt ook een licht geworpen op die activiteiten die een indirecte impact hebben op het industriële duurzame energiebeleid. Allereerst is dat energiebesparing (hoe minder energie er verbruikt wordt, hoe minder er dient geproduceerd te worden) maar ook de activiteiten zoals netontwikkeling, elektrisch vervoer, waterstoftechnologie en CO2-afvang en -opslag (CCS) worden onder de loep genomen*." (Ecorys, 2010).

De duurzame energiesector wordt in deze studie opgedeeld in:

De exploitatiefase: De daadwerkelijke productie van hernieuwbare energie

De pre-exploitatiefase: De bedrijven die actief zijn in waardeketens voorafgaand aan de exploitatiefase, zoals de productie van hernieuwbare energiesystemen, R&D gericht op duurzame energietechnologieën, transport van windmolens, handel in biomassa. Ook bedrijven en instellingen die zich bezighouden met energiebesparing worden hierbij meegenomen.

[7] Het 2011 cijfer is een voorlopig cijfer.

Voor de pre-exploitatiefase geldt dat er cijfers beschikbaar zijn voor de variabelen werkgelegenheid, productie, toegevoegde waarde, internationale handel, investeringen en innovatie. Voor de exploitatiefase zijn (op onderdelen) geen cijfers beschikbaar voor de onderwerpen innovatie en internationale handel. De duurzame energiesector is opgedeeld in 16 productprofielen en 7 procesprofielen. De verschillende productprofielen die worden onderscheiden zijn 'zon-PV', 'zon-CSP', 'zonthermisch', 'biogas', 'biomassa (vast) & afval', 'biobrandstoffen', 'bioraffinage', 'wind op land', 'wind op zee', 'warmte & geothermie', 'energie uit water', 'energiebesparing', 'elektrisch vervoer', 'smart grids', 'waterstoftechnologie' en 'CO2 –afvang en- opslag'. De onderscheiden procesprofielen zijn 'R&D', 'consultancy', 'transport', 'voorbewerking/grondstofproductie', 'toelevering assemblage en constructie', 'productie energiedragers', 'installatie en onderhoud en maintenaince'. In deze studie zijn voor deze verschillende profielen economische cijfers vastgesteld.

Resultaten

In tabel 1 staat een samenvatting van de resultaten van de verschillende economische indicatoren. Voor het jaar 2010 is slechts een beperkt aantal variabelen beschikbaar. Deze beschikbaarheid is afhankelijk van het onderliggende bronmateriaal. De meeste gegevens in tabel 1 hebben betrekking op de gehele Duurzame Energiesector, die bestaat uit de pre-exploitatie fase en de exploitatiefase.

<u>Economische kerncijfers</u>

Ten opzichte van 2008 is in 2009 de productiewaarde van de Duurzame Energiesector gedaald. De productiewaarde en andere monetaire variabelen worden weergegeven in lopende prijzen. Dit betekent dat de ontwikkeling van de variabelen altijd bestaat uit de prijsontwikkeling en de hoeveelheidsontwikkeling van de betreffende goederen en diensten. In 2009 zijn de prijzen van hernieuwbare energiedragers sterk gedaald overeenkomstig de prijzen van conventionele energiedragers. Deze prijsdaling werd mede veroorzaakt door de wereldwijde financiële crisis.

Terwijl de productiewaarde daalde tussen 2008 en 2009 laten de werkgelegenheid en de toegevoegde waarde een stijging zien. Dit creëert een tegenstrijdig beeld. Positieve langere termijn verwachtingen en de overheidsmaatregelen kunnen een mogelijke verklaring zijn voor dit beeld. Door positieve toekomstverwachtingen hebben een aantal ondernemers in de pre-exploitatiefase hun werknemers in dienst gehouden, soms met overheidssteun, ondanks de daling in de vraag naar hun goederen en diensten op de korte termijn.

Voor 2010 zijn geen gegevens voor de toegevoegde waarde en productie beschikbaar. De werkgelegenheid is wel geraamd. Deze groeit in 2010 met vier procent ten opzichte van één jaar eerder.

Productprofielen in pre-exploitatiefase belicht

Energiebesparing is het profiel met de grootste werkgelegenheid, productie en toegevoegde waarde. Voor dit productprofiel zijn zowel de productiewaarde als de toegevoegde waarde gedaald tussen 2008 en 2009. De daling is het sterkst bij de gespecialiseerde bedrijven. Dit zijn bedrijven die zich volledig toeleggen op activiteiten die relevant zijn voor de Duurzame Energiesector. Niet-gespecialiseerde bedrijven produceren ook goederen en diensten buiten de afbakening van de Duurzame Energiesector. Producenten van isolatiemateriaal zijn een belangrijk onderdeel van het profiel Energiebesparing. De afzet van deze goederen is sterk gerelateerd aan de bouwnijverheid, een sector die geraakt is door de financiële crisis. Andere typen van bedrijven binnen de Energiebesparing zijn onderzoeksinstellingen en consultants.

De productie, handel en raffinage van biobrandstoffen is het belangrijkste product voor de buitenlandse handel binnen de sector. De haven van Rotterdam is een belangrijke locatie op het gebied van overslag, productie en opslag van biobrandstoffen. Terwijl de productiewaarde sterk daalde (- 23%) is de werkgelegenheid in dit profiel gestegen met 15 procent tussen 2008 en 2009. De daling van de prijzen van zowel fossiele als biobrandstoffen is belangrijk voor het beeld dat ontstaat.

Bedrijven in zonenergie producten waren belangrijk voor de werkgelegenheid in de pre-exploitatiefase in 2009. In de periode 2008-2009 nam de werkgelegenheid toe (4%), de productie en toegevoegde waarde daalden.

Het handelstekort is kleiner geworden

De import (2,3 miljard euro) en export (2,2 miljard euro) van goederen door bedrijven in de Duurzame Energiesector waren in 2009 vrijwel aan elkaar gelijk. In 2008 werd voor ruim 400 miljoen euro meer aan goederen geïmporteerd dan geëxporteerd. Deze cijfers hebben uitsluitend betrekking op goederen. Diensten die door bedrijven in de Duurzame Energiesector worden geëxporteerd of geïmporteerd zijn niet inbegrepen. Biobrandstoffen zijn de goederen die het meest worden ingevoerd en uitgevoerd (haven van Rotterdam). Het aandeel van wederuitvoer in de export door de Duurzame Energiesector bedraagt 24 procent. De groothandel is derhalve een belangrijke activiteit bij het product biobrandstof.

Investeringen

De investeringen in de pre-exploitatiefase en de exploitatiefase worden afzonderlijk gepresenteerd vanwege het verschil in de scope van de cijfers en de gebruikte bronnen. De investeringen in de exploitatiefase beperken zich tot de projecten die bij

de overheid (Agentschap NL) voor de EIA[8] regeling. Ten opzichte van 2008 zijn de investeringen, aangemeld voor de EIA regeling, sterk teruggelopen in 2009. In 2009 had de financiële crisis een sterke invloed op de economische ontwikkelingen in Nederland en daar buiten. De 2010 cijfers laten een gedeeltelijk herstel zien.

Aangezien de EIA regeling qua scope in de tijd veranderd zijn de resulaten slechts indicatief voor de totale investeringen in de exploiatiefase. Bepaalde projecten kunnen het ene jaar binnen de regeling vallen en het daarop volgende jaar niet. De tijdelijke uitbreidingen op de EIA regeling zijn meegenomen.

De investeringen door bedrijven in de pre-exploitatiefase groeiden met 12 procent in de periode 2008-2009. Investeringen kennen een incidenteel karakter en de ontwikkeling en de verdeling over de verschillende productprofielen wordt bepaald door enkele zeer omvangrijke projecten (concentratie). De investeringen in de economie als geheel daalden tussen 2008 en 2009.

Innovatie en R&D

Gegevens over research and development (R&D) zijn niet voor alle verslagjaren beschikbaar, omdat het CBS deze enquête eens per twee jaar verstuurd. Gegevens worden gepresenteerd voor 2008 en 2010. Deze resultaten hebben uitsluitend betrekking op de grotere bedrijven met meer dan 10 werknemers. Succesvolle R&D kan leiden tot een patentaanvraag. Cijfers van het NL Octrooicentrum (onderdeel van Agentschap NL) laten zien dat het grootste deel van de patentaanvragen gerelateerd zijn aan de producten; zonenergie, windenergie en brandstofcellen. Het aantal patentaanvragen per jaar door bedrijven in pre-exploitatiefase is tussen 1999 en 2005 afgenomen. Zowel binnen de EU als wereldwijd was een duidelijke stijging te zien. Tussen 2005 en 2008 is het aantal aanvragen jaarlijks toegenomen.

Van de bedrijven in pre-exploitatiefase heeft ruim 16 procent een of meerdere octrooien aangevraagd tussen 2003 en 2009. Dit aandeel is aanzienlijk hoger dan het totaal van alle Nederlandse bedrijven, waarvan ongeveer één procent tenminste één octrooiaanvraag deed. Van de octrooiaanvragen door bedrijven in pre-exploitatie fase van de Duurzame Energiesector is ongeveer een derde gerelateerd aan duurzame energie technologie, terwijl meer dan de helft duidelijk geen relatie heeft met duurzame en energie of andere milieudoelen. Deze uitkomst wordt verklaard doordat een aanzienlijk deel van de betreffende bedrijven als ‘niet gespecialiseerd’ is gekwalificeerd. Deze bedrijven produceren goederen en diensten waarvan slechts een gedeelte relevant is voor de Duurzame Energiesector. De innovatie intensiteit, gemeten in het aantal octrooiaanvragen, is groter in de pre-exploitatiefase dan in de Nederlandse economie als geheel. Octrooiaanvragen leiden niet noodzakelijk tot meer economische groei of werkgelegenheid.

[8] De Energie Investeringsaftrek (EIA) biedt ondernemers die investeren in duurzame energieproductie of energiebesparing mogelijkheden tot belastingaftrek.

Kerncijfers Duurzame Energiesector		2009	2010
%-verandering			
Werkgelegenheid[1]		4	4
Productie		-7	nb
Toegevoegde waarde		2	nb
Import van goederen		3	nb
Export van goederen		22	nb
Investeringen:			
Exploitatie fase (vraagzijde)		-38	37
Pre-exploitatie fase		12	nb
Innovatie (R&D uitgaven per euro omzet, verandering 2008-2010)			20
	2008	**2009**	**2010**
absolute waarden			
Werkgelegenheid[2] (FTE, afgerond)	16.000	16.700	17.400
Productie (mln euro, afgerond)	5.160	4.800	nb
Toegevoegde waarde (mln euro, afgerond)	1.710	1.750	nb
Import van goederen (mln euro, afgerond)	2.232	2.300	nb
Export van goederen (mln euro, afgerond)	1.806	2.200	nb
Investeringen:			
Exploitatie fase (vraagzijde (mln euro, afgerond))[3]	1.400	870	1.190
Pre-exploitatie fase	234	261	nb
Innovatie (Innovatie (R&D uitgave per euro omzet[4], %)	2,0	nb	2,4

[1] 2010 groeicijfer voor de pre-exploitatiefase is 5 percent

[2] Bevat uitsluitend interne werknemers van bedrijven in de pre-exploitatiefase. Extern ingehuurde werknemers worden niet meegeteld

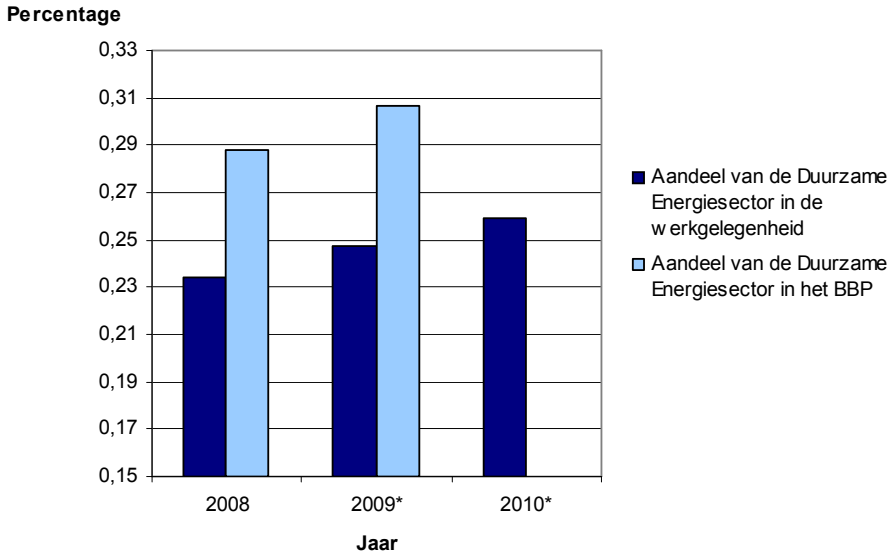
[3] Bevat uitsluitend investeringsprojecten die aangemeld zijn voor de EIA regeling (Jaarverslag A-NL).

[4] 2008 cijfer is gewijzigd ten opzichte van de voorgaande Radar (2011) omwille van de vergelijkbaarheid. Alleen representatief voor middelgrote en grote bedrijven.

Tabel 1: Kerncijfers van de Duurzame Energiesector 2008-2010

Aandeel van de Duurzame Energiesector in de Nederlandse economie

Het aandeel van de Duurzame Energiesector in de werkgelegenheid in Nederland bedroeg 0,25 procent in 2009. In 2008 was dit aandeel 0,24 procent en in 2009 was het aandeel 0,26 procent. Het aandeel in het bruto binnenlands product (bbp) was 0,31 procent in 2009, een kleine stijging ten opzichte van 2008.

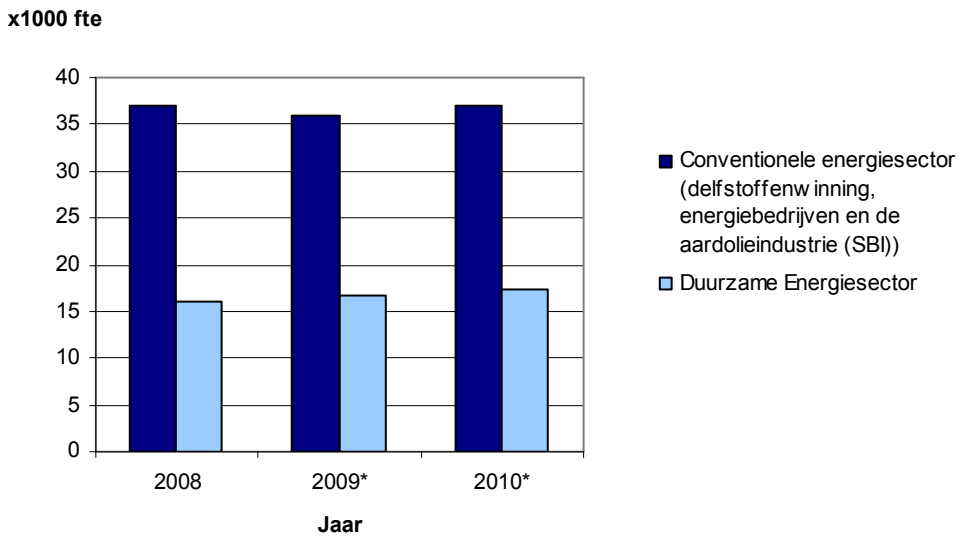


Figuur 1: Aandeel van de Duurzame Energiesector in de Nederlandse economie (cijfers van 2009 en 2010 zijn voorlopig)*

De conventionele energiesector

Om de Duurzame Energiesector te vergelijken met de conventionele energiesector moet deze laatste gedefinieerd worden. Een mogelijke afbakening is de combinatie van de volgende SBI bedrijfstakken: 'Winning van delfstoffen (B)', 'Vervaardiging van cokesovenproducten en aardolieverwerking (19)' en 'Productie en distributie van en handel in elektriciteit, aardgas, stoom en gekoelde lucht (35)'. De werkgelegenheid in de conventionele energiesector is ruim twee keer zo groot als die van de Duurzame Energiesector.

De cijfers van de Duurzame Energiesector en conventionele energiesector zijn niet geheel vergelijkbaar. De afbakening verschilt, omdat voor de conventionele energiesector een aantal bedrijfstakken (SBI) zijn geselecteerd terwijl voor de Duurzame Energiesector de 'gehele waardeketen' wordt meegenomen. Laatstgenoemde bevat bedrijven verspreid over alle bedrijfstakken, van industrie tot en met dienstverlening en onderwijs. De conventionele energiesector, zoals hier gedefinieerd, bevat alleen de exploitatie en niet de pre-exploitatie activiteiten in conventionele energie. Energiebedrijven produceren deels hernieuwbare energie (exploitatiefase) en kunnen ook actief zijn in de pre-exploitiefase van de duurzame energiesector. De overlap die ontstaat is gecorrigeerd door de cijfers van de conventionele energiesector te verminderen met de activiteiten die de betreffende bedrijven op het gebied van duurzame energie verrichten.



Figuur 2: Duurzame Energiesector (exploitatie en pre-exploitatie) in vergelijking met de conventionele energiesector (alleen exploitatie) 2008-2010 (cijfers van 2009 en 2010 zijn voorlopig)*

Innovatiethema's in de Topsector Energie

In het huidige economische beleid van de Rijksoverheid zijn negen topsectoren geformuleerd. Dit zijn sectoren waarin Nederland wereldwijd sterk is en die de overheid verder wil versterken. De topsector Energie is daar een van en deze topsector heeft een gedeeltelijke overlap met de Duurzame Energiesector. Binnen de topsector Energie zijn zeven deelthema's geformuleerd. Experts inzake de energiesector verwachten voor deze thema's grote kansen voor groei in werkgelegenheid en export. Zes van de zeven thema's sluiten aan bij de productprofielen die voor de pre-exploiatiefase worden gebruikt. Het thema Gas bestaat zowel uit natuurlijk aardgas dat geen onderdeel uitmaakt van de Duurzame Energiesector als uit nieuw gas dat overeenkomt met het productprofiel biogas in de pre-exploitatiefase. Op het gebied van energiebesparing worden twee thema's onderscheiden: Energiebesparing gebouwde omgeving en Energiebesparing in de Industrie. De productprofielen in deze studie maken dit onderscheid niet, in tabel 2 wordt het totaal van beide categorieen weergegeven.

Thema's Topsector Energie	2009		
	Werkgelegenheid (fte)	Productie (x miljoen euro)	Toegevoegde waarde (x miljoen euro)
Energiebesparing 1. gebouwde omgeving en 2. Industrie	7.300	1.520	560
3. Gas (exclusief aardgas)	400	120	30
4. Smart grids	500	120	40
5. Wind op zee	600	160	50
6. Zon	1.300	410	70
7. Bio-energie	2.200	940	190
Innovatiethema's Topsector Energie	**12.900**	**3.480**	**1.010**
Overige producten in de pre-exploitatie fase	1.900	620	210
Total pre-exploitation SES	**14.200**	**3.890**	**1.150**

Tabel 2: Kerncijfers (pre-exploitatie) ingedeeld naar de thema's van de Topsector Energie.

De resultaten zijn exclusief de productie van energiedragers anders dan biobrandstoffen. De cijfers beperken zich tot de pre-exploiatiefase. Energie uit water, Elektrisch vervoer, Wind op land, Zon thermisch, Zon CSP en Waterstoftechnologie zijn producten die wel tot de pre-exploiatiefase van de Duurzame Energiesector worden gerekend, maar die niet onder de Topsector Energie vallen. Ongeveer 87 procent van de werkgelegenheid in de pre-exploiatiefase valt onder de producten die zeer relevant zijn voor de Topsector Energie. Een deel van de werkgelegenheid is ook relevant voor Topsector High Tech Systems and Materialen (vooral elektrisch vervoer) en Topsector Water.

Methodologie

De gebruikte methoden berusten op gegevens die al bij het CBS bekend zijn in combinatie met expertkennis van binnen en buiten het CBS. Dit betekent dat er geen additionele administratieve lastendruk bij bedrijven is vanwege dit onderzoek. De expertkennis (ECN, Agentschap NL, PBL, EL&I en CBS) is onder meer gebruikt om de populatie van bedrijven in de pre-exploitatiefase vast te stellen. De populatie van bedrijven is vervolgens gekoppeld met verschillende enquêtes en registers om de kerncijfers voor de pre-exploiatiefase vast te stellen. Gegevens over octrooiaanvragen van deze bedrijven zijn direct afkomstig van het NL Octrooicentrum.

Niet gespecialiseerde bedrijven worden slechts gedeeltelijk meegenomen. Om per bedrijf het aandeel van duurzame energie gerelateerde producten en diensten binnen de bedrijfsactiviteiten te schatten is uitgegaan van experts. Voor alle economische indicatoren is per bedrijf uitgegaan van dezelfde specialisatiefactor. De juistheid van deze factor is niet te toetsen en zal per variabele verschillen. Gespecialiseerde bedrijven zijn volledig toegewijd aan het produceren van duurzame energie goederen en diensten. De resultaten van deze groep zijn niet afhankelijk van de geschatte specialisatiefactor en zijn daarom betrouwbaarder.

In tegenstelling tot de pre-exploitatiefase zijn de resultaten voor de exploitatiefase niet gebaseerd op microdata van individuele bedrijven. De cijfers van exploitatiefase zijn gebaseerd op de energieproductie met hernieuwbare energie technieken.

De gebruikte methoden en bronnen resulteren in redelijk betrouwbare cijfers voor de Duurzame Energiesector. De resultaten voor werkgelegenheid, productie en toegevoegde waarde hebben een hoger betrouwbaarheidsniveau dan de investeringen, import, export en R&D.

De economische radar voor de Duurzame Energiesector is een product dat in ontwikkeling is en waarbij ruimte is voor verbeteringen. Eventuele toekomstige aanpassingen door veranderingen in methodieken zullen teruggelegd worden in de tijd om zodoende de volgtijdelijkheid van de gegevens te waarborgen.

Toekomstige ontwikkelingen van de radar

Voor de tweede helft van 2012 staan nog een aantal uitbreidingen van de radar gepland. Deze hebben betrekking op internationalisering en afschrijvingen. Afschrijvingen zijn met name in exploitatiefase van groot belang, omdat deze vaak kapitaalintensief zijn. Internationalisering wordt concreet door het in kaart brengen van zowel buitenlandse investeringen (FDI) en de (internationale) zeggenschapstructuur in de pre-exploitatiefase.

In 2013 wordt de populatie van bedrijven in de pre-exploitatiefase geactualiseerd en aangepast om nieuwe bedrijven en de dynamiek binnen bestaande bedrijven zo goed mogelijk in kaart te brengen. Het succes hiervan is mede afhankelijk van de beschikbaarheid van externe experts bij ECN, Agentschap NL, PBL en EL&I.

Een aanbeveling is om de productie van bio brandstoffen, die nu onder de pre-exploitatiefase valt, te verplaatsen naar de exploratiefase. Deze indeling sluit beter aan bij karakter van de activiteiten.

1. Introduction and background

In this introduction we present both the objective (1.1) of this study and some background information (1.2) on the relevance of the sustainable energy sector for the Dutch economy.

1.1 Motive and purpose of this study

The increasing importance of sustainable energy sources brings economic opportunities both within the Netherlands and abroad (exports). Economic, technological and geopolitical developments have the potential to make the sustainable energy sector (SES) one the fastest growing industries in the Netherlands (Ecorys, 2010). This study aims to monitor whether these opportunities have been realised in the recent past. The SES includes both energy producers and manufacturers of machinery, researchers, transport and storage companies and other companies active in the value chain of sustainable energy goods and services. The SES comprises industries in energy saving, renewable energy systems as well as industry profiles that make fossil energies relatively more sustainable like CCS. There is prominent role for the leaders and innovators of the industry itself, research and technology and for policymakers in the development of the SES, similar as was the case in the past for the Dutch coal and gas industry. As any new sector, the SES is likely to experience teething problems. Modern energy-industry policies (Energy report 2011) can reduce part of these problems and help to make sustainable energy competitive with its conventional competitors more quickly. This is important, as a large part of the sustainable energy market is still an infant industry and in the development phase. The reduction of teething problems without creating a purely subsidy-driven SES requires intelligent policy that, in turn, requires a comprehensive overview of the energy market. Here we should note that, like all markets, the sustainable energy market knows both a deployment and innovation or supply-side. From a economic policy viewpoint the economic data on the sustainable energy market are very important along physical data on energy production and environmental indicators. Therefore, the Ministry of Economic Affairs, Agriculture and Innovation (EL&I) requested a supply-side overview of the current Dutch sustainable energy market, providing insight into its trends, diversification, value added and employment. In order to be of help in (re)directing present and future industry policies, competitive industries in the SES are an important backbone for future earning capacities of the Dutch economy in general and the new energy systems in particular. The aim of this document is to present an overview by means of economic indicators such as value added, employment, exports, imports, investment and innovation.

1.2 Policy context

The Dutch economy has a long tradition of substantial economic activity in the energy sector. Where the first half of the 20th century was characterised by the extraction of coal in the south of the Netherlands, the second half was characterised by the extraction of natural gas in the north of the country. Furthermore, the port of Rotterdam serves as a gateway for all kinds of fossil fuels to the inlands of Europe, constituting economic activity in both the refinery and distribution of fossil fuels. Although fossil fuels are on a global scale still the main source of energy, there is a growing awareness of the need to create a good investment climate for innovations in and a realistic deployment of new energy systems.. Also in European policy documents robust trends as electrification and the increasing share of new energys systems has been elaborated(Communication by the EC of EU energy roadmap 2050, 15 December 2011). The increasing importance of sustainable energy sources has become self-evident and is indicative of a new global and European perspective on energy consumption and production where comparative economic advantages play an important role in creating a decarbonised, competitive and secure energy sector in the EU and at national level. This is reflected by increasing investments in renewable energy worldwide (e.g. Clean Energy Progress Report (OECD/EIA, 2011)) and by national and international climate and energy goals.

Recent economic policy in the Netherlands is characterised by the formulation of nine top sectors. The objective is further strengthen economic activities in which the Netherlands holds a strong worldwide position (www.rijksoverheid.nl). The economic activities discussed in this study are part of the top sector Energy.

More economic data on energy and the sustainable energy sector in particular is important for several energypolicy motives at national and European level. Some reflections are presented hereafter.

Imports dependency

Geopolitical motives are very relevant for the development of sustainable energy. Fossil fuels can either be extracted from a country's own territory or imported from other countries. If a large amount of these resources have to be imported, a national economy will become very dependent on other countries. If we define energy dependency as the share of net domestic energy consumption originating from imported energy products, the energy dependency of the total Dutch economy in 2010 was 54 percent[9]. This means that more than half of net energy consumption originates from outside the Netherlands, while the remainder was extracted within its own borders. Figure 1.1 below shows that this energy dependency did not change substantially in the period 1990-2010. Its steep decrease in 2007–2010 is a first side effect of the financial crisis, as between 2008 and 2009 the domestic demand for

[9] In the calculation of the energy dependency it is assumed that the imported energy cannot be substituted by energy extracted from the national territory. If complete substitution is assumed, the energy dependency would be lower. For example, the Netherlands extract more natural gas than is needed for domestic use. If this surplus gas could be substituted for crude oil or oil products (which have to be imported), the energy dependency would be around 25 percent

natural gas, produced in the Netherlands, increased compared to the domestic demand for foreign oil products. The energy dependency fell further in 2010, mainly because of the increased use of natural gas for heating as a result of the lower temperatures in the winter months.

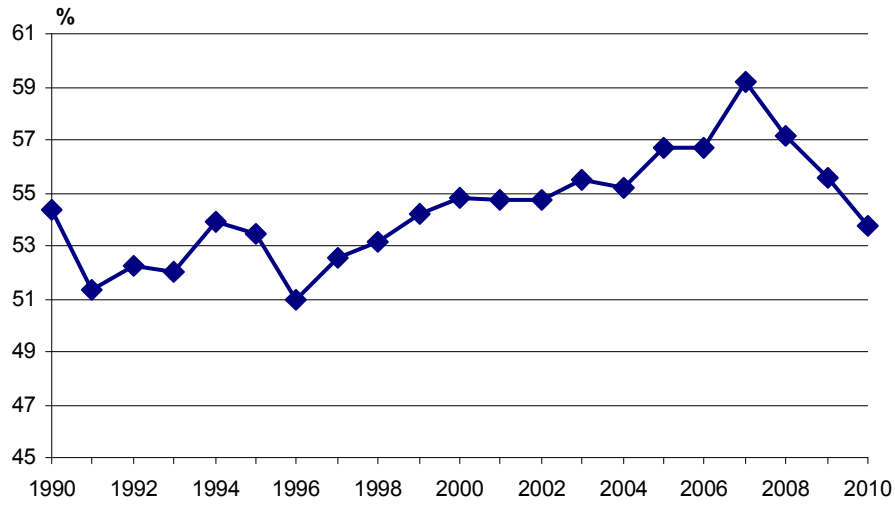


Figure 1.1 Energy dependency of the Dutch economy (Source: Environmental accounts of the Netherlands, 2010)

Limited fossil energy reserves

In this geopolitical context it is also interesting to look at the Dutch gas reserves in more detail. Since the discovery of these natural reserves in the 1950s and 1960s they have been used for the Dutch economy. Revenues from oil and gas extraction have contributed about 3 percent on average to total government revenues in recent years. Although new reserves are discovered occasionally, more than two-thirds of the initial reserves have already been extracted (as far as currently known). At the end of 2010, the remaining expected reserves of natural gas in the Netherlands were estimated at 1,304 billion standard cubic metres (Sm^3). This corresponds to 44,420 PJ. The Dutch economy used 3,723 PJ of net energy in 2010, part of which was imported. Assuming that net annual production remains constant at its 2010 level, Dutch natural gas will last about another 15 years. Figure 1.2 below presents the decrease of the Dutch gas reserves in the period 1990–2011.

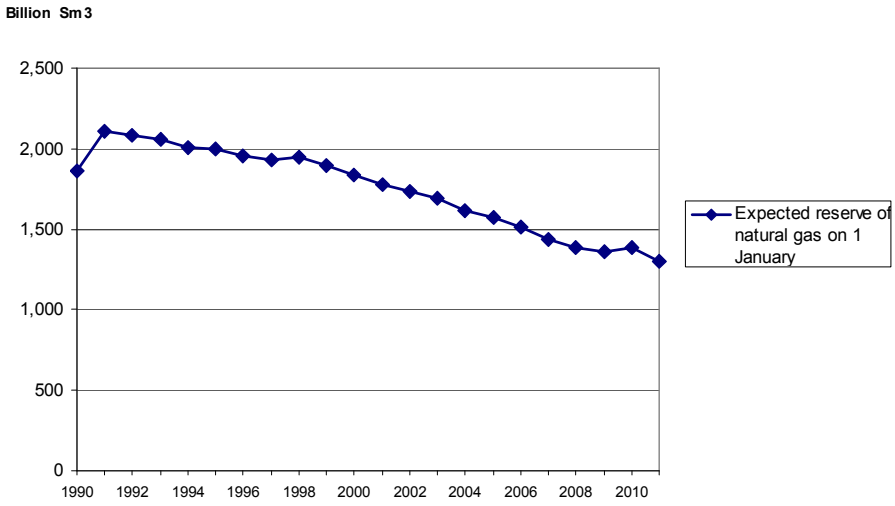


Figure 1.2 Remainder of expected reserve of natural gas on 1 January (Source: Environmental accounts of the Netherlands, 2010)

Energy transformation

The introduction of new energy production and consumption is growing over time. Focussing on the use of renewable energy and compared with total energy consumption, there has been a relatively modest increase between 1990 and 2003 Subsequently the share started to rise more rapidly, partly as a result of government support on the production of renewable electricity. A second effective government measure was the obligation for suppliers of petrol and diesel on the Dutch market to blend their products with bio fuel. This obligation increased gradually overtime. Between 1990 and 2011 the share of renewable energy in the total energy consumption in the Netherlands grew from 1.2 percent to 4.25 percent (CBS, Statline). Well below the European target of 14 percent by 2020. Considering electricity, the production from renewable techniques (CBS, Statline) is about nine percent of total production (CBS, Statline) in 2010 in the Netherlands. At local level consumers, local governments and new institutions are active in creating a better investment climate for new energysystems as soon as grid parity is in reach. Imported Asian solar panels have increased market shares. Industries in the Netherlands play in niches an important role in making the technology, services or complex machinery for these new energy systems (Ecorys 2010).

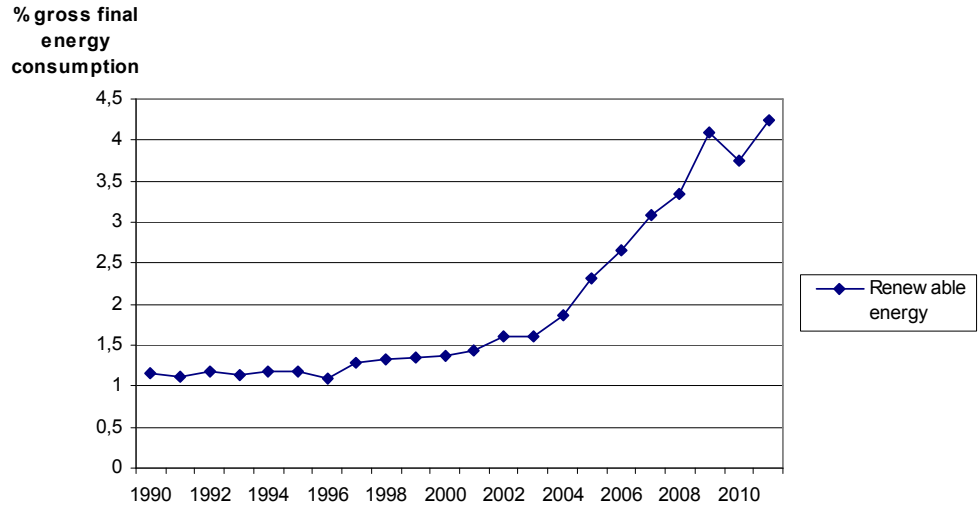


Figure 1.3: Share of renewable energy sources in total energy use (Source: Statistics Netherlands, StatLine, 2012)

Climate change

Most economies have grown in the past decades. In addition to benefits, economic growth has also had harmful side effects. Fossil fuels and other natural resources that enable economic growth are becoming increasingly scarce, which might hamper future growth. Also there is substantial scientific evidence (IPCC, 2007) that global critical boundaries such as climate change have been exceeded. This has led to increasing international acknowledgement that urgent action is required. Under current conditions, the Netherlands is set to realise its Kyoto targets (PBL, 2010). However, only relative decoupling is taking place. Although the growth rate of greenhouse gas emissions from production processes was lower than GDP growth, the total volume of emissions has not decreased.

1.3 Structure of this report

This report is a continuation of the SES radar 2011 and contains four chapters. Chapter 2 includes the definitions and the concepts used in this report. Chapter 3 presents the figures for reference year 2009 and compares these figures to the 2008 results. Chapter 4 shows the results of our feasibility study for the compilation of more recent figures. This chapter includes both the methodology used and its result. Lastly the fifth chapter provides the conclusions and some recommendations for further research.

2. Concepts, definitions and methodology

This chapter provides a detailed description of the activities included in the sustainable energy sector (scope and boundaries, section 2.1). The methods applied to compile the economic indicators for the SES are presented in section 2.2. Lastly, section 2.3 contains the definitions of the economic variables (e.g. production, value added and export).

2.1 Delineation and division of the sustainable energy sector

The present report is not the first study on the Dutch SES. At the request of EL&I, Ecorys conducted a study on the SES in 2010, (Ecorys, 2010). That study defined the SES as follows:

"Sustainable energy is the energy we can use indefinitely without compromising the environment and the possibilities for future generations. Sustainable energy, better called pure renewable energy, is not generated by using fossil fuels or chemical minerals, which are all finite. We assume that the sun, water and the air are infinite sources. From an economic perspective and the 'Trias Energetica' we also look at activities with a direct impact on sustainable energy policy in manufacturing.. So energy saving will be dealt with (less energy consumption means less energy production) but we also examine activities such as developing the grid, electric transport, hydrogen technology, and capture and storage of CO2 (CCS)." (Ecorys, 2010).

SES contains industries active in energy saving, renewable energies and industries making fossil energy more sustainable such as CCS.

This definition is also applied in this study. Furthermore, the results of the Ecorys pilot study earlier served as input for the 'SES radar' published (in Dutch) by Statistics Netherlands in 2011 (van Rossum et al., 2011). The SES radar of 2011 will serve as a benchmark for the present study. This study presents and discusses similar but more recent data, thus constituting a structural monitoring system for the SES. The aim of the 2011 study was to provide an overview of the most recent available data, which turned out to be for 2008 for most statistics. In order to continue this timeline, the first section of this study presents data on SES statistics for 2009. However, for some statistics it was possible to collect newer data and construct more recent statistics (mainly 2010). These are presented in the section on more recent indicators.

With the economic value chain in mind, the SES is separated into two sub-sectors, the pre-exploitation phase (P-SES) and the exploitation phase (E-SES). Ecorys (2010) defined them as:

P-SES: 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, trade in biomass. Also included are companies and institutions dealing with energy saving.

E-SES: The actual production of renewable energy

The P-SES concerns companies and institutions involved in activities that precede the physical production of sustainable energy: for example the development and production of solar cells, wind turbines and frugal energy technologies. This is heterogeneous group of companies, active in many different industries (table 1.1). Electric power companies are not included in the P-SES. Most of their activities in renewable energy relate to deployment and these activities are part of the exploitation phase in this study.

Industry	Share in the number of P-SES companies (%)
Construction	10
Mining and quarrying	1
Financial and business activities	36
Trade, Repair, Transport, Storage and Hotels/Restaurants	5
Manufacturing	23
Government, care and other services	2
Wholesale	22

Table 1.1: Share in the Number of companies in the P-SES per industry in 2009.

The E-SES follows after the P-SES and involves the physical production of energy, for example wind turbine operators or the production of energy carriers using solar panels. It is interesting to distinguish the two sectors, as the P-SES is more R&D intensive while the E-SES is much more capital intensive. Furthermore, the P-SES is of economic interest in terms of high-level employment, while the E-SES indicates the stage of new energy deployment in the Netherlands. Moreover, this distinction allows us to investigate whether investment in technological innovation is reflected in an increased use of sustainable technology in the Netherlands.

In contrast to other studies (Ecorys, 2010 and Roland Berger, 2010), this study is limited to quantifying activities that have a direct relation to the SES, while indirect effects (spillover effects) on other sectors are ignored. Indicative indirect effects are often considered to be a factor 2 (Ecorys) or 3(Roland Berger).

In order to analyse the SES on a more detailed level we build further on the framework constructed by Ecorys (2010). This framework distinguishes different processes and products within the SES. More precisely, the sustainable energy sector is broken down into 16 product profiles (table 1.2) and 7 process profiles (table 1.3).

1. Solar PV
2. Solar - Concentrated Solar Power (CSP)
3. Solar thermal energy

4. Biogas
5. Biomass (solid) & waste
6. Biofuels (including the production of bio fuels)
7. Bio-refining
8. Wind on land
9. Wind at sea
10. Heat & geo thermal energy
11. Energy from water
12. Energy saving
13. Electric transport
14. Smart grids
15. Hydrogen technology
16. CO2 capture and storage (CCS)

Table 1.2: Overview of product profiles (Source: Ecorys, 2010)

1. R&D
2. Consultancy
3. Transport (of biomass, wind turbines, etc.)
4. Preparation/raw material production
5. Supply, assembly and construction
6. Production of energy carriers
7. Installation and maintenance

Table 1.3: Overview of process profiles (Source: Ecorys, 2010)

International context

Lastly, it is important to note that in a national accounting context, the SES is part of the 'environmental goods and services sector', for which Statistics Netherlands has recently developed a new set of statistics. These statistics are the result of a European (Eurostat) handbook on guidelines to construct European statistics that structurally monitor the Environmental Goods and Services Sector These statistics are also part of the System of Environmental Economic Accounting (SEEA), which has been formally adopted by the statistical department of the United Nations in 2012. The SEEA describes an international system of harmonised concepts for the compilation of environmental accounts.

2.2 Methodology

Pre-exploitation phase

Statistics Netherlands assigned individual companies from its business register to the P-SES; these were relevant companies from the environmental goods and services sector already monitored by Statistics Netherlands. Ecorys, ECN and NL Agency all supplied additional companies to complete the population of companies. These companies are linked with the Dutch business register, which allows Statistics Netherlands to derive economic indicators specific to this set of companies. Such an approach is generally referred to as a 'microdata approach'.

Not all relevant companies are dedicated fully to the sustainable energy sector. For each company, the share of sustainable energy goods in its total revenue was estimated on the basis of expert guesses by Ecorys, ECN, PBL, NL Agency and Statistics Netherlands. This share, referred to as the 'specialisation factor', was used to separate specialised companies (specialisation factor = 1) from non-specialised companies (specialisation factor < 1, but > 0) and to compile economic figures for both.

The P-SES includes the complete value chain of sustainable energy sector except for the operational activities, which are part of the exploitation phase. The P-SES consists of activities, such as research, transport and manufacturing, which belong to many different NACE classes. This value chain approach demonstrates the contribution of renewable energy products and energy saving to the Dutch economy (CBS, *Economische radar duurzame energiesector*, 2011).

Exploitation phase

An alternative computation technique was developed for the E-SES. This approach is based not on company level information (micro data) but on industry level information (meso statistics). At industry level, Statistics Netherlands has access to high quality data about the physical production of the various sustainable energy techniques (CBS, *Hernieuwbare energie in Nederland* , 2011).

All data collected for both the P-SES and E-SES are presented in such a way that they are comparable with the data presented in the SES radar 2011 (van Rossum et al., 2011). Furthermore, as this report will be publicly available, all data are aggregated and presented in such a way that the results are anonymous with respect to individual companies.

2.3 Definitions of the economic indicators

This study uses the same definitions and concepts as the System of National Accounts (SNA). This system provides a quantitative description of the economic process within a country and its economic relations with other countries. It distinguishes production, accumulation and distribution of income, spending and finance. All these concepts are determined based on the resident-principle. Residents

are all persons and companies that belong to the Dutch economy. Any person or company (including companies under foreign control) residing in the Netherlands for longer than one year belongs to this group of residents. We use several key concepts from the SNA to monitor the SES: production, value added and employment (in full- time equivalents (FTEs)). Export, imports and capitol formation are part of SNA framework as well. The figures on innovation and R&D are not explicitly part of SNA, all concepts are also defined below.

Production or output (basic prices)

Production covers the value of all goods produced for sale, including unsold goods, and all receipts for services rendered. It also includes the market equivalent of goods and services produced for own use, such as own account capital formation, services of owner-occupied dwellings and agricultural products produced by farmers for own consumption. Production is valued at basic prices, defined as the price received by the producer excluding trade and transport margins and the balance of taxes and subsidies on products. This is the price the producer is ultimately left with.

Value added (basic prices)

Value added at basic prices by industry is equal to the difference between output (basic prices) and intermediate consumption (purchasers' prices). Gross means inclusion of consumption of fixed capital.

Employee (fte)

A person working for a company, an institution or private household located in the Netherlands. Full-time equivalent (fte): a measure of labour volume, calculated by converting all full-time and part-time jobs to full-time jobs

Exports of goods

Exported goods are goods that have been exported by residents from the Dutch economic territory to the rest of the world. Exports of services include services of Dutch transport enterprises abroad, port services, ship repair services and engineering works by Dutch contractors abroad. Also included in exports of services are expenditure by foreign tourists, inhabitants of border areas and diplomats in the Netherlands.

Imports of goods

Imported goods are goods intended for residents that are imported from abroad into the Dutch economic territory. These include raw materials, semi-manufactured products, fuels and final products. They also include imported goods which are re-exported without undergoing any processing. Imports of services include among other things expenditure abroad by Dutch tourists, inhabitants of border areas and diplomats.

Gross fixed capital formation

Expenditure for produced tangible or intangible assets that are used in the production process for more than one year, such as buildings, dwellings, machinery, transport equipment, etc.

Innovation and R&D expenditures

The development of new or significantly improved goods (product innovation) and/or the implementation of new or significantly improved production processes (process innovation). Organisational and marketing innovations also belong to innovation. Generally, innovation can be divided into technological and non-technological innovation. Technological innovation consists of product and process innovation, non-technological innovation consists of organisational and marketing innovation. Innovations may be new for an enterprise, but not necessarily for the industry or market. The innovation may have been originally developed by an enterprise itself or by other enterprises.

A characteristic of R&D is that it is original and innovative. R&D is the creative, systematic and planned search for solutions to practical problems. It also includes strategic and fundamental research aimed at gaining background knowledge and increasing (pure) scientific knowledge rather than generating a direct economic benefit; and the development of ideas and prototypes into useful processes and production-ready products.

3. Economic figures for the sustainable energy sector 2009

3.1 Introduction

This chapter presents figures on employment, production and value added for both the exploitation phase (E-SES) and pre-exploitation phase (P-SES) of the sustainable energy sector. Figures for reference year 2009 are calculated using the same methodology as discussed in the 2008 economic radar for the sustainable energy sector (in Dutch: 'Economische radar duurzame energiesector', van Rossum et al., 2011)).

In the P-SES a distinction is made between companies of which all activities are relevant for the sustainable energy sector (specialised), and companies in which only some activities are relevant for the sustainable energy sector (non-specialised). For the non-specialised companies, the share (specialisation factor) included is based on an expert estimate for each individual company.

The monetary figures on production and value added in this report are in current prices. The developments over time are a combination of both price and volume changes. Real economic growth is always measured in constant prices representing only volume changes.

In section 3.2.1 we present the results for the P-SES. Next in section 3.2.2, we present the results for the E-SES. Section 3.3 includes a summary of the economic key figures for the whole SES. Other economic indicators for 2009, such as imports and exports (3.4), and capital formation (3.5) are also discussed in this chapter.

3.2 Economic key figures

3.2.1 Economic key figures – pre-exploitation phase

Table 3.1 shows employment (in fte's), production and value added[10] in 2009, as well as their growth rates compared to 2008. The total number of employees, including temporary workers[11], was 15,600 fte in 2009. This constitutes a 4 percent growth compared to 2008.

Another figure for employment based on another definition, employees that are on the payroll of companies in the P-SES, shows a similar growth of approximately 4 percent. The latter figure on employment is recommended for use, as it is less dependent on the inclusion of individual companies in the production survey sample.

[10] Value added refers to gross value added and thus includes the depreciation of fixed capital. Gross value added is equal to net value added plus depreciation.
[11] For companies in the production survey this includes temporary workers from employment agencies.

Also the figure including temporary workers may include some double counts if one company in the P-SES hires employees from another.

The increase of 4 percent in employees on the payroll of P-SES companies is similar for both specialised and non-specialised companies. The number of staff hired from temp agencies decreased for specialised companies between 2008 and 2009, while hiring by non-specialised SES companies remained stable. Therefore the total number of employees, including employees hired from temp agencies, increased more in non-specialised companies than in specialised companies.

Total employment in the Netherlands showed a decrease of just over 1 percent in 2009. The P-SES performed better in terms of employment than the total economy on average. The Dutch economy was in recession because of the global financial crisis.

Production value in the pre-exploitation phase of the SES showed a strong decrease of 9 percent between 2008 and 2009. For the Dutch economy this decrease was 5 percent. The P-SES performed more poorly in terms of production in current prices than the total economy on average.

For biofuels the decrease in production value (table 3.2) was caused by a decrease in prices, consistent with the decrease in the prices of conventional fuels. Our bio fuels product profile includes the production of bio fuels as well as research, trade, transport and storage of bio fuels. The physical production of bio diesel grew from 83 million kilos in 2008 to 274 kilo tonnes in 2009 and 382 in 2010 (source: Statistics Netherlands, StatLine).

The energy saving product profile consists partly of companies active in manufacturing insulation materials for buildings. As construction suffered significantly from the recession, the demand for insulation materials also decreased.

Value added shows only a small decrease (1 percent) in the pre-exploitation phase. There is large difference between specialised companies (11 percent decrease) and the non-specialised producers (9 percent growth). Value added of the Dutch economy decreased by 3.6 percent in current prices. The P-SES performed better in terms of value added in current prices than the total economy on average. This should be interpreted with caution, as the decrease in value added of the specialised companies equals 11 percent, which is worse than the decrease of the total economy.

Results are ambiguous because employment increases while production decreases. Value added decreases for specialised companies, while the value added of non-specialised companies increases. This can be explained by the assumption that the development in employment in the P-SES is more dependent on long-term expectations of future profit opportunities and less dependent on short-term disappointments. Also, subsidies and tax exemptions can play a big role in the explanation of the difference in developments of the three main indicators. Tables 3.2 and 3.3 show that developments differ between different products and processes.

		2008	2009	% change 2008-2009
Employees (FTE, rounded)	specialised	6.800	7.100	4
	non-specialised	7.000	7.300	4
	Total	**13.800**	**14.400**	**4**
Employees, including temporary employees (FTE, rounded)	specialised	7.300	7.500	2
	non-specialised	7.800	8.200	5
	Total	**15.100**	**15.600**	**4**
Production (x 1 million Euro, rounded)	specialised	2.030	1.860	-8
	non-specialised	2.260	2.020	-11
	Total	**4.290**	**3.880**	**-9**
Gross Value Added (x 1 million Euro, rounded)	specialised	550	490	-11
	non-specialised	590	640	9
	Total	**1.140**	**1.130**	**-1**

Table 3.1 Economic key figures for the pre-exploitation phase in 2008 and 2009.

Some of the product profiles (table 3.2) and process profiles (table 3.3) are combined, because these small profiles consist of only a few companies. Publication of these profiles individually contravenes the confidentiality regulations of Statistics Netherlands.

It is important to note that companies active in many different technologies (products) in the sustainable energy sector are distributed proportionally over our 16 product profiles. Examples are universities, some research institutes and some consultancy firms. A substantial part of the activities in small profiles, such as the smart grids, comes from these organisations. Their actual focus will differ annually. The figures should be interpreted with caution, especially for the smaller product profiles.

The products biomass and biofuels contributed most to the rise in employment. Some products showed a minor decrease, e.g. solar PV/CSP and heat and geothermal energy.

All profiles, except for biogas, electric transport and combined smart grids/ hydrogen technology/CO2 capture and storage profiles show a decrease in production value. Prices of biofuels and other SES products are notably volatile as their price is partly linked to price of crude oil. These price effects affect the value of the production.

product profiles	2009			% change 2008 -2009		
	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Number of empoyees, (FTE, rounded)						
1. solar PV	1,100	300	1,300	17	-32	1
2. solar CSP	100	0	100	-7	29	-1
3. solar thermal energy	100	400	500	5	13	11
4. bio gas	200	200	400	29	64	45
5. bio mass (solid) & waste	400	300	600	13	-12	1
6. bio fuels (incl bio fuel prod.)	300	700	1,100	51	3	15
7. bio refining	200	300	500	-2	5	2
8. wind onshore	500	0	500	1	18	2
9. wind offshore	200	400	600	-13	8	-2
10. heat & geo thermal energy	500	1,600	2,000	1	-1	-1
11. energy from water	100	0	100	20	39	25
12. energy saving	2,800	2,500	5,300	-4	10	2
13. electric transport	200	200	400	12	12	12
14. smart grids	100	300	500	21	11	14
15. hydrogen technology	100	0	200	13	39	17
16. CO2 capture and storage	100	0	100	5	-8	0
Total	**7,100**	**7,300**	**14,400**	**4**	**4**	**4**
Number of empoyees, including temporarily hired employees (FTE, rounded)						
1. solar PV	1,100	300	1,500	15	-36	-3
2. solar CSP	100	0	100	-9	30	-2
3. solar thermal energy	100	500	600	4	14	12
4. bio gas	200	300	400	23	79	50
5. bio mass (solid) & waste	400	300	700	13	-5	4
6. bio fuels (incl bio fuel prod.)	400	800	1,200	43	5	14
7. bio refining	200	300	500	-1	4	2
8. wind onshore	500	0	500	-3	23	-1
9. wind offshore	200	500	700	-12	35	15
10. heat & geo thermal energy	500	1,700	2,200	-2	-3	-2
11. energy from water	100	0	100	16	39	22
12. energy saving	3,000	2,700	5,700	-6	9	0
13. electric transport	300	200	500	12	4	8
14. smart grids	200	400	500	20	10	13
15. hydrogen technology	100	0	200	12	39	15
16. CO2 capture and storage	100	100	200	3	46	19
Total	**7,300**	**8,200**	**15,600**	**2**	**5**	**4**
Production (x 1 million Euro, rounded)				0	0	0
Solar	400	220	620	-5	-12	-7
4. bio gas	40	80	120	30	64	51
5. bio mass (solid) & waste	60	50	110	7	-10	-1
6. bio fuels (incl bio fuel prod.)	200	520	710	-10	-28	-23
7. bio refining	30	90	120	-50	-13	-25
8. wind onshore	200	10	210	-4	-11	-5
9. wind offshore	50	110	160	-36	-5	-17
Heat & geo thermal energy /energy from water	120	300	410	-7	-13	-11
12. energy saving	670	440	1,120	-10	-1	-7
13. electric transport	50	50	90	6	-3	1
Smart grids/ Hydrogen technology/ CO2 capture and storage	60	150	210	9	29	23
Total	**1,860**	**2,020**	**3,880**	**-8**	**-11**	**-9**
Gross Value Added (x 1 million Euro, rounded)						
Solar	60	70	140	-13	-10	-11
4. bio gas	10	20	30	23	81	53
5. bio mass (solid) & waste	30	20	50	2	-5	-1
6. bio fuels (incl bio fuel prod.)	20	80	100	29	-4	1
7. bio refining	10	30	40	-53	19	-12
8. wind onshore	40	0	40	5	37	7
9. wind offshore	20	30	50	-20	9	-4
Heat & geo thermal energy /energy from water	40	120	160	9	-3	0
12. energy saving	220	180	400	-20	10	-9
13. electric transport	20	20	40	10	19	14
Smart grids/ Hydrogen technology/ CO2 capture and storage	30	70	90	15	87	59
Total	**490**	**640**	**1,130**	**-11**	**9**	**-1**

Table 3.2 Economic key figures for the pre-exploitation phase of the sustainable energy sector in the Netherlands, per product profile, including production of biofuels

Value added shows only a small decrease (1 percent) in the pre-exploitation phase. There is a large difference between specialised companies (11 percent decrease) and non-specialised producers (9 percent growth). This difference must be taken into account in interpretation of the results. This pattern is very similar for the energy conservation product profile. Apparently companies specialised in energy saving had a difficult year in 2009.

Table 3.3 shows the economic key figures for the process profiles. Most of the activities are concentrated in the supply, assembly and construction profile. This profile predominantly consists of manufacturers of insulation materials (23 percent of value added in the process), manufacturers of machinery (18 percent) and wholesale trade (18 percent). In this process profile the number of employees falls slightly, in line with general developments in the Dutch economy. All other process profiles show an increase. The manufacturing industry in the Netherlands was hit heavily by the global economic crisis. Manufacturers of insulation materials, solar panels and efficient central heating boilers, for example, are included in the P-SES.

	2009			% change 2008 -2009		
process	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Number of empoyees, (FTE, rounded)						
Installation and maintenance	500	1.200	1.700	-4	10	6
R&D	1.300	800	2.100	4	33	13
Production of energy carriers	200	300	500	70	14	35
Supply, assembly and construction	4.000	3.100	7.200	2	-1	1
Preparation/raw material production	100	300	400	36	19	24
Consultancy + Transport	1.000	1.600	2.600	2	-3	-1
Total	**7.100**	**7.300**	**14.400**	**4**	**4**	**4**
Number of empoyees, including temporarily hired employees (x 1,000 fte, rounded)						
Installation and maintenance	500	1.400	1.900	-8	9	4
R&D	1.300	800	2.100	1	37	12
Production of energy carriers	300	300	600	58	13	29
Supply, assembly and construction	4.200	3.500	7.700	0	-2	-1
Preparation/raw material production	100	300	500	33	41	39
Consultancy + Transport	1.000	1.800	2.900	4	0	2
Total	**7.500**	**8.200**	**15.600**	**2**	**5**	**4**
Production (x 1 million Euro, rounded)						
Installation and maintenance	190	340	530	15	7	10
R&D	210	230	440	-5	13	4
Production of energy carriers	160	370	530	-20	-30	-27
Supply, assembly and construction	1.000	740	1.740	-13	-12	-13
Preparation/raw material production	100	70	170	50	13	32
Consultancy + Transport	200	260	460	-11	-13	-12
Total	**1.860**	**2.020**	**3.880**	**-8**	**-11**	**-9**
Gross Value Added (x 1 million Euro, rounded)						
Installation and maintenance	40	100	140	23	17	18
R&D	90	90	180	-3	111	33
Production of energy carriers	10	40	40	-19	0	-4
Supply, assembly and construction	270	270	540	-21	-6	-14
Preparation/raw material production	10	30	40	110	39	55
Consultancy + Transport	70	120	190	4	-1	1
Total	**490**	**640**	**1.130**	**-11**	**9**	**-1**

Table 3.3 Economic key figures for the pre-exploitation phase of the sustainable energy sector in the Netherlands per process profile, including production of bio-fuels

3.2.2 Economic key figures – exploitation phase

The exploitation phase includes the operation of renewable energy installations in which energy (electricity, heat) is produced from renewable resources. The production and value added of these activities is calculated based on the quantities produced (CBS) and their relevant prices (CBS). Employees are active in operation and maintenance of the installations. These employees may be employed by the companies that operate the relevant installations or by specialised companies in other industries. The number of employees is based on the operation and maintenance costs (ECN) and the quantities produced or operational capacity installed (CBS). Operation and maintenance costs are based on studies from the Energy Research Centre of the Netherlands (ECN).

For more information on the production and production capacity of renewable energy technology we refer to the *Hernieuwbare Energie in Nederland* [Renewable energy in the Netherlands] (CBS, 2011). Figures presented in the publication provide meaningful insights into the developments in the SES.

All economic key indicators show a growth from 2008 to 2009[12] (table 3.4). Biomass and wind energy are the most relevant technologies in the E-SES in the Netherlands. Both biomass and wind energy accounted for a bigger production value in 2009 than 2008, and employment also grew. However, for wind energy the value added shows a small decrease (minus 2 percent) while the value added for energy from biomass increased strongly (22 percent). The decrease in the price of electricity was unfavourable for capital-intensive renewable energy producers. As a result, value added of wind energy production was lower than in 2008. Value added of biomass combustion increased sharply because of more renewable energy by means of more combustion of biomass by energy companies and companies from the waste sector.

Production 2009 (x 1 million Euro, rounded)	Hydropower	Windenergy	Solar energy	Biomass	Biogas	Heat and geothermal	Total
Agriculture	0	70	0	10	40	0	120
Construction	0	0	0	0	0	0	0
Mining and quarrying	0	0	0	0	0	0	0
Electricity, gas and water supply	10	250	0	230	0	0	490
Financial and business activities	0	20	0	0	0	0	20
Trade, Repair, Transport, Storage and Hotels/Restaurants	0	0	0	0	0	0	0
Manufacturing	0	0	0	30	10	0	50
Waste incineration, government, care and other services	0	0	0	190	20	0	210
Not allocated	0	0	0	0	0	30	30
Total	**10**	**340**	**0**	**460**	**70**	**30**	**920**
% change 2008-2009	-4%	4%	-6%	9%	0%	0%	6%
Gross Value Added 2009 (x 1 million Euro, rounded)							
Agriculture	0	40	0	10	40	0	90
Construction	0	0	0	0	0	0	0
Mining and quarrying	0	0	0	0	0	0	0
Electricity, gas and water supply	10	160	0	70	0	0	230
Financial and business activities	0	10	0	0	0	0	10
Trade, Repair, Transport, Storage and Hotels/Restaurants	0	0	0	0	0	0	0
Manufacturing	0	0	0	30	10	0	50
Waste incineration, government, care and other services	0	0	0	190	20	0	210
Not allocated	0	0	0	0	0	30	30
Total	**10**	**210**	**0**	**300**	**70**	**30**	**620**
% change 2008-2009	-4%	-2%	-6%	22%	0%	0%	8%
Number of empoyees 2009 (FTE, rounded)							
Agriculture	0	200	0	0	400	0	600
Construction	0	0	0	0	0	0	0
Mining and quarrying	0	0	0	0	0	0	0
Electricity, gas and water supply	0	700	0	100	0	0	800
Financial and business activities	0	0	0	0	0	0	0
Trade, Repair, Transport, Storage and Hotels/Restaurants	0	0	0	0	0	0	0
Manufacturing	0	0	0	200	100	0	300
Waste incineration, government, care and other services	0	0	0	300	200	0	600
Total	**0**	**900**	**0**	**600**	**700**	**0**	**2,300**
% change 2008-2009		4%	17%	2%	7%		5%

Table 3.4 Economic key figures of the exploitation phase of the sustainable energy sector, 2009.

3.2.3 Economic key figures – total

Table 3.5 provides a summary of the economic key figures in both the exploitation and pre-exploitation phase SES.

[12] Growth percentages are based upon unrounded numbers.

	2009			Percentage of change 2008-2009		
	Pre-exploitation	Exploitation	**Total**	Pre-exploitation	Exploitation	**Total**
Employees (FTE, rounded)	14,400	2,300	**16,700**	4%	5%	**4%**
Production (x 1 million Euro, rounded)	3,880	920	**4,800**	-9%	6%	**-7%**
Gross Value Added (x 1 million Euro, rounded)	1,130	620	**1,750**	-1%	8%	**2%**

Table 3.5 Economic key figures of the total sustainable energy sector, 2009.

Total employment in the SES increased by 4 percent between 2008 and 2009, to 16.7 thousand fte. The production value in 2009 was 7 percent lower than in 2008, while value added grew by 2 percent. The increase in value added is mainly the result of the more value added in the exploitation phase of the SES.

3.3 Imports and exports

This section presents the value of foreign trade by companies in the SES. These trade flows are limited to trade in goods only. Imports and exports of services are not included as the required data are unavailable. International trade of goods by P-SES companies and trade in biomass and bio fuels by E-SES companies are presented in tables 3.6, 3.7, 3.8 and 3.9.

	2009			% change 2008-2009		
Product profile	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Solar	175	50	225	84	-3	53
Biomass*		116	116		24	24
Bio fuels*		1457	1,457		-1	-1
Energy saving	119	46	165	-25	-12	-22
Other Products	162	171	333	-8	29	8
Total	**456**	**1,840**	**2,296**	**6**	**2**	**3**

Table 3.6 Imports of goods (million euro) by the sustainable energy sector per product profile (includes exploitation phase)*

	2009			% change 2008-2009		
Product profile	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Supply, assembly and construction *	302	1,797	2,099	7	2	3
Other Processes	154	43	197	4	-1	3
Total	**456**	**1,840**	**2,296**	**6**	**2**	**3**

Table 3.7 Imports of goods (million euro) by the sustainable energy sector per process profile (includes exploitation phase)*

In 2009 the value of the goods imported by the sustainable energy sector increased. The relative growth of imports by specialised companies was larger, specifically for producers of solar products, than the growth for non-specialised companies. The value of imported bio fuels was 1 percent lower in 2009 than in 2008.

	2009			% change 2008-2009		
Product profile	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Solar	213	100	313	61	-1	34
Biomass*		5	5		-82	-82
Bio fuels*		1463	1,463		32	32
Energy saving	210	60	269	-6	6	-4
Other Products	40	115	155	98	-17	-2
Total	**462**	**1,743**	**2,205**	**23**	**22**	**22**

Table 3.8 Exports of goods (million euro) by the sustainable energy sector per product profile (includes exploitation phase)*

Product profile	2009			% change 2008-2009		
	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Supply, assembly and construction *	373	1,677	2,050	14	23	21
Other Processes	89	66	155	82	-4	32
Total	**462**	**1,743**	**2,205**	**23**	**22**	**22**

Table 3.9 Exports of goods (million euro) by the sustainable energy sector per process profile (includes exploitation phase)*

As tables 3.8 and 3.9 show, exports grew faster than imports (tables 3.6/3.7). In 2009 - just as in 2008 – there was still a negative trade balance for the SES. Exports equalled approximately 2.2 billion euro, imports approximately 2.3 million euro. The trade deficit was therefore minus 100 million euro in 2009. The trade deficit was larger in 2008, namely 400 million euro. The improvement in the trade deficit was caused by a number of factors:

- Exports of solar products increased faster than imports of solar products. This growth was mainly the result of more re-exports of solar products by wholesale traders in the Rotterdam area. Industries in the Netherlands play an important role in the niche market for complex solar production machines who are increasingly exported to Asia.

- More production of bio fuels in the Netherlands by manufacturers for foreign consumption. In physical terms, more bio fuels are still imported than exported. Terms of exchange of wholesale traders also improved in 2009.

- Lower imports by companies producing energy conservation products. Fewer insulation materials were imported, because the construction industry was affected by the financial crisis. Investments in energy conservation equipment were also cancelled or postponed.

There was only one exception. Imports of biomass increased in value and in physical terms, as energy companies co fired more and more biomass to produce electricity.

The share of re-exports in total exports of the SES was 24 percent in 2009, see table 3.10. Trade is thus an important feature of the SES in the Netherlands. Trade in bio fuels is particularly significant because of the favourable location of the Netherlands in Europe (Rotterdam effect).

	2009
Total Export	2,205
Total Re-exports	520
Re-export of biomass and bio fuels	402
Re-export of other goods	118
Share Re-exports	24%

Table 3.10 re-exports in the sustainable energy sector

3.4 Gross capital formation

For a correct interpretation of gross capital formation in the P-SES it is important to emphasise that the figures in table 3.11 include only the pre-exploitation phase of the sustainable energy sector. For example, gross capital formation by companies active in the wind energy product profile relates to the extension of capacity by producers of wind energy products and is included. Construction of wind farms represents gross capital formation by E-SES companies and these investments are therefore not included in table 3.11.

Total gross capital investment by P-SES companies in 2009 was 261 million euro. Compared to 2008 this is a growth of 12 percent. Gross capital investments have an incidental character. Often large amounts spent in a particular year are not repeated or extended in subsequent years.

	2009 (x 1 million Euro)			% change 2008 -2009		
	specialised	Non-specialised	Total	specialised	Non-specialised	Total
Solar and Wind	87	29	116	272	61	181
Bio gas	1	0	1	94	-30	34
Bio mass (solid) & waste	4	4	8	48	5	24
Bio fuels/ bio refining/ energy saving	74	48	122	-38	2	-27
Heat & geo thermal energy/ energy from water	4	4	8	-7	-29	-19
Electric transport/ smart grids/ hydrogen technology/ CO2 capture and storage	4	3	6	76	-59	-28
Total	**174**	**87**	**261**	**14**	**8**	**12**

Table 3.11 Gross capital formation in the pre-exploitation phase of the sustainable energy sector per product profile

Solar and wind energy showed the strongest growth in gross capital formation in 2009 compared to 2008. One solar panel producer is responsible for a large part of this growth. A lot was also invested in ships for the transport of wind turbines. Gross capital formation by companies producing biomass and biogas products also grew, but the absolute level of gross capital formation was quite small for these products. Although product profile Bio fuels has the largest gross capital formation, in 2008 gross capitol formation in this profile was much larger. This is mainly related to new biofuel production facilities and storage facilities.

In 2009, again, capital formation is concentrated in a few large projects. The three largest projects accounted for 50 percent of total gross capitol formation in 2009. a number of products have been combined in table 3.11 for reasons of confidentiality.

Capital formation in the SES grew in 2009 compared to 2008. Gross fixed capital formation in the total Dutch economy decreased in 2009 compared to 2008.

The figure for non-specialised companies has a bigger margin of error than the figures for specialised companies. For these non-specialised companies the so-called specialisation factor is applied, which could lead to errors in total gross capital formation. Companies included in the sample of the business investment survey constitute 97 percent of the figures in table 3.11. The remaining 3 percent is the result of a statistical imputation process.

4. More recent indicators on the sustainable energy sector

4.1 Introduction

This chapter provides a description of the efforts made for reporting more recent figures for the SES. For some economic indicators, such as production and value added, the availability of survey data is required. Collecting and processing these survey data results in figures that are available 18 months after the reference year. The same holds for employment in fte's. Unfortunately it is not possible to compile more recent data for these specific key indicators of the SES. The number of jobs, on the other hand, is available much sooner for the P-SES; by using a different data source statistics can be made on the number of jobs in 2010. In this chapter we include the number of jobs in 2010. This jobs figure is strongly related to the number of employees (fte), because the relation between jobs and fte's is quite stable over time. A partial figure (exploitation phase) on investment in the exploitation phase of the E-SES is also available for 2010 (section 4.3). Section 4.4 describes research and development by companies in the sustainable energy sector in 2010.

4.2 Employment in the pre-exploitation phase of the sustainable energy sector in 2010

In order to monitor developments in the pre-exploitation phase of the sustainable energy sector (P-SES), we monitor employment developments of the companies that are active in the P-SES in 2009 and 2010. For 2009 we identified over 700 companies that are active in the P-SES. The criteria used to define this population can be found in the report on the economic radar of the sustainable energy sector (in Dutch: 'Economische radar duurzame energiesector', (van Rossum et al., 2011)).

The general idea is to construct an indicator that allows us to monitor developments in the P-SES both accurately and as up-to-date as possible. So far, most indicators are available at $t - 30$ (with t in months). One of the company-level statistics that is available relatively early is employment data (number of jobs). As of January 2012 annual, company-level employment statistics are available up to the year 2010 (i.e. at $t - 18$ months). Below we describe the procedure and considerations that allow us to make a fair comparison between the employment figures for these years.

Data sources and employment in 2009

For employment data, we use the employment registers of 2009 and 2010. These registers consist of all Dutch companies that hire employees and therefore, naturally, do not include sole proprietorships. This implies that all companies that are in the P-SES but not in the employment register of 2009 should in fact be sole proprietorships. These constitute a total of 164 sole proprietorships that hire no employees. However, these sole proprietorships are important because they may hire employees in 2010. This gives 563 companies that, according to the 2009 employment register, hired a total number of 14,500 employees (number of jobs) in

2009. This number is corrected for the specialisation factor, as discussed in section 2.1.

Comparison of employment in 2009 and 2010

Obviously, we want to make a reliable comparison with the number of jobs in 2009 and 2010. However, not all companies of the 2009 P-SES population are in both the 2009 and 2010 employment registers. A company might not be in the 2010 employment register because of bankruptcy but also because of a change of name, merger or relocation. This implies that some companies might have continued with the same business activities, but under a different 'flag'. It is worthwhile to trace these companies, because there is a significant difference between these categories. This additional micro-level search consisted of a 'Google search', which allowed us to confirm whether companies are still active. It turned out most relevant companies were still active.

Other companies that deserve additional effort are sole proprietorships that started hiring employees in 2010 and new companies that started business in 2010. Both company types are not in the 2009 employment register, but do create jobs in 2010.

The number of jobs in the P-SES grew from 14,500 in 2009 to 15,300 in 2010. This constitutes an increase of 5.1 percent. We consider this growth rate to be quite accurate, as 95 percent of the total employment figures are directly included in the data.

It is interesting to zoom in on the data and look a bit deeper at the sources of growth in the 2009 and 2010 employment statistics. Both the sole proprietorships that started hiring and the new companies are important. Together they are responsible for almost 400 new jobs. This constitutes a total growth contribution of 2.5 percent which represents almost half of the total growth.

Total employment SES in 2010

The number of employees (fte) employed in the E-SES is estimated to be 2,300 in 2010 (using the same method as for 2009). As stated before, the employment in fte's of the P-SES in 2010 cannot yet be calculated directly. Using the growth in the number of jobs (5.1 percent) as in indicator for the development of the fte's employed in P-SES results in an estimate of 15,100 for 2010. Adding P-SES and E-SES results in a preliminary figure of 17,400 fte's in 2010. The 2010 figure of employment (fte) in the total sustainable energy sector is a provisional figure.

4.3 Gross capital formation in the exploitation phase in 2010

In order to monitor developments in the exploitation phase of the sustainable energy sector (E-SES) we focus on its climate for investment. This is feasible because companies can request a subsidy (i.e. tax exemption) if they think their capital formation projects comply with the EIA (*Energie Investeringsaftrek regeling*) exemption criteria. Companies apply for subsidy to NL Agency, which is part of the Dutch Ministry of Economic Affairs, Agriculture and Innovation. Subsequently, NL Agency either approves or rejects these applications.

Every year NL Agency publishes a detailed overview of these subsidy requests, categorised by reported investment category (e.g. 'Wind turbine'). In the economic radar of the sustainable energy sector (Van Rossum et al., 2011) these activities are categorised into 16 product profiles that we present in table 4.1 below. We further present the amount of investment (million euro) for which subsidy was requested[13] in 2009 and 2010. Here we should note that we present the provisional figures (i.e. as first published) for both years, as this allows us to make a reliable comparison. Using more recent data leads to a bias, because the provisional figures are simply constructed by adding up the information that is available at the moment of publication, without correcting for missing data. This implies that more recent figures are affected by larger underestimation, which would create a downward bias in the estimation of growth.

Lastly, we should note that the figures in table 4.1 contain only E-SES gross capital formation for which subsidy was requested. This implies that the actual volume of investments in the E-SES might be larger.

Profile	Reported investments (x 1 million Euro)		% change 2009-2010
	2,009	2,010	
Solar panels	21	40	97
Biogas	4	7	65
Biomass (solid) & waste	36	15	-59
Biofuels	0	9	4,450
Wind on land	55	78	43
Warmth & Geothermics	321	256	-20
Energy savings	431	733	70
CO2-capture and -storage	3	53	1,623
Total	870*	1,191**	37

Table 4.1 Gross capital formation (in millions of euros) by companies in the E-SES per product profile in 2009 and 2010.

The product profiles in table 4.1 allow us to monitor the developments within the E-SES more meaningfully. They show that:

- In 2010 there was overall growth in gross capital formation. Bio fuels and Carbon Capture and Storage (CCS) showed the highest growth percentages.
- Growth in reported investment in energy savings accounts most to the growth in investment (gross capital formation) in the total E-SES (in absolute terms).
- Biomass (solid) and waste and warmth and geothermic profiles show decreasing gross capital formation.
- In 2010 warmth and geothermic and energy savings remain the major profiles in terms of absolute reported projects.

The overall growth rate of 37 percent may seem large, but considering a decrease of 38 percent in reported investment over 2008-2009, it can also be interpreted as a partial recovery from the 2009 crisis. However, when we compare this pattern with

[13] Not necessarily approved.

overall investment in the Dutch economy, which decreased by 9.9 percent[14] in 2009 and a further decreased 4.1 percent in 2010, we can conclude that the climate of investment in the E-SES in 2010 was much better than on average.

The scope of these figures is limited to the EIA scheme only, actual capital formation related to renewable energy production of energy saving will be larger. Also the conditions of the EIA scheme change in time. Developments include both actual change in the investment climate and 'administrative' changes of the EIA scheme.

4.4 Innovation and R&D by the pre-exploitation phase in 2010

Every two years, Statistics Netherlands carries out an innovation survey that aims to collect information on R&D activities in the Netherlands. The two most recent surveys have been carried out for 2008 and 2010. In this section we compare different aspects of innovation in 2008 and 2010 based on these surveys. This sample survey includes only companies that have 10 or more employees. Our figures on R&D represent only the bigger companies in the pre-exploitation phase. As over half of the companies in the P-SES had fewer than 10 employees in 2008, representativeness of the figures on R&D is not satisfactory.

For 2008, 73 P-SES companies matched the survey sample and for 2010 53 matched the survey sample; 43 companies are in both survey samples. However, not all these companies respond to all the relevant questions. Therefore, because of missing responses to specific questions, the reference group might contain slightly fewer companies in some of the sub-analysis presented here.

We should note that in order to compare the results over time, the 43 companies (or sometimes slightly fewer) that are in both samples serve as our main reference group. There might thus be a selection bias, since we only look at companies that existed in both 2008 and 2010 and responded to the surveys in both years. These companies might have specific patterns in R&D spending. In view of the possibility of sample bias, the results in this section should be interpreted with care.

This section compares R&D spending as a share of company turnover. The total sample is dominated by one (special) company that has relatively large R&D spending. If we correct for turnover and remove the outlier we get figure 4.1.

14 http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=81144NED&D1=1&D2=0&D3=20-22&HDR=T&STB=G1,G2&VW=T

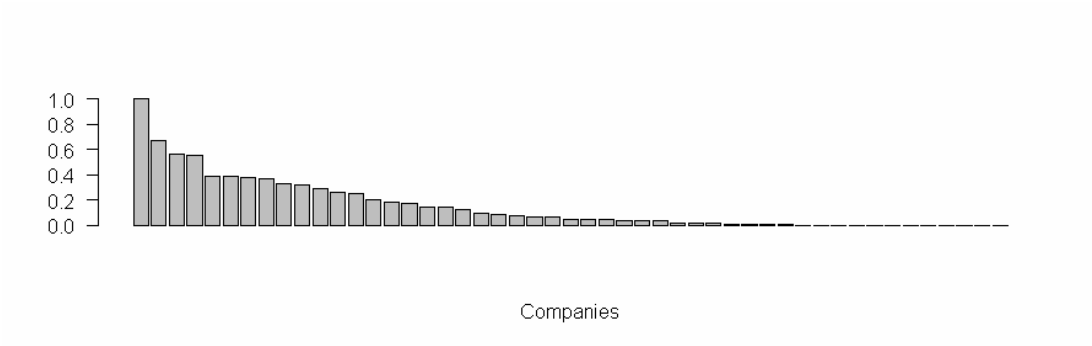


Figure 4.1 R&D spending as share of turnover 2010 (rescaled to maximum value)

Figure 4.1 also shows that substantial shares of R&D spending are performed by a limited share of the P-SES companies, while a large number of companies spend relatively small amounts. This is further illustrated by table 4.2 which presents the average R&D spending as share of turnover without the outlier[15]. These results are only representative for medium-sized and large companies in the P-SES.

R&D spending measures	2008	2010	Change
R&D spending as share of total turnover	2.0%	2.4%	20%
Median of R&D spending shares	1.1%	1.3%	18%

Table 4.2 Average and median R&D spending as share of turnover

Some specific survey questions are related to intellectual property rights that can be considered to be results of innovation activities. Again, we compare the 38 companies that are in both the 2008 and 2010 survey samples and responded to the relevant questions. Table 4.3 presents the percentages for companies that requested a copyright, registered a trademark, registered an industrial design and/or applied for a patent.

Innovation indicator	2008	2010	Change
Requested copyright	11%	11%	0%
Registered a trademark	32%	37%	16%
Registered an industrial design	18%	21%	17%
Requested a patent	47%	47%	0%

Table 4.3: Intellectual property rights indicators

Table 4.3 shows an increase in two types of intellectual property rights, while two other types remained stable. This is in line with the other statistics presented in this section. The results in this section on R&D in the P-SES show that despite the crisis of 2009, innovation activities in the P-SES increased between 2008 and 2010.

Box 3.1 Time series of patents in the sustainable energy sector

In this box we discuss patent applications in the sustainable energy sector. Patents are direct results of innovation and are therefore indicative for the quality of R&D in the SES. Specifically for this report, the patents department of NL Agency collected a number of patent statistics, which we describe here. One advantage of patents is that they are classified in accordance with the International Patent Classification

(IPC). They can therefore be linked directly to energy technologies, making it possible to pinpoint more precise relevant innovation activities.

This section presents several statistics based on patent applications by companies in the 2009 P-SES population in 2003-2009.

First, to get an indication of the innovative nature of the P-SES, this section presents the total share of companies in the P-SES that submitted one or more patent applications. The patent department of NL Agency matched the 2009 P-SES companies to their patent database, and found 118 companies in the P-SES that had applied for one or more patents in 2003-2009, i.e. 16.2 percent of the total SES. This share is quite high compared to the average for the Dutch economy, where approximately 1 percent of companies applied for one or more patent applications in the last ten years.

Next, we present the distribution of patent applications that according to the IPC are related to sustainable energy technology. If we zoom further in on the patents requested by the 2009 P-SES companies, we can classify them into different content types. Table 4.4 presents the distribution of patent applications by four content types (i.e. sustainable energy and other content categories)

Content type	Number of patent requests	% of patent requests
No relation with sustainable energy or environment	415	54,2%
Indirect relation with sustainable energy or environment	43	5,6%
Relation with environment	50	6,5%
Relation with sustainable energy	257	33,6%
Total	765	100,0%

Table 4.4 Types of patents applications for (2003-2009) by companies in the P-SES in 2009 (source; Patent Office NL Agency)

Table 4.4 shows that about one third of the applications are directly related to sustainable energy technology, while over half have no relation to either sustainable energy or the environment. This share is not surprising, considering the fact that many companies in the 2009 P-SES have activities both within and outside the scope of SES (non-specialised companies). Innovation activity (in terms of patent applications) is still more intensive in the SES than the average innovation activity in the Dutch economy. Patent applications do not necessarily lead to more economic growth, employment or profits.

Lastly it is interesting to look at patent developments over time. Here the patent department of NL Agency provided data for the period 1999-2008. Figure 4.2 presents the evolvement of patent applications by different categories of sustainable energy technology.

[15] Figures differ from those published in Economic Radar 2008 because the population has changed for reasons of comparability (2008 and 2010).

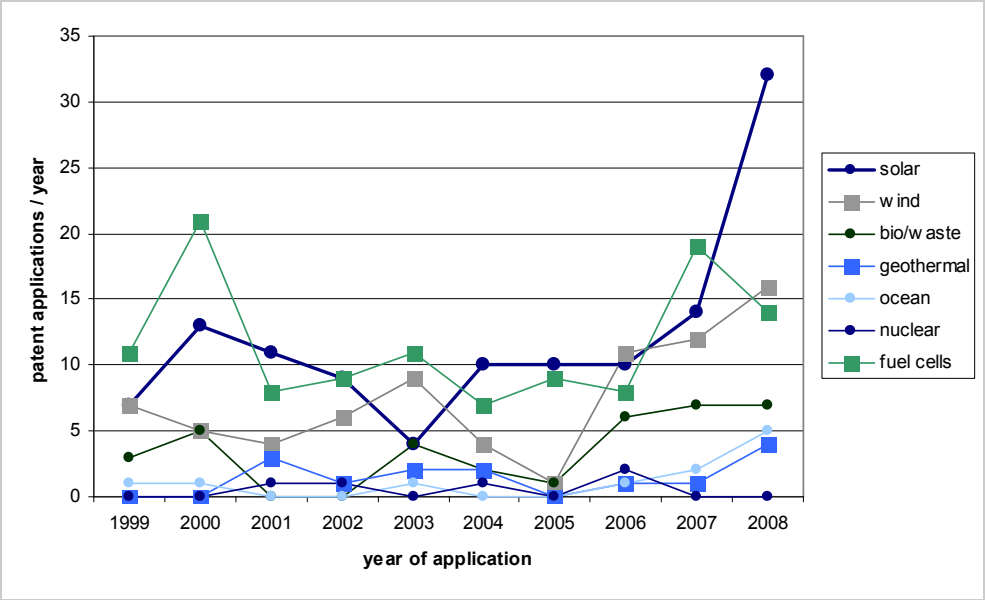


Figure 4.2 Patents in sustainable energy technology by Dutch companies (source; Patent Office NL Agency)

Figure 4.2 indicates that over the years solar, fuel cell and wind energy technology are the most prominent technology categories in which patents have been applied for, while nuclear, ocean and geothermal technologies are less prominent. Moreover, we see that in 2005–2008 both solar, wind and bio and waste energy patent requests show a substantial increase. (NL Agency, 2011).

In the period 1999–2008 the growth in the number of applications in the Netherlands was on average slower than in other countries. The number of annual patent applications related to renewable energy decreased in the Netherlands from 1999 to 2005. After 2005 it increased every year until 2008 (figure 4.3).

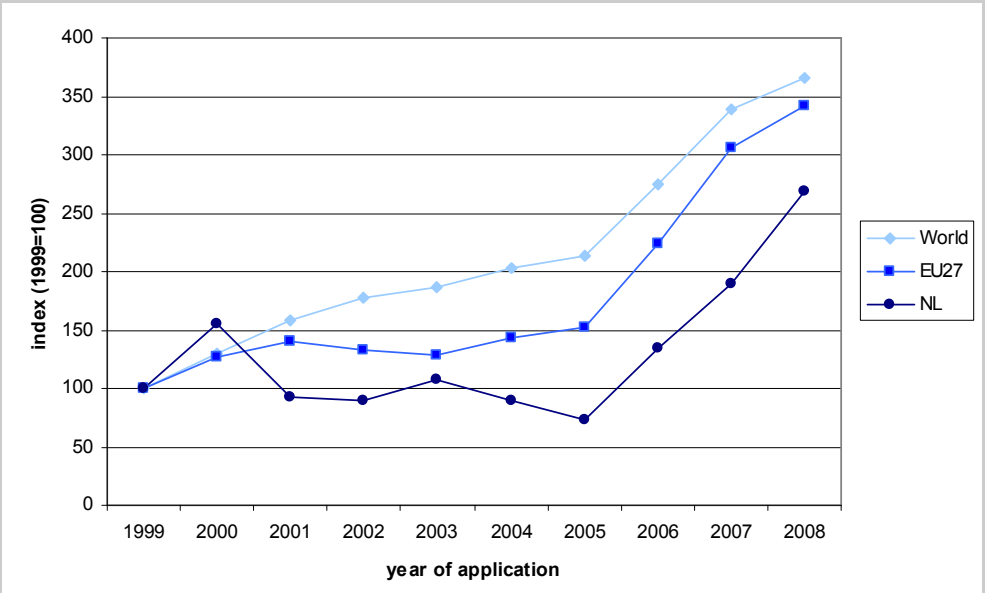


Figure 4.3 Growth of international patent applications renewable energy (1999=100) (source; Patent Office NL Agency)

5. Conclusion and recommendations

Key figures

Statistics Netherlands provides a quantitative overview of the economic activities related to sustainable energy. Conclusions will be limited to the numerical results and the compilation of these figures only. The key figures are summarised in table 5.1.

Key figures for Sustainable Energy Sector (SES)		2009	2010
	%-change		
Employment [1]		4	4
Production		-7	na
Value added		2	na
Import of goods		3	na
Export of goods		22	na
Gross fixed capital formation:			
Demand side exploitation phase		-38	37
Pre-exploitation phase		12	na
Innovation (R&D expenditures per euro turnover, change 2008-2010)			20
	2008	**2009**	**2010**
	absolute values		
Employment[2] (FTE, rounded)	16 000	16 700	17 400
Production (mln euro, rounded)	5 160	4 800	na
Value added (mln euro, rounded)	1 710	1 750	na
Import of goods (mln euro, rounded)	2 232	2 300	na
Export of goods (mln euro, rounded)	1 806	2 200	na
Gross capital formation:			
Demand side exploitation phase (mln euro, rounded)[3]	1 400	870	1 190
Investments pre-exploitation phase	234	261	na
Innovation (R&D expenditures per euro turnover[4], %)	2.0	na	2.4

[1] 2010 growth figure for P-SES equal to 5 percent

[2] Includes only employees on the payroll of SES companies. Employees hired from temp. agencies are not included

[3] Includes only projects reported to the EIA scheme, based on financial reports by A-NL

[4] 2008 figure has changed compared to previous Radar results because of comparabilty reasons. This figure includes only companies of ten or more employees. Figures only representative for medium-sized and large companies

Table 5.1 Key table for the sustainable energy sector

Macro-overview of key economic indicators

Employment in the sustainable energy sector equalled 16,700 in 2009 and grew to 17,400 in 2010. Value added of the sustainable energy sector was 1,750 million euro and production was 4,800 million euro in 2009. The relevant economic indicators for the sustainable energy sector for 2009 show an ambiguous development. Employment grew consistently between 2008 and 2010, by about four percent annually. Production in current prices decreased between 2008 and 2009 (-7 percent), while value added increased slightly, by two percent. Figures for 2010 for production and value added are not yet available.

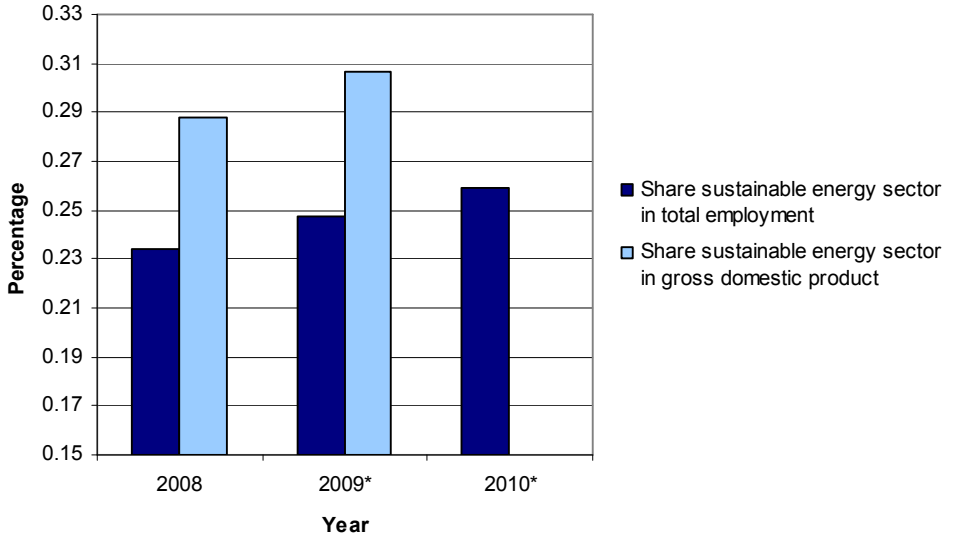


Figure 5.1 Contribution sustainable energy sector to Dutch economy (figures for 2009/2010 are preliminary)*

The share of the sustainable energy sector in total employment was 0.25 percent in 2009. In 2008 it was 0.24 percent, and in 2010 0.26 percent (figure 5.1). The share in gross domestic product is slightly larger, 0.31 percent in 2009. This share has also grown over time. The indicators *share in employment* (fte) and *share in gross domestic product* (GDP) are potential indicators for the green growth framework.

The sustainable energy sector can be divided between the pre-exploitation phase and the exploitation phase. The latter generally includes producers of renewable energy carriers, while the first includes the producers of the technologies required for the renewable energy production. For both phases, multiple products/technologies are distinguished. With respect to value added energy savings was the most important profile in the pre-exploitation phase, while in the exploitation phase value added was dominated by wind energy and energy from biomass. The results for specialised companies are generally of a better quality as they are less dependant on expert opinions on the specialisation factor.

The decrease in production value in 2009 may partly be explained by a decrease in prices of sustainable energy goods such as biofuels and electricity. The decrease in the prices of fossil fuels had a downward effect on the price of renewable energy carriers. The biofuels product profile in the pre-exploitation phase, including the production of biofuels, shows a substantial decrease in production value (-23 percent) while employment increased by 14 percent between 2008 and 2009.

In 2010 the number of jobs at companies in the pre-exploitation phase grew by five percent. 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.

Some companies in the pre-exploitation phase of the sustainable energy industry may have chosen to hold on to staff, in some cases with government support, in spite

of cutbacks in short-term demand. Positive investment prospects for the long run market development for new energy systems have a role in explaining these ambiguous developments.

Different products and technologies are known to be in different stages of development. It is important to keep this in mind when comparing the figures, as these will not necessarily reflect opportunities for future growth. The figures only reflect what has actually been realised, not growth potential in the future.

Gross fixed capital formation (production capacity)

Long term prospects are probably also the driving force behind gross capital formation in the pre-exploitation phase (P-SES), which grew by 12 percent in 2009 compared to 2008. This gross capital formation has an incidental character and a few large projects determine the distribution of growth over the different product profiles. In contrast gross fixed capital formation for the economy as a whole decreased in the period 2008-2009.

Gross fixed capital formation (demand side)

Gross fixed capital formation in sustainable energy production and energy savings is eligible for the Energy Investment Deduction (EIA) scheme of the Dutch government. This is gross capital formation by companies in the exploitation phase (E-SES) and constitutes products produced by companies in the Dutch or foreign pre-exploitation phase of the sector. The selected products from the EIA scheme[16] show a strong decrease in 2009 (-38 percent) compared to the previous year. In 2010 this figure partially recovered representing a growth of 37 percent

Research and development and innovation

R&D expenditure as a share of turnover grew by 20 percent in a two-year period (2008–2010). This figure does not represent smaller companies as only companies of more than 10 employees are included in the relevant survey. The P-SES consists of many small (and innovative?) companies. One should be careful in interpreting this figure, but it is still an indication that future prospects indeed trigger companies to invest more in new products and/or processes.

Sixteen percent of the companies in the P-SES applied for one or more patents in 2003-2009. This share is quite high compared to the average for the Dutch economy, where approximately one percent of companies submitted one or more patent requests in the last ten years. About one third of the requests are directly related to sustainable energy technology, while over half have no relation to either sustainable energy or the environment. This share is not surprising, considering the fact that

[16] The EIA scheme is a tax reduction scheme for companies investing in the production capacity of renewable energy or energy savings.

many companies in the 2009 P-SES have activities both within and outside the scope of SES (non-specialised companies). Innovation activity (in terms of patent requests) is still more intensive in the SES than the average innovation activity in the Dutch economy. Patent applications do not necessarily lead to more economic growth, employment or profits.

International trade

Our figures on foreign trade by SES companies show that exports (2.2 billion euro) almost equalled imports (2.3 billion euro) in 2009. The trade balance improved as imports exceeded exports by more than 400 million euro in 2008. Our measurement of foreign trade is limited to the trade in goods. Services sold or bought abroad by P-SES companies are not included. The foreign trade figures are dominated by the bio fuels product profile (Rotterdam port). Different product profiles show different trade balances with positive (e.g. solar, offshore) and negative balance (e.g. on land wind, biomass). The share of re-exports in total exports of the SES in 2009 was 24 percent.

Comparison with conventional energy sector

The sustainable energy sector can be compared to the conventional energy sector. The conventional energy sector can be defined as the sum of the NACE classes; Mining and Quarrying (B), Manufacture of coke and refined petroleum products (19) and Electricity, gas, steam and air conditioning supply (35)[17]. In terms of employment, the conventional energy sector is more than twice as large as the sustainable energy sector. It is important to note that the figures for the sustainable energy sector in figure 5.2 are not directly comparable with those of the conventional energy sector because a number of concept differences affect the figures of the two sectors. The sustainable energy sector uses the so-called 'value chain approach' while the figures presented for the conventional energy sector are based on the NACE-scope concept. The NACE classification system does not use the value chain concept. NACE is the acronym used to designate the various statistical classifications of economic activities developed since 1970 in the European Union. NACE provides the framework for collecting and presenting a large range of statistical data according to economic activities. The conventional energy sector as defined here only includes the exploitation phase (production of energy carriers) and not the P-SES. Activities in renewable energy production (exploitation) or in sustainable energy products (pre-exploitation) by companies assigned to the NACE classes of the conventional energy sector are excluded from the conventional energy sector. As a consquence there is no double counting in figures.

[17] There are also other definitions for the convential energy sector.

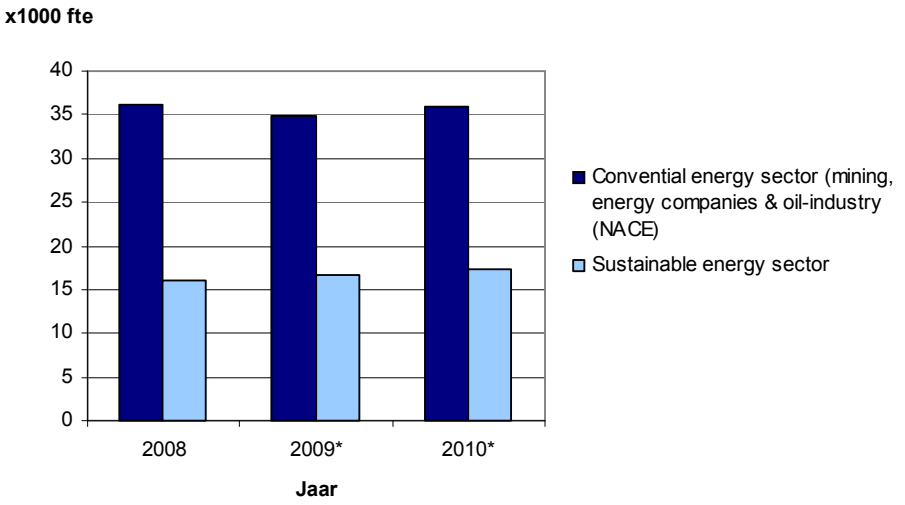


Figure 5.2 Employment (fte) in the SES (exploitation + pre-exploitation) and the conventional energy sector (exploitation only) 2008-2010 (figures for 2009/2010 are preliminary)*

Innovation themes of the Topsector Energy

Recent economic policy in the Netherlands focusses on nine so called 'topsectors'. This study includes figures relevant for the topsector Energy. For this topsector seven themes are formulated for composing innovation contracts. The selection of these themes is to a large extent based on 'energysector experts' expectations regarding export and employment growth opportunities. Six of the seven themes are fully included in the sustainable energy sector. The theme Gas is only partly included in the P-SES, new gas (bio gas product profile) is included while natural gas is not. Two themes concern energy saving, these are energy saving in the built environment and energy saving in manufacturing. As product profiles used in the E-SES do not facilitate this distinction, table 5.2 includes only a single figure for the combination of these profiles (See Annex A for bridgetable).

	2009		
Themes Topsector Energy	Employment (fte)	Production (x million euro)	Value added (x million euro)
Energy saving 1.Built environment and 2. Manufacturing	7,300	1,520	560
3. Gas (natural gas excluded)	400	120	30
4. Smart grids	500	120	40
5. Wind offshore	600	160	50
6. Solar Energy	1,300	410	70
7. Bio-energy	2,200	940	190
Innovationthemes of Topsector Energy	**12,300**	**3,270**	**940**
Other pre-exploitation SES not in top sector themes	1,900	620	210
Total pre-exploitation SES	**14,200**	**3,890**	**1,150**

Table 5.2 Key figures of the Topsector Energy (pre-exploiation) and the relation with P-SES.

The economic figures in table 5.2 do not include the production of energy carriers other than bio fuels. Only pre-exploitation phase activities are included. Energy from water, electric transport, hydrogen technology, wind onshore, solar CSP, solar thermal energy and carbon capture and storage are part of the P-SES but are not part of the seven 'themes' within the top sector Energy. Approximately 87 percent of employment in the P-SES is very relevant for the themes of the top sector Energy. Some productprofiles SES may well belong to other topsectors as for instance Electric Transport is belonging to top sector High Tech Systems and Materials (HTSM).

Recommendations and future developments

International statistical cooperation on the sustainable energy sector resulting in comparable figures for different countries is highly desirable. CBS has exchanged information on this subject with the German statistical office (Destatis) further efforts should be made in designing guidelines for comparable figures.

The comparison of the sustainable energy sector and the conventional sector, which is discussed in the conclusion of this study, is not of satisfactory quality. The compilation of figures on the pre-exploitation phase of the conventional energy value chain would result in more comparable figures.

Production facilities of bio fuels are currently included in the pre-exploitation phase of the sustainable energy sector. It seems appropriate to transfer these activities to the exploitation phase of the sector. In 2013 this will be changed.

Small figures for specific products and processes in pre-exploitation profiles of the sustainable energy sector should be interpreted with caution. Some figures are so small that this can result in strong fluctuations in developments over time.

The figures on the sustainable energy sector are published annually in june to incorporate data in the annual budget of EL&I. In June 2012 CBS publishes production and value added for 2009. Picking a different publication date can result in a more up to date publication. Publishing in October 2012, for example, would allow CBS to publish 2010 figures for production and value added. Changing the publication date depends partly on the planning of the EL&I.

In order to present accurate dynamics of the activities in the pre-exploitation phase of the sustainable energy sector, the population of relevant companies must be periodically updated and rebased. Annually or once every two years is the recommended interval for updating the population. The first population update is planned for 2013. Input from experts (such as ECN and NL Agency) is necessary to keep the population compilation accurate.

New insights into definition and division of the various processes and products will be part of the update of the population scheduled for 2013.

Supplements to this monitor planned for the second half of 2012 include depreciation and internationalisation. Depreciation is highly relevant, especially for

the E-SES, because of the capital intensive nature of these activities. Internationalisation will be measured in terms of Foreign Direct Investment and (foreign) company control.

This second radar of the sustainable energy sector is still work under development. Improvements are still forthcoming and we are still in the middle of the learning process. Learning through practical experience and even more cooperation with stakeholders will ultimately result in more accurate and socially relevant figures for the sustainable energy sector.

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Annex A Topsector Energy themes and product profiles of the SES

Product profile P-SES	Topsector Energy's Innovationtheme
1. solar PV	6. Solar Energy
2. solar CSP	Other pre-exploitation SES not in top sector themes
3. solar thermal energy	Other pre-exploitation SES not in top sector themes
4. bio gas	3. Gas (natural gas excluded)
5. bio mass (solid) & waste	7. Bio-energy
6. bio fuels (incl biodiesel prod.)	7. Bio-energy
7. bio refining	7. Bio-energy
8. wind onshore	Other pre-exploitation SES not in top sector themes
9. wind offshore	5. Wind offshore
10. heat & geo thermal energy	Energy saving 1.Built environment and 2. Manufacturing
11. energy from water	Other pre-exploitation SES not in top sector themes
12. energy saving	Energy saving 1.Built environment and 2. Manufacturing
13. electric transport	Other pre-exploitation SES not in top sector themes
14. smart grids	4. Smart grids
15. hydrogen technology	Other pre-exploitation SES not in top sector themes
16. CO2 capture and storage	Other pre-exploitation SES not in top sector themes

Some productprofiles SES may well belong to other Topsectors than Energy. For instance Electric Transport is belonging to topsector High Tech Systems and materials (HTSM).