

# Netherlands National Energy Outlook 2014

## Summary

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## The National Energy Outlook

**The National Energy Outlook (NEO) outlines the current state of the Dutch energy system.** The NEO describes the observed development from 2000 up to the present, as well as expected developments up to 2030. It covers physical indicators, such as energy supply, energy demand and greenhouse gases emissions, and economic indicators, such as Economic Value Added and employment related to energy. The NEO aims to provide a fact base for the societal debate about energy in the Netherlands.

**The NEO describes the expected development following two policy variants,** which include government policy and measures and the activities of other societal actors. It is based on insights regarding prices, markets, technology and policy as of May 2014. The 'with existing measures' variant' includes specific, officially published measures and activities that are binding for stakeholders as much as possible. The 'with additional measures' variant also includes published intentions for measures which, by early May 2014, were considered specific enough to process in the calculations. Many elements of the national Energy Agreement have been included in the 'with additional measures' policy variant. The projections in the NEO aim to reflect the most plausible developments according to the selected policy variant, by using insights on prices, markets and the state of technology as of May 2014. However, as the future is inherently uncertain, interpreting projections is not possible without accounting for these uncertainties. A variety of factors such as prices, economic growth, sector-specific developments, or developments abroad can evolve differently than assumed in the projections. Therefore, where relevant and possible, uncertainty ranges are given in the projections to indicate probable ranges of future values.

## General overview

**The Dutch energy system is sensitive to developments abroad.** Energy prices are mainly set on international markets and impact national energy supply and demand. Recent developments such as the disaster at the nuclear plant in Fukushima, the rapid development of shale gas in the United States and the political turmoil in the Middle East impact what happens in the Dutch energy system. Moreover, the open Dutch economy is heavily dependent on foreign demand for its goods and services, and technological development is a global issue.

**Decoupling of energy and greenhouse gases from economic growth.** Structural changes in society, application of increasingly energy efficient technologies and other energy efficiency measures, and the increasing use of renewable energy have resulted in a decoupling of economic growth, energy use and the emission of greenhouse gases in the Netherlands in the last decade. The expectation is that this decoupling will continue in the period up to 2030. Despite the assumed 30 per cent growth of the economy between 2013 and 2030, energy use is expected to remain almost constant over the same period, and the emission of greenhouse gases will decrease by 17 [8-23] per cent (see the core table below).

### Core table National Energy Outlook

|   | 2000        | 2010        | 2012        | 2020 <sup>2)</sup>                 |                                    | 2030 <sup>2)</sup> |                   |
|---|-------------|-------------|-------------|------------------------------------|------------------------------------|--------------------|-------------------|
|   |             |             |             | WEM <sup>3)</sup>                  | WAM <sup>3)</sup>                  | WEM <sup>3)</sup>  | WAM <sup>3)</sup> |
| GDP (index)   | 100*        | 113         | 113         | 124                                |                                    | 147                |                   |
| <b>Oil price<sup>1)</sup> (US dollar per barrel)</b>  | <b>37</b>   | <b>86</b>   | <b>113</b>  | <b>127</b>                         |                                    | <b>143</b>         |                   |
| Gas price <sup>1)</sup> (eurocent per m <sup>3</sup> )  | 15          | 18          | 23          | 30                                 |                                    | 32                 |                   |
| <b>Coal price<sup>1)</sup> (euro per tonne)</b>   | <b>50</b>   | <b>88</b>   | <b>96</b>   | <b>89</b>                          |                                    | <b>94</b>          |                   |
| CO <sub>2</sub> price <sup>1)</sup> (euro per tonne)  | n.a.        | 16          | 7           | 9                                  | 12                                 | 15                 | 21                |
| <b>Final energy consumption<sup>6)</sup> (Petajoule)</b>  | <b>2245</b> | <b>2215</b> | <b>2185</b> | <b>2163</b>                        | <b>2132</b>                        | <b>2193</b>        | <b>2161</b>       |
| Annual rate of energy efficiency improvement <sup>4)</sup> (per cent per year in previous decade) | n.a.        | 1.1         |             | 1.0                                | 1.2                                | 0.7                | 0.7               |
| <b>Share of renewable energy in final consumption (percent)</b>                                   | <b>1.4</b>  | <b>3.7</b>  | <b>4.5</b>  | <b>10.6</b><br><b>(2023: 13.1)</b> | <b>12.4</b><br><b>(2023: 15.1)</b> | <b>20</b>          | <b>20</b>         |
| Greenhouse gas emissions (megatons of CO <sub>2eq</sub> )   | 213         | 209         | 192         | 183                                | 176                                | 161                | 158               |
| <b>of which non-ETS</b>   | <b>n.a.</b> | <b>125</b>  | <b>115</b>  | <b>97</b>                          | <b>96</b>                          | <b>90</b>          | <b>89</b>         |
| Energy-related employment <sup>5)</sup> (x1000 full-time equivalents)                             | 81*         | 84          | 89          | 106                                |                                    |                    |                   |
| <b>Economic Value Added as a share of GDP<sup>5)</sup> (percent)</b>                              | <b>4.1*</b> | <b>4.7</b>  | <b>5.3</b>  | <b>5.2</b>                         |                                    |                    |                   |

1 Constant prices 2013. 2) All values have significant uncertainty ranges that are not shown here. 3) WEM = with existing measures; WEM = with existing and additional measures. 4) Energy efficiency improvement rate according to the Protocol Monitoring Energy Saving, in primary terms. 5) Monitored activities, excluding activities from investments for conventional energy generation. 6) Temperature corrected. \* 2001 instead of 2000

## Energy consumption

**Since 2004, the total energy use of final consumers in the Netherlands has followed a slightly decreasing trend.** Corrected for temperature influences, the total energy use of final consumers in the Netherlands in the year 2013 was almost 3 per cent lower than in the year 2000, and over 5 percent lower than in the year 2004.

**With existing policies a slight decrease in energy consumption is projected for the period 2013 - 2020, amounting to approximately 1 per cent.** Taking into account uncertainties, the change in energy consumption in 2020 is expected to be in the range of -6 to +4 per cent compared to 2013. Especially in the built environment and transport sectors, the historic trend of increasing energy consumption is expected to reverse, resulting in decreasing consumption over the coming decade. This change is attributed to a combination of factors including slower economic growth, slower population increase, technological progress and increased attention to energy efficiency.

**With additional measures energy consumption is expected to decrease by approximately 2.5 per cent between 2013 and 2020,** with an uncertainty range of -8.5 to +3 per cent. In this policy variant, energy consumption is lower because of the implementation of additional energy efficiency measures. After 2020 energy consumption may increase again slightly, due to an increase in industrial production, among other reasons.

## Energy efficiency

**The average rate of annual energy efficiency improvement in the Netherlands was approximately 1.1 per cent in the period 2000 - 2010. For the period 2010 up to 2020, the implementation of existing measures is expected to lead to an annual efficiency improvement rate of 1.0 percent.** Taking into account uncertainties, this rate will lie within a range of 0.7 to 1.2 percent. The efficiency improvement is mainly explained by the use of increasingly efficient appliances and vehicles, and improved insulation of buildings.

**With both existing and additional measures, a higher energy efficiency improvement rate of on average 1.2 percent per year is expected.** The uncertainty range then becomes 1.0 to 1.4 per cent. The additional efficiency improvement is mainly explained by the implementation of measures from the Dutch Energy Agreement. The efficiency improvement rate is expected to decrease after 2020, because most prevailing measures will have reached a high penetration rate and will have less incremental impact.

**Not all energy efficiency targets are within reach.** The Dutch objective of the European Directive for energy efficiency will most likely not be reached with existing measures. Including additional measures, the target is expected to be within reach. The objective of the national Energy Agreement of additional energy efficiency improvement of 100 petajoules in 2020 will not be achieved with the currently known measures in either policy variant.

## Primary energy fuel mix

### **Natural gas loses its position as number one energy carrier in the Netherlands.**

For several years, the use of natural gas in the Netherlands has shown a decreasing trend. A further decrease in the gas demand of final consumers, combined with a reduction in gas use in gas-fired power plants and CHP plants, leads to a continued declining trend up to 2030. The use of coal increases strongly in the short term, and is then expected to decline again towards 2030. The use of energy from renewable sources increases strongly. Because the use of oil as a raw material in the industry will increase in the coming years, the total oil demand remains relatively constant despite the decreasing demand for oil products in the traffic and transport sector. From 2015, oil will take over the position of mostly used energy carrier in the energy system from natural gas.

**Between 2025 and 2030 the Netherlands will switch from being a net exporter to becoming a net importer of natural gas.** The Dutch gas production will decrease only slightly in the coming 10 years, but afterwards it will decrease more rapidly due to exhaustion of the large Groningen field. As a result, despite the expected fall in gas demand, the Netherlands will become a net importer of natural gas at the end of the next decade.

## Electricity supply and electricity market

**Fossil fuels play a dominant role in electricity generation.** In the period 2000 up to 2010 the largest share of electricity was produced from natural gas. However, in the past years, and particularly in 2014, the production of electricity from

natural gas has decreased strongly while the production from coal has increased. **This is caused by an unfavourable market situation for natural gas fired power plants and CHP plants.** Several factors play a role: a relatively low price for coal compared to natural gas, the low price of CO<sub>2</sub> emission allowances, the high production capacity in the Netherlands and low electricity prices in Germany. The expected closure of five old coal fired power plants in 2016-2017 brings no substantial change to the market situation, because new coal fired plants become operational and the capacity of electricity connections with neighbouring countries expands. The continuing increase of renewable electricity generation in the Netherlands after 2020 will also lead to a more unfavourable market situation for electricity generation from coal.

**The low wholesale trade prices of electricity in the Netherlands will be maintained in the next years.** The market situation for electricity generation has recently led to a decrease in wholesale trade prices. In the longer term, the prices of gas and coal are expected to increase. Combined with a decrease in overcapacity, this is expected to lead to an increase of the wholesale electricity price towards 2020.

**The increase of renewable electricity production, particularly after 2020, has a mitigating impact on the wholesale prices.** Over time, wind and solar power will increasingly replace gas and coal fired plants that have higher marginal production costs. This will lead to a steadier average wholesale price after 2020, despite of rising coal, gas and CO<sub>2</sub> prices.

## Renewable energy

**The share of renewable energy will grow strongly in the coming decade.** In the previous decade the share of renewable energy in final energy consumption has increased from 1.4 percent in the year 2000 up to 4.5 percent in 2013. Moderate

growth is expected in the next few years, but the share will grow significantly from 2017 onwards under the influence of renewable energy subsidies (SDE and SDE+), regulation of renewable energy in transport, energy performance standards for buildings, and tax measures. The expected acceleration in growth is partly explained by the fact that some large projects that were delayed are expected to become operational by 2017.

**Strong uncertainties surround the expected increase of renewable energy.**

**Uncertainties exist in, amongst other things, the development of the willingness to invest, costs, societal support, and availability of capital.**

Moreover there are some technology-specific uncertainties. For example, policy design to stimulate offshore wind is still in full swing and may change expected outcomes. With existing measures, a share of 10.6 per cent is expected for 2020. Taking into account these uncertainties, the share is expected to be within a range of 9.1 to 11.1 percent. Including additional measures, the share in 2020 is expected to be 12.4 per cent, within a range of 10.5 to 13.0 per cent. The Dutch target for renewable energy that has been agreed in the European context (14 per cent in 2020), lies outside these ranges. An increasing share is expected for nearly all technologies, but the most important contributions are expected to come from wind energy, solar power and various biomass applications. The additional growth in case of additional measures originates from co-firing of biomass in coal fired plants and from an accelerated growth of offshore wind power.

**After 2020 the share of renewable energy will grow further.** With existing measures a share of 13.1 per cent in 2023 is expected, within a range of 11.5 to 13.7 per cent. Including additional measures, the expected share in 2023 is 15.1 per cent. Taking into account uncertainties, additional measures are expected to lead to a share between 13.1 to 15.9 per cent in 2023. The objective from the

Energy Agreement (16 per cent in 2023) can only be achieved if all uncertainties develop favourably. In 2030, assuming continued incentivisation of renewable energy by means of the aforementioned regulations, about 20 per cent of the final energy consumption will originate from renewable sources. Almost 50 per cent of domestic electricity generation could be renewable.

## Energy bill

**Energy efficiency improvements and solar power lead to a lower energy bill for households on average, despite of the price increase of natural gas and electricity.**

The average energy bill of households has increased considerably in the previous decade. After a peak in the period 2006-2009, the average bill has been relatively constant since 2010. Due to increasing energy efficiency and private generation of solar energy, the average supply of gas and electricity to households will decrease in the period up to 2020. The avoided costs of specific households depend on user behaviour and the extent to which the measures are being implemented. On average the cost decrease is expected to be higher than the increase in the supply tariffs and the surcharge for sustainable energy in this period, based on the current tariffs of the energy tax. The average bill in 2020 is therefore expected to be approximately 2.5 percent (46 euro per year) lower than in 2014.

## Greenhouse gas emissions

**The emission of greenhouse gases in the Netherlands shows a decreasing trend.** The total emission of greenhouse gases in the Netherlands has decreased by 9 per cent to 192 megatons of CO<sub>2</sub> equivalents between 2000 and 2013. A

large part of this reduction is caused by a reduction of non-CO<sub>2</sub> greenhouse gas emissions, which are not energy related. With existing measures, the total emissions will continue to decrease significantly, to 161 megatons in 2030, within an uncertainty range from 147 to 175 megatons. With additional measures, emissions are further reduced, to 158 megatons, within a range from 147 to 170 megatons. The expected emissions reduction originates mainly from decreasing CO<sub>2</sub> emissions and relates strongly to the increasing share of renewable energy.

**The Netherlands will achieve its European greenhouse gas emissions target in 2020.** In the European context, the Netherlands only has a national emissions target for the emission of greenhouse gases that are not regulated by the European Emissions Trading Scheme (EU ETS). This target relates to the cumulative (non-ETS) emissions in the period 2013-2020 and is set at 897 megatons of CO<sub>2</sub> equivalents. With existing policy, the annual emissions of sources not covered by the ETS decrease from 105 to 97 [88-106] megatons of CO<sub>2</sub>-eq in the period 2013-2020. Including additional measures, the emissions reduction is slightly larger, i.e. to 96 [87-105] megatons in 2020. The cumulative emissions with existing measures amounts to about 811 megatons. Including additional measures, the cumulative emissions in this period amounts to 808 megatons. Hence, the Netherlands will amply meet its emission target.

## Innovation

**The public spending on energy innovations in the Netherlands has decreased since 2010. The amount of private spending in this sector is not known for this period.** A favourable innovation climate is important to realise a cost-efficient switch to a low-carbon energy system. This could also create opportunities for

Dutch businesses. The development of the number of patents for sustainable energy in the Netherlands is comparable to the European average. The Netherlands is lagging behind, however, compared to the worldwide average. Compared to other countries, the number of biomass patents in the Netherlands is remarkable. The focus on innovations in the energy system is increasing in the Netherlands. For example, offshore wind system innovation is marked by a strengthening cooperation between parties. Innovation plays an important role in the cost reduction of offshore wind, a focus area that the Netherlands is committed to through the Energy Agreement. Moreover, the promotion of (semi-) electric private cars in recent years is a powerful incentive to stimulate innovations in passenger transport.

## Growth and employment

**Energy-related activities deliver an important contribution to the Dutch economy.** Both the exploitation of energy, and resulting investments create Economic Value Added and employment. The share of the observed activities in the Gross Domestic Product amounted to 5.4 per cent in 2012. The share of these observed activities in employment in 2013 is much lower at 1.3 percent. Extraction companies in particular have a relatively high added value per employee. The economic significance of the conventional energy sectors in the Netherlands is very high because of this. These sectors are facing a difficult market situation however. The oil and gas sectors are facing stagnation or downsizing. The electricity producers are dealing with losses on gas-fired power plants and CHP. An important part of the activities is not directly monitored for economic statistics at this moment. A model approach shows that the total energy-related employment is more than twice as high as the direct monitored employment (200,000 jobs in 2013).

**Approximately half of these jobs are related to 'sustainable energy activities (renewable energy and energy efficiency).** The expectation is that sustainable energy activities in particular will grow in volume, as a result of which the total number of jobs in 2020 will be around 230,000. This growth mainly takes place in the construction sector. These figures do not take into account replacement of other activities.

**The employment in energy exploitation activities has increased by 14 per cent between 2005 and 2013.** Especially the exploitation of natural gas and electricity grids and the production of renewable energy made an important contribution to this growth. The employment from energy exploitation is expected to remain approximately stable up to 2020. There is a slight shift from conventional to renewable energy. After 2020 the increase in renewable energy production continues, but this cannot entirely compensate for the loss in employment caused by declining natural gas extraction and other types of exploitation of fossil energy. As a result, the employment in exploitation activities decreases in the long run.

**The monitored activities that result from investments in the field of renewable energy and energy efficiency increased significantly in the period 2005-2013, by almost 60 per cent.** Particularly activities related to solar energy (e.g. installation of solar panels) and wind energy (both offshore and onshore activities) have grown in the previous years. The employment related to electric transport is still limited but has increased considerably in the past four years. Investments in conventional energy activities, such as the construction of new coal-fired plants, have yielded additional employment in the past years. In the coming years this will slightly decrease due to a declining investment level. **The investments in**

**energy efficiency in the built environment and renewable energy generation will lead to further growth of gross employment up to 2020**