Draft Integrated National Energy and Climate Plan 2021-2030

The Netherlands

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PART A NATIONAL PLAN

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1.1 Executive summary

i. Political, economic and social context

Summary of political and policy context

The Netherlands wishes to make a substantial contribution to the Paris Agreement, so we will be taking measures that prepare us for a 49% reduction in greenhouse gas emissions by 2030, compared to 1990. At a European level, we are calling for a reduction in emissions of 55% by 2030.

One of the commitments in the Coalition Agreement 2017 was the realisation of a Climate Agreement that is to mark the next step, following the Energy Agreement that was realised in 2013, towards a climate-neutral society and a reliable, affordable, safe and low-carbon energy supply by 2050. In the Climate Agreement, the national government wishes to make commitments with local and regional authorities, businesses, nature and environmental organisations, trade unions and other social stakeholders with regard to the measures that are required to achieve a 49% reduction of greenhouse gas emissions by 2030 and put us on track for the 2050 target. The long-term outlook of the Climate Agreement will allow a gradual transition, prevent any adverse effects and ensure that we are able to seize the economic opportunities available. Furthermore, an agreement was made that the key elements of the commitments in the field of climate and energy policy of the Coalition Agreement would be enshrined in a Climate Act (see Section 1.2 ii). Finally, the Coalition Agreement sets out that the implementation of a number of commitments from the Government-wide programme for a Circular Economy and the transition agendas from the Raw Materials Agreement will be implemented as part of the government's climate commitments.

The Climate Agreement will form the basis for the final Integrated National Energy and Climate Plan (NECP). Shortly before the summer, the proposal for key points of the Climate Agreement[1] was presented, and the government provided an appraisal of the proposal at the beginning of October 2018.[2] The proposal contains the proposed key points of a future-proof climate policy with a reduction target of up to 49% and the preparation of the additional European reduction target of 55%.

The Coalition Agreement forms the basis for the Climate Agreement. This means that some matters will not be subject to discussion. This includes the national target of 49% and the resulting reduction target in megatonnes, the level of public funds available, the phasing out of coal-fired power plants by 2030 and the minimum price for carbon in electricity production.[3] The final Climate Agreement will be negotiated and developed in the months to come and it is expected to be finalised by December 2018. The Dutch government's commitment to the Climate Agreement and the Government appraisal of the proposal for key points of a Climate Agreement will provide the frameworks within which the negotiations for the Climate Agreement will continue to take place in the months to come.

[1] Letter to Parliament on the Government's Approach to Climate Policy, 23 February 2018, Parliamentary Paper 32 813, no. 163.
[2] Letter to Parliament on the Government appraisal of the proposal for key points of a Climate Agreement, 5 October 2018, Parliamentary Paper 32 813, no. 220.
[3] Letter to Parliament on the Government's Approach to Climate Policy, 23 February 2018, Parliamentary Paper 32 813, no. 163.

Given that the Climate Agreement is expected to be finalised by the end of 2018, the draft NECP cannot be based on that document. We will therefore be limiting ourselves to existing and proposed policy, as is set out in the Coalition Agreement and other policy documents that have been published (please see the annex for a list of the sources).

Summary of the economic and social context

With its 17 million inhabitants, the Netherlands is a densely populated nation with a growing economy. In 2017, the Dutch economy saw growth of 3.2%. That growth is largely dependent on exports. Netherlands is one of the most competitive economies in the world. This has translated into various leading positions, including a fourth place in the World Competitiveness Yearbook[4] and sixth place in the Global Competitiveness Report 2018.[5] In addition, holding second place on the Global Innovation Index,[6] we are one of the most innovative countries in the world.

Both climate issues and sustainability receive a significant amount of coverage in both political and social debate, a key example being the recent climate court case between the Urgenda Foundation and the State of the Netherlands, regarding which the Court of Appeal recently upheld the appealed decision. The Court of Appeal reaffirmed that the Netherlands should reduce the emissions of greenhouse gases by at least 25% by 2020 in respect of the level of 1990.

Social awareness of climate issues is also expressed by the multitude of sustainability initiatives that have been launched by citizens, businesses, NGOs and government agencies, and by the amount of media coverage. Despite the positive attitude to achieving a more sustainable society, there is resistance in some regions in the Netherlands, for example against the construction of wind farms.

In addition to the climate goals, the occurrence of earthquakes in the Groningen region as a result of gas extraction also significantly determines climate and energy policy. These earthquakes have led to the decision to end gas extraction operations in the Groningen gas field to ensure the safety of the residents (also see Section 1.2 i).[7]

ii. The European Energy Union

The effects of global warming are becoming visible to everyone all around the world. Radical measures are required to limit global warming and the impact of climate change. For that reason, the transition to a sustainable carbon-neutral economy is a top priority. The Paris Agreement establishes a commitment to keeping the global average temperature increase well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 °C. On behalf of its Member States, the European Union has made firm commitments to reduce the emission of greenhouse gases by at least 40% by 2030 compared to the levels of 1990. The Netherlands supports this commitment, but at the same time notes that it will be insufficient to keep the global average temperature well below 2 °C. For that reason, the Netherlands will be setting the bar higher than the commitments made by the European Union, and will be implementing measures at a national level that put us on track for a 49% reduction of greenhouse gas emissions by 2030 in respect of 1990. At a European level, we actually support an even more ambitious emissions reduction target, namely that of 55% by 2030. In the event that a more stringent target should not prove to be feasible within the EU, the Netherlands will attempt to achieve more ambitious agreements with like-minded North-Western European countries.

[4] https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2018/.
[5] https://www.weforum.org/reports/the-global-competitveness-report-2018.
[6] https://www.globalinnovationindex.org/Home.
[7] Letter to Parliament on Groningen gas extraction, 29 March 2018, Parliamentary Paper 33 529, no. 457.

As outlined above, the national strategy for the realisation of the long-term reduction goals will be laid down in the Climate Agreement. As a result of the integrated nature of the Climate Agreement, it will cover the five dimensions of the Energy Union (decarbonisation, energy efficiency, energy security, the internal energy market, and research and innovation), divided into five sector platforms, these being electricity, industry, mobility, agriculture and land use, and the built environment, and into a number of cross-sectoral themes, such as electrification, hydrogen, biomass, innovation, labour market and training, financing, citizen participation, spatial planning and regional energy strategies (RES).

iii. Summary table

The greenhouse gas reduction target proposed by the Coalition Agreement, comprising a reduction of 49% by 2030 compared to 1990, means a reduction of approximately 49 Mt of carbon dioxide equivalents by 2030 compared to unchanged policy. This includes the impact of policy on the circular economy. The Climate Agreement uses an indicative allocation of CO_2 targets for the five sector platforms of industry, mobility, built environment, electricity, and agriculture and land use. This allocation is as follows[8]:

Sector	Indicative allocation in terms of the 49% reduction target (in Mt of carbon dioxide equivalents as of 2030)*
Industry	14.3
Mobility	7.3
Built environment	3.4
Electricity	20.2
Agriculture and land use	3.5**

(*) Including the effects of the circular economy.
(**) Including 1.5 Mt of reduction from land use that does not count toward achieving the 49% reduction.

This table outlining the indicative allocation of the 49% reduction target per sector platform is based on the Coalition Agreement. As stated previously, this means that, in addition to the reduction target of 49%, neither the public funds available, the phasing out of coal-fired plants by 2030 at the latest, nor the minimum price for carbon in electricity production are open to reconsideration.[9]

Based on a cost-efficient greenhouse gas reduction package of 49% in 2030, the expected contributions that the Netherlands will make to the goals with regard to renewable energy and energy efficiency will be 27-35% and a maximum of 1,950 PJ in terms of primary energy consumption, respectively. With this, the Netherlands will make a contribution to the European targets for renewable energy (32%) and energy efficiency (32.5%)[10] that is above average. In terms of the interconnectivity target, the Netherlands is currently already ahead of the European target of 15% by 2030.[11]

[8] Letter to Parliament on the Netherlands Environmental Assessment Agency (PBL) memorandum "Costs of the Energy and Climate Transition in 2030 – Update 2018", 26 April 2018, Parliamentary Paper 32 813, no. 186.
[9] Letter to Parliament on the Government's Approach to Climate Policy, 23 February 2018, Parliamentary Paper 32 813, no. 163.
[10] Parliamentary Paper 21 501-33-700.
[11] Parliamentary Paper 21 501-20-968.

1.2 Overview of the current policy context

i. Energy system and policy context

Energy system

In this section, we will be addressing the key characteristics of the Dutch energy system, based on the National Energy Outlook 2017 (*Nationale Energieverkenning*, NEV).[12] The NEV uses a single reference scenario that incorporates external factors such as the economy, demographics and fuel and carbon prices, and is based on specific technological developments and assumptions about human behaviour. The reference scenario is based on the policy variant consisting of adopted and proposed policies without opening any new rounds for the SDE+ grant scheme after 2019.

The key developments of the Dutch energy system in the reference scenario will be outlined briefly below. Chapter 4 contains a more detailed outline.

Greenhouse gas emissions

It is expected that greenhouse gas emissions will decrease from 193 Mt of carbon dioxide equivalents (CO_2-eq) in 2017 to nearly 170 Mt in 2020 and to 158 Mt in 2030 (ECN, 2017a). This means a decline of over 34 megatonnes of carbon dioxide equivalents between 2017 and 2030, which is chiefly the result of developments in the country's energy system.

Final energy consumption

Final energy consumption in the Netherlands has fallen by 9% between 2005 and 2017. As a result of continued energy efficiency measures, consumption is expected to continue to decrease under existing policy, falling to 1786 petajoules in 2020 and 1698 petajoules in 2030.[13] The expected consumption shows a decrease in most final consumption sectors, except in traffic and transport (ECN, 2017a).

The energy mix is gradually changing

In 2017, primary energy consumption was at 3154 petajoules, 8% below the level of 2005. This is set to fall even further to 3136 petajoules in 2020 under current policy and to 3005 petajoules in 2030 (ECN, 2017a).[14] Natural gas consumption is expected to fall further,[15] whereas consumption from renewable sources will increase. The opening of three new coal-fired power plants resulted in a coal consumption peak in 2015. Despite the closure of five power plants from the 1980s, coal consumption is expected to be above pre-peak levels for the next few years. The Coalition Agreement includes a commitment to closing down all coal-fired plants no later than 2030. The Dutch government will be implementing this commitment by way of a bill that includes a ban on the use of coal as a fuel for the production of electricity as of 1 January 2030. This will ensure that the ban on coal will make a maximum contribution to the realisation of the ambition set out in the Coalition Agreement to achieve a 49% reduction of carbon emissions by 2030.[16]

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[12] Energy Research Centre of the Netherlands (ECN), 2017a; Parliamentary Paper 30 196, no. 559.

[13] Final energy consumption does not include non-energy consumption based on the new Eurostat definition that will come into force in 2019.

[14] Primary energy consumption includes non-energy consumption in accordance with the new Eurostat definition that will come into force in 2019.

[15] Following the publication of the NEV 2017, a decision was made in March 2018 to end gas extraction in the Groningen gas fields (Letter to Parliament on Groningen gas extraction, 29 March 2018), which will affect the future consumption of natural gas.

[16] Letter to Parliament on Phasing out the use of coal for energy production, 18 May 2018, Parliamentary Papers 30 196, no. 600.

For the time being, oil is maintaining its dominant role in transport and as a raw material in the chemical industry. The consumption of oil has remained roughly the same since 2005; as a result, over the next few years, oil is expected to take the place currently occupied by natural gas as the largest energy carrier in the energy mix (ECN, 2017a).

There has been a significant growth in renewable energy. In 2017, the proportion of renewable energy was at 6.6%. It is expected that this percentage will grow to 12.4% [11-13%] by 2020 and stabilise around 15% after 2023 (ECN, 2017a). That growth is chiefly the result of an increase in offshore wind energy, as well as the rapid development of solar power and higher consumption of biofuels.

The announced additional roll-out of offshore wind power and the continued increase in the contribution of solar power will lead to a strong growth in the proportion of renewable electricity in national electricity production. By 2025, this proportion will have increased to around half, and it will be close to two-thirds by 2030. Conventional energy production from gas, and from coal in the future, will come under pressure. Under these circumstances, the Netherlands will increasingly be importing electricity on balance (ECN, 2017a).

Energy market

A large number of parties operate on the Dutch energy market and have strong ties with foreign countries. In respect of the supply of gas and electricity, there are the producers and suppliers that operate on the market on the one hand, and the network managers on the other. The Netherlands previously separated the energy companies, as a result of which grid companies have to be able to function independently and be financially robust.

The high-voltage grids (electricity) and high-pressure grids (gas) each have a single network manager, TenneT and GTS respectively. There are multiple parties for the distribution networks, which each operate in a specific region.

Groningen gas extraction

For the safety of the residents of Groningen, a decision was taken in March 2018 to end the extraction operations in the Groningen gas field, which will take place in several major steps, including through the construction of an additional nitrogen plant and the intended conversion of large-scale industrial users. Gas extraction is projected to drop below the level of 12 billion Nm^3 no later than October 2022, and possibly a year earlier. In the years thereafter, gas extraction levels will continue to be brought down to zero. Large-scale consumers will have to switch to other sources at an accelerated pace, with the preference naturally being on sustainable alternatives. Efforts are also being made to stimulate more sustainable options among small-scale consumers and in the built environment.[17]

Developments abroad in relation to the Dutch energy supply

Developments taking place in the countries surrounding our own have a significant impact on the Netherlands. For the past few years, the Netherlands has been a net importer of electricity, with the greenhouse gas emissions from the production of imported electricity taking place abroad. The NEV 2017 projections that the import balance of electricity will increase significantly in the period leading up to 2035 – barring a temporary dip around 2024. This projection, however, is highly sensitive to any developments abroad.

Policy context

The Dutch economy, measured based on the GDP (€725.4 billion) grew by 3.2%[18] in 2017, which was the highest growth since 2007[19] (€666.4 billion). That growth depends heavily on exports. However, in

[17] Letter to Parliament on Groningen gas extraction, 29 March 2018, Parliamentary Paper 33 529, no. 457.
[18] https://www.cbs.nl/nl-nl/achtergrond/2018/19/de-nederlandse-economie-in-2017.

recent years, investments in fixed assets and consumption were also key contributing factors. Consumption by individual households, however, has shown less strong growth than the gross domestic product in recent years. This is partly the result of growth not translating to households' real disposable income. The economic boom of 2017 continued into the first few months of 2018. The Netherlands is one of the most competitive economies in the world, with our nation ranking fourth in the IMD World Competitive Yearbook[20] and coming sixth in the Global Competitiveness Report of the World Economic Forum.[21] Key strengths of the Netherlands include its macro-economic policy, the relatively low level of public debt and its infrastructure. In addition, with its second place on the Global Innovation Index,[22] the Netherlands is also one of the most innovative countries in the world.

The Netherlands is a densely populated country. As of 1 July 2018, it has 17,103,623 inhabitants, with a population density of 411.7 inhabitants/km². Statistics Netherlands (CBS) expects the population to increase to a provisional maximum of 18 million by 2034, after which any further increase in the population will only take place through immigration, rather than through a birth surplus.[23]

The quality of the life in the Netherlands[24] has improved on many fronts over the past few decades. The quality of both the air and the water has improved, there is no shortage of safe and cheap food, further improvements have been made to the energy efficiency of new homes and devices and the road network has become denser and safer. At the same time, there are still persistent challenges. The excessive emission of greenhouse gases contributes to climate change, livestock farming is running into ecological and social barriers, biodiversity is under a significant amount of pressure, the use of raw materials is resulting in significant environmental pressure and the differences between and within regions and groups of people are increasing, such as with regard to the accessibility of the housing market and the number of healthy life years people have.

There is a significant focus on climate policy in public discourse. The Urgenda Foundation, for example, brought a court case against the State of the Netherlands with the claim that the State should be mandated to reduce the emission of greenhouse gases in the Netherlands by at least 25% by 2020 compared to the level of 1990. On 24 June 2015, the Court ruled in the Urgenda Foundation's favour and the Court of Appeal subsequently reaffirmed the ruling on 9 October 2018. The Dutch government is giving effect to the Urgenda judgment by focusing its efforts on achieving the goals of the Energy Agreement. The Energy Agreement Implementation Agenda of 14 February 2018 sets out which measures have been taken to realise these goals. At the start of 2019, the Netherlands Environmental Assessment Agency will publish an update of the NEV 2017 that will provide insight into the scope of the Energy Agreement and the implementation of the Urgenda judgment. Additional measures will be put in place in the event that the publication should show that the reduction target of 25% is not being achieved.

The awareness of climate change, sustainability and the circular economy in society is also expressed by the multitude of sustainability initiatives launched by citizens, businesses, NGOs and government agencies. There is a great deal of media coverage on these topics as well.

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[19] http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=84105ned&D1=0-62&D2=0,2&D3=12,22,111-115&HDR=G1,G2&STB=T&VW=T.

[20] https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2018/.

[21] https://www.weforum.org/reports/the-global-competitveness-report-2018.

[22] https://www.globalinnovationindex.org/Home.

[23] https://www.cbs.nl/nl-nl/cijfers#theme=bevolking.

[24] Please consult the Balance in the Living Environment publication for more information: http://themasites.pbl.nl/balansvandeleefomgeving/wp-content/uploads/pbl-2018-balans-van-de-leefomgeving-2018-3160.pdf.

A survey conducted among Dutch citizens showed that, although sustainability is relatively low on their agenda, a majority of people have a favourable attitude to making the energy supply more sustainable. They do, however, estimate the share of sustainable energy to be higher than it actually is and feel that the State (both the Dutch government and local and regional authorities) have a key role to play in the climate and energy transition.[25]

Despite this positive attitude toward sustainability initiatives, there is resistance to the introduction of projects, including infrastructure, solar farms and wind farms, in certain regions in the Netherlands, partly due to the fact that certain local residents feel that these types of projects have an adverse impact on their living environment. The spatial challenges associated with the climate and energy transition are significant.

ii. Overview of current policies and measures

Existing policies

Current energy and climate policy is set out in the Energy Agreement 2013 and the Coalition Agreement 2017. The Climate Agreement and the Climate Act announced in these documents will contain new policy measures. The following is a brief outline of the key building blocks of Dutch energy and climate policy.

Coalition Agreement "Confidence in the Future"

The Rutte III government (VVD, CDA, D66, ChristenUnie) was sworn in on 26 October 2017. The guiding political principles of the government were outlined in the Coalition Agreement entitled "Confidence in the Future", which was published on 26 October 2017. [26] The Netherlands is determined to make a substantial contribution to achieving the goals of the Paris Agreement, which is why we will be taking measures that put us on track for a 49% reduction of greenhouse gas emissions by 2030, which also includes the impact of policy with regard to the circular economy. As highlighted by the State Secretary for Infrastructure and Water Management in the government response to the transition agendas regarding the circular economy, the transition to a circular economy has the potential to make a significant contribution to the realisation of the targets in the context of the Climate Agreement.[27] At a European level, we intend to advocate a reduction of emissions of 55% by 2030. In the event of a more stringent target in the EU not proving feasible, the Netherlands will endeavour to secure more ambitious commitments with like-minded North-Western European countries than envisaged by the allocation assigned by the EU – without such commitments leading to higher emissions elsewhere.

At the national level, the Coalition Agreement has committed to the realisation of a Climate Agreement, to provide more security with regard to long-term goals. Furthermore, it was agreed that the key points of the commitments in the field of climate and energy policy in the Coalition Agreement would be enshrined in a Climate Act.

A number of measures that are included in the Coalition Agreement are making the tax system greener and more sustainable, the closing of coal-fired plants no later than 2030, the recycling of raw materials in industry, making the zones for offshore wind energy larger, ensuring new homes no longer use natural gas and making existing homes more sustainable, replacing the duty to connect housing to the gas network with a right to heating and an ambition to achieve 100% zero emissions through sales of new passenger cars from 2030.

[25] Motivaction, *Publieksmonitor Energie*, 2017.
[26] Confidence in the future, Coalition Agreement 2017 – 2021, VVD, CDA, D66, and ChristenUnie.
[27] Parliamentary Paper 32 852, no. 59.

The Coalition Agreement is the point of departure for the realisation of the Climate Agreement. In addition to the 49% reduction target and the commitments regarding the phasing out of electricity production using coal and the minimum price for carbon (see Section 1.1. iii), the Coalition Agreement also includes stipulations that the agreements from the Government-wide programme for a Circular Economy and the transition agendas from the Raw Materials Agreement are to be implemented as part of the government's climate commitments.[28]

The Agreement on Energy for Sustainable Growth (Energy Agreement)

The Energy Agreement for sustainable growth was realised in September 2013, and involved over 40 organisations (including the government, employers, trade unions, nature and environmental organisations, social organisations and financial institutions) formulating and laying down collective ambitions for sustainable growth and making concrete agreements with regard to achieving those ambitions. The Energy Agreement will run until 2023. In this regard, the parties are committed to achieve the following goals[29]:

- reducing final energy consumption by an average of 1.5% per year;
- a reduction in final energy consumption in the Netherlands of 100 petajoules;
- an increase in the share of renewable energy production (over 4% at present) to 14% by 2020;
- a further increase of this percentage to 16% by 2023;
- at least 15,000 full-time jobs, to be created for a large part in the next few years.

In 2016, the package of additional measures was agreed upon by the Energy Agreement Monitoring Committee. Furthermore, the Implementation Agenda 2018 was agreed upon in 2018 and contains a response of the parties to the Energy Agreement regarding the results of the NEV 2017 and a number of key considerations relating to the implementation of the Energy Agreement in the forthcoming year.[30] The Implementation Agenda 2018 also makes reference to the Climate Agreement. The development of the Climate Agreement will only succeed if everyone remains fully committed to achieving the goals of the Energy Agreement.[31]

Implementation of the commitments of the Energy Agreement should result in an affordable and clean energy supply, employment and opportunities for the Netherlands on the clean technology markets. The Energy Agreement signifies an irrevocable step on the part of the Netherlands in the direction of the energy transition, resulting in a significant increase in the share of renewable energy and energy efficiency.

Top Sectors

Top Sectors are fields in which Dutch businesses and research centres excel at a global level, such as agriculture & food, the chemical industry, the creative industry, energy, high-tech systems & materials, life sciences & health, logistics, horticulture and parent materials and water & maritime. Businesses, universities, research centres and the government work on knowledge and innovation alongside one another to further strengthen that position. Within each Top Sector, the parties have joined together in Top Consortia for Knowledge and Innovation (TKI), which have formulated research agendas and objectives for the coming years.

The Energy Top Sector (TSE) is the driving force behind the innovations that are necessary for the transition to an affordable, reliable and sustainable energy system. TSE helps businesses, knowledge institutes, public authorities and social organisations collaborate on shaping the energy system of the

[28] Letter to Parliament on the Government's Approach to Climate Policy, 23 February 2018, Parliamentary Paper 32 813, no. 163.
[29] Energy Agreement for Sustainable Growth, Social and Economic Council in the Netherlands (SER), September 2013.
[30] Parliamentary Paper 30 196, no. 559.
[31] Letter to Parliament on the Implementation Agenda for the Energy Agreement 2018, 14 February 2018, Parliamentary Paper 30 196, no. 573.

future. In addition, TSE encourages new initiatives that accelerate the transition to sustainable energy, thus creating new activities and strengthening our international competitiveness.

In July 2018, the Dutch government outlined what shape the new approach in top sector policy would take.[32] The government's key focus is on the economic opportunities of social challenges, including the energy transition and sustainability. Newcomers are likewise emphatically encouraged to participate.

Climate Agreement

The Climate Agreement will contain specific measures for the period of 2021-2030 and, as such, has a more distant horizon than the Energy Agreement. Businesses and social organisation will participate in sector platforms in the field of electricity, mobility, agriculture and land use, industry and the built environment in order to develop measures to realise the reduction target. A Climate Change Conference will monitor overall progress, whilst the specific sector bodies will provide cross-sectoral recommendations on funding, employment and education.

The greenhouse gas reduction target of 49% by 2030 proposed in the Coalition Agreement entails a reduction of approximately 49 Mt of carbon dioxide. The adjusted indicative allocation of CO_2 goals for the five sectors of industry, mobility, built environment, electricity, and agriculture and land use is as follows[33]:

Sector	Indicative allocation in terms of the 49% reduction target (in Mt of carbon dioxide equivalents as of 2030)*
Industry	14.3
Mobility	7.3
Built environment	3.4
Electricity	20.2
Agriculture and land use	3.5**

(*) Including the effects of the circular economy.
(**) Including 1.5 Mt of reduction from land use that does not count toward achieving the 49% reduction.

From March to July 2018, over 100 participants spread across the five sector platforms of the Climate Agreement (in the field of electricity, mobility, agriculture and land use, industry and the built environment) collaborated on developing a joint vision of what is needed to realise the ambitious goal of a 49% reduction in greenhouse gas emissions.[34] Their work under the direction of the five independent chairs of the sector platforms, the chairs of the two task forces and the chair of the Climate Change Conference has resulted in the current proposal for key points of a Climate Agreement, which was published on 10 July.[35] The government issued eight guiding principles for the formulation of the Climate Agreement[36]:

1) Stakeholders should be guided towards one central goal.
2) Cost-efficiency should the guiding principle for decisions.

[32] Letter to parliament "Towards mission-driven innovation policy with impact", 13 July 2018, Parliamentary Paper 33 009, no. 63.
[33] Letter to Parliament on the Netherlands Environmental Assessment Agency (PBL) memorandum "Costs of the Energy and Climate Transition by 2030 – Update 2018", 26 April 2018.
[34] Letter to Parliament on the "Government appraisal of the proposal for key points of a Climate Agreement", 5 October 2018, Parliamentary Paper 32 813, no. 220.
[35] www.klimaatakkoord.nl; Parliamentary Paper 32 813, no. 193.
[36] Letter to Parliament on "The Government commitment to the Climate Agreement", 23 February 2018, Parliamentary Paper 32 813, no. 163.

3) The Coalition Agreement should be the key point of departure.
4) Any packages of measures should be future-oriented (e.g. focus on entire innovation chain from research to implementation).
5) Arrangements should be concrete and integral.
6) An integrated approach is required.
7) The Agreement must serve the public interest.
8) The arrangements should be quantifiable.

The proposal for key points of the Climate Agreement was presented on 10 July 2018.[37] Analyses from the Netherlands Environmental Assessment Agency (PBL) and the Netherlands Bureau for Economic Policy Analysis (CPB) show that the parties are on track with the proposal for key points and that the reduction goal of 49% by 2030 is within reach.[38] However, their analyses also show that further steps must be taken to flesh out the proposal into specific instruments and actions. Enabling further elaboration in each sector will require all the parties to define in greater detail what efforts they themselves will undertake and what agreements the parties commit themselves to towards each other. Such clarity is also required on the part of the government. The proposal for key points contains an express call to action for the government to provide guidance.

In the Government appraisal of the proposal for key points of the Climate Agreement, the government sets out a course providing a more detailed framework for the discussions that the parties will conduct over the coming months in order to agree on specific undertakings. The second round of consultations at the sector platforms and in the Climate Change Conference will take place in the months leading up to and including December 2018. The government has requested that the sector platforms use this second round to identify more clearly what additional measures might still be possible, in the context of the government's efforts at European level to increase the European target to 55%. In the event a higher European target is set as a result of these efforts, we will already be prepared for this. Because the outcome of the international talks to be held in 2019 is not yet certain, the goal ultimately established for 2030 may differ from the 49% the government currently has in mind.[39]

The sector platforms' negotiations should culminate into one cohesive Climate Agreement in December 2018, with five sectoral pillars and specific focus on cross-sectoral topics. The agreement will then be analysed yet again by the Netherlands Environmental Assessment Agency and the Netherlands Bureau for Economic Policy Analysis in order for an independent, objective assessment to be carried out on whether the proposed measures are sufficient to achieve the targets, European or otherwise. Finally, Parliament will vote on the proposed national Climate Agreement.

Climate Act

The Coalition Agreement announced that a Climate Act would be created in which the long-term climate policy goals for 2030 and 2050 would be laid down in law:

- By 2050, the Netherlands must have reduced its greenhouse gas emissions by 95% in respect of 1990.
- An interim target of a 49% reduction in greenhouse gases has been set for 2030.
- Another target has been included with regard to electricity production, which must be 100% carbon neutral by 2050.

In addition, the Act will set out that a climate plan must be drawn up every five years. The climate plan will outline the key issues of the climate policy to be carried out in the next ten years – this

[37] Proposal for key points of the Climate Agreement, 10 July 2018, Parliamentary Paper 32 813, no. 193.
[38] Parliamentary Paper 32 813, no. 216.
[39] Letter to Parliament on the Government appraisal of the proposal for key points of a Climate Agreement, 5 October 2018, Parliamentary Paper 32 813, no. 220.

corresponds to the approach of the NECP. The Climate Act will connect long-term goals with policies in the medium and short term. Furthermore, the Act will include that the Climate and Energy Report (*Klimaat- en Energieverkenning*, KEV) and the climate memorandum are to be submitted to the House of Representatives each year – on the fourth Thursday of October. This monitoring system is in line with that of the NECP and will inform the House on the progress in the field of climate policy.

Collaboration with other government authorities

Start of the Inter-Administrative Programme

Local and regional authorities play a major role in the realisation of the climate and energy transitions, as emphasised in the Coalition Agreement. In February 2018, the Inter-Administrative Programme (*Interbestuurlijk Programma*, IBP) – to which Climate and Energy, including the circular economy and climate adaptation, was a party – was signed by the Dutch central government and the local and regional authorities.[40] The central government and local and regional authorities agreed to a joint commitment to climate mitigation (the central government and the local and regional authorities will jointly work to achieve the goal of a 49% reduction in carbon emissions by 2030), climate adaptation (by 2050, the Netherlands should be climate-proof and have robust water management systems in place) and the circular economy (a circular nation by 2050). The joint ambition of the government authorities is to achieve substantive results with regard to these three themes that all authorities support. Substantive agreements in which the business sector and social parties also bear responsibility will be laid down in the Climate Agreement.

Regional Energy Strategies

One of the components of the Inter-Administrative Programme is the agreement on a multi-annual programmatic national approach with nationwide integrated Regional Energy Strategies (RES) in conjunction with regional circular economy strategies. RES are vital to ensuring the ambitions of the forthcoming Climate Agreement are put into practice. The objective of the RES is to organise careful spatial integration of renewable energy generation and heat transition in the built environment, in a way that is acceptable to society, whilst focusing on the required infrastructure. The RES are used to structure the collaboration between public authorities and their social partners (citizens, businesses, green parties, network managers), and to promote acceptance of the energy transition throughout society. The RES will lead to decision-making in the environmental policy (environmental vision, environmental plans, environmental programmes and environmental by-laws). The contribution of social partners will be essential in this context, not only in terms of awareness-raising and acceptance, but also to be able to make optimum use of the knowledge, implementation positions and capabilities of the various parties.

iii. Key issues with cross-border relevance

The Netherlands wishes to make ambitious agreements with like-minded North-Western European countries in order to jointly develop policy instruments and practical measures and in doing so achieve a higher climate goal within the leading group. For example, this could take the form of a cooperation that aims to coordinate the phasing-out of coal, more far-reaching carbon pricing than that introduced by the ETS, roll-out of sustainable energy or accelerated introduction of electric vehicles. Alternatively, such a cooperation could focus on jointly developing CCU/CCS or the use of hydrogen. The Netherlands has drawn up a Hydrogen Roadmap[41] aimed at stimulation of the further roll-out of hydrogen for mobility, energy production, transport and storage, and for the provision of raw materials in the industry. The Netherlands is currently developing a programmatic approach within the

[40] Start of the Inter-Administrative Programme, 14 February 2018.
[41] Parliamentary Paper 21 501 – 33, no. 723.

context of the Climate Agreement. The political declaration "*The Hydrogen Initiative*"[42] of the Austrian Presidency may be useful in this regard.

By joining forces with neighbouring countries, we will be able to prevent any leakage effects arising from the reductions in greenhouse gases and prevent any major competitive disadvantages to the Dutch economy. Regional coordination is also crucial to supply security.

Depending on the joint challenges and interests in neighbouring countries, the composition may differ per topic, with existing partnerships in the field of energy, industry and climate (such as the Pentalateral Energy Forum and the North Seas Energy Forum) as a basis for collaboration and with cooperation initiatives in the area of agriculture, mobility, the circular economy and the built environment being sought with like-minded countries. A further survey of the instruments along which more intensive collaboration can take place with our neighbours is currently underway.

iv. Administrative structure of implementing national energy and climate policies

As of October 2017, climate and energy policy are part of the remit of a single ministerial department, namely that of the Ministry of Economic Affairs and Climate Policy. The remit of the Ministry in this case includes the implementation of the Energy Agreement, the development of the Climate Agreement, the preparation and drafting of a Climate Act and drawing up the underlying draft and final NECP. The Ministry of the Interior and Kingdom Relations is responsible for policy relating to increasing the sustainability of the built environment. The Ministry of Agriculture, Nature and Food Quality is responsible for the targets with regard to agriculture and land use and the Ministry of Infrastructure and Water Management with regard to mobility, the circular economy and climate adaptation. Consultation and coordination between these ministries is crucial and takes place on a regular basis.

The local and regional authorities are responsible for the development of the measures in the physical environment, spatial policy and the realisation of environmental goals. They will also take a leading role in the Regional Energy Strategies (RES), which represent the regional approaches for the challenge around onshore electricity production (locations and networks) and the heating transition in the built environment in particular. They will be creating a link to the regional circular economy strategies from the IBP and will also be translating them into provincial and municipal environmental visions, environmental regulations and environmental plans.

The consultative body of the Social and Economic Council in the Netherlands (SER) and the national government jointly make up the Secretariat for the Climate Agreement, with the SER also ensuring compliance with the agreements of the Energy Agreement. The progress of the Energy Agreement will be reported by way of the Progress report.

The National Energy Outlook (NEV) that is drawn up by the Netherlands Environmental Assessment Agency (PBL) constitutes a crucial basis for national energy and climate policy. Each year, the NEV provides the up-to-date evidence base for political decision-making and the public debate in the Netherlands on energy and the climate. The NEV 2017 outlines the expectations in respect of the development of the Dutch energy system, with a projection up to 2035. The NEV 2017 is used as a reference to determine the indicative challenges of the Climate Agreement for each sector platform; no NEV will be published in 2018. In accordance with the Climate Act, a national Climate and Energy Outlook (KEV) will be published annually from 2019.

[42] see: https://www.rijksoverheid.nl/documenten/publicaties/2018/09/11/verklaring-the-hydrogen-initiatieve

The figures in this Integrated National Energy and Climate Plan (NECP) are based on the most current integrated survey of the National Energy Outlook 2017, without any new rounds of the Sustainable Energy Production Incentive (SDE+) grant scheme after 2019.[43] This scenario allows the available resources to be used in other ways, allowing the government to fully weigh the application of the SDE+ resources for a cost-efficient implementation of a 49% reduction in greenhouse gases by 2030. New measures from the Coalition Agreement are mentioned, but have not been incorporated into the estimates. The NEV 2019 will be published in the autumn of 2019, and then be used for the final NECP, in which the impact of the Climate Agreement, as part of the Climate Plan that is drawn up based on the Climate Act, will also be incorporated.

1.3 Consultation and involvement of stakeholders

Dutch climate and energy policy is defined by two social agreements: the Energy Agreement and the future Climate Agreement. An important part of climate adaptation policy is laid down in the inter-administrative Delta Programme. This structure means that consultation and involvement of national and international stakeholders and local and regional authorities (municipalities, provinces, water boards) is guaranteed. Given that the final NECP will largely be based on these agreements, and on the Climate Agreement in particular, this goes to responding to the need for stakeholders and local and regional authorities to be involved.

More specifically, the stakeholders, local and regional authorities and public and semi-public organisations all participate in the development and drafting of the Climate Agreement in the sector platforms. This means that they each bear responsibility for the realisation and implementation of the Climate Agreement. As outlined previously, the consultations take place within five sectoral platforms: built environment, industry, agriculture and land use, mobility and electricity. A number of topics are relevant to several or all sectors simultaneously. For that reason, the following cross-sectoral themes will be developed further: electrification, hydrogen, biomass, innovation, labour market and training, financing, citizen participation, spatial integration and Regional Energy Strategies (RES).

The organisations and companies invited to participate in the sector platforms are all capable of making concrete contributions to the transition within their sector. For specific subjects, parties outside the sector platforms were also involved.

The government considers it essential that the transition be attainable and affordable for every household and every Dutch citizen. Even if we are able to keep the costs of the transition as low as possible, support is by no means guaranteed, as citizens will be confronted with the transition in various ways. The government feels it is essential in this regard that citizens are able to actively participate in the transition process if they so wish. The government considers support in society to be critical to the Climate Agreement. This support is to an important degree contingent upon the impact of the transition on spatial planning. The transition is set to impose significant demands on spatial planning over the coming years and the government therefore considers it important that discussions in the context of the Climate Agreement should be as wide-ranging as possible where measures with spatial implications are concerned.

Two key instruments that enable citizens to take up an active role in the implementation of the transition in their local environment are the district-oriented approach in the built environment and the shaping of the Regional Energy Strategies (RES). The objective of these instruments is to shape the integration of the transition into the environment in a manner that is coherent and involves all relevant stakeholders and citizens.

[43] NEV 2017 – ECN, 2017.

It is important to the government that there be a role for citizens in the development of projects. This could be achieved in a number of ways, one of which is through financial participation. In the context of the spatial integration of renewable energy, a concerted effort is also underway to create support by enabling residents to have a say and participate in sustainable energy projects. The government intends to partly shape civic participation through a broad public approach and an umbrella campaign, aimed at providing citizens and businesses agency with prospects.[44]

i. Consultation with other Member States

Dutch energy and climate policy is regularly shared with other Member States through various consultative bodies. The Netherlands participates in, among others, the Pentalateral Energy Forum, the North Seas Energy Forum, the Green Growth Group and the Adaptation Sub-Committee of the Climate Change Committee. The NECP is coordinated through the Pentalateral Energy Forum and the North Seas Energy Forum.

The **Pentalateral Energy Forum** was co-founded by the Netherlands in 2005, with the BENELUX, France and Germany as the initial members, and Austria and Switzerland at a later date. The BENELUX provides the secretariat for the organisation and the Netherlands holds the Presidency this year. The ministers provide political direction to the regional partnership of the Penta countries, with a particular focus on market coupling, security of supply and improvement of flexibility services. The ministers convene once every two years, with the last meeting having taken place in June 2017. The Penta region is the largest EU market and BENELUX countries have identified a new role for the Pentalateral Energy Forum with regard to the coordination of the Integrated National Energy and Climate Plans. In the margins of the Energy Council (on 11 June 2018), Belgium, the Netherlands and Luxembourg signed a statement on cooperation for the development of the integrated national energy and climate plans. At the end of June, a high-level kick-off summit was held with all Penta countries in a Benelux context. The purpose of this summit was to discuss existing regional and other partnerships, sections of the key points of the content of the various NECPs and the identification of synergies and next steps for cooperation. It is expected that the Penta DG consultation of 14 November will include further discussions on the possible role of the Penta Forum in drafting and coordinating the NECPs.

Belgium, Luxembourg, Germany, France, Denmark, the United Kingdom, Ireland, Sweden and Norway signed the Political Declaration on energy cooperation between the North Seas Countries, which relates to the development of offshore wind energy, improvements to the grid and coordination. These countries will be involved in fleshing out a package of concrete measures to achieve additional reductions, given that any additional efforts must also align with the other ambitions that have been formulated with these countries. The agreements of the **North Seas Energy Forum** are summarised in an annex to the final Integrated National Energy and Climate Plan.

The **Green Growth Group** (GGG) consists of 16 EU Member States (AUS, BEL, DEN, EST, GER, FIN, FRA, IRE, ITA, LUX, NL, POR, SLOV, SPA, SWE and UK) and Norway, which collaborate on strengthening EU climate ambitions.

In the **Climate Adaptation Sub-Committee** (as part of the CC Committee), EU Member States and the Commission collaborate on the implementation of the EU Climate Adaptation Strategy. The evaluation of this strategy will be published at the end of 2018.

[44] Letter to Parliament on the Government appraisal of the proposal for key points of a Climate Agreement, 5 October 2018, Parliamentary Paper 32 813, no. 220.

Bilateral consultation also takes place with neighbouring countries, including on issues such as the phasing out of (low-calorific) natural gas, the phasing out of coal, measures for the reduction of greenhouse gases, the introduction of a carbon price floor and the effects of capacity market mechanisms.

ii. Iterative process with the European Commission

Consultation with the European Commission takes place in the normal Technical Working Groups for the Governance Regulation, in the NECP online platform (ICF) and through the periodic Commission surveys in order to provide progress updates of the drafting of the NECP. In addition, following the submission of the draft plans, the Commission will issue recommendations that the Netherlands will take into account when drafting the final version.

1.4 Regional cooperation in the drafting of the plan

i. Elements subject to joint or coordinated planning with other Member States

In June 2018, Belgium, along with the Benelux Secretariat, held a consultation (=dialogue) in order to discuss how we would be jointly drafting our NECPs, and the elements subject to coordination, in the Pentalateral context (AUS, BEL, CH, FRA, GER, LUX, NL). Following a number of presentations on the status of the NECPs, the Member States expressed their vision on how the Pentalateral structure should be used to coordinate the plans.

ii. Explanation on how regional cooperation is considered in the plan

The North Seas countries have agreed to add a North Seas section to the NECP. This section is currently being developed and is expected to be added to the final version.

At present, the Pentalateral Forum is focused on promoting cooperation in the field of cross-border electricity exchange. The Netherlands will be focusing on expanding this cooperation to include collaboration on – and coordination of – cross-border measures and instruments that contribute to the realisation of the five dimensions of the Energy Union. This is in line with the obligation to consult neighbouring countries with regard to the NECPs. In addition, it is consistent with the intention in the Coalition Agreement to strengthen cooperation in a North-Western European context within the framework of the climate ambitions. The Netherlands has kicked off the dialogue with its neighbours on a strengthened role for the Pentalateral Forum and is committed to making agreements with these countries by the end of this year.

Chapter 2. National objectives and targets

In line with what was outlined in Chapter 1 on the current status of the development of the national Climate Agreement, this chapter in the draft NECP will chiefly be based on the objectives and targets for 2021-2030 that have already been established and/or are proposed in the Coalition Agreement. The final NECP will lay down the new objectives and targets as established in the Climate Agreement, which will additionally be translated into concrete policies and measures (Chapter 3).

The figures in this draft NECP are based on the National Energy Outlook 2017, with no new rounds of the Sustainable Energy Production Incentive (SDE+) grant scheme after 2019.[45] This scenario will allow alternative ways to use the available resources to be considered, allowing the government to fully weigh the application of the SDE+ resources for a cost-efficient implementation of a 49% reduction in greenhouse gases by 2030. The NEV 2019 will be published in the autumn of 2019 and will subsequently be used for the final NECP, which shall also incorporate the impact of the Climate Agreement.

2.1 Dimension of decarbonisation

2.1.1 Greenhouse gas emissions and removals

i. Emission reduction target for greenhouse gases, ESR and LULUCF

In the Netherlands, the Coalition Agreement of the Rutte III government has recognised that, partly as a result of the Paris Agreement, greater and faster emission reductions should take place. To this end, the Coalition Agreement includes a higher national target for a reduction of greenhouse gas emissions by 2030: 49% compared to 1990. In addition, the Coalition Agreement includes a commitment for the Netherlands to strive to raise the EU reduction target to 55% by 2030. Within the national Climate Agreement, the government wishes to make agreements with local and regional authorities, businesses, nature and environmental organisations, trade unions and other civil society organisations regarding the measures that are required to achieve emission reductions of at least 49% by 2030 compared to 1990. Such reductions align with a gradual emissions reduction pathway to achieve a 95% reduction of emissions by 2050.

In Europe, the Netherlands is even calling for a more ambitious reduction target of 55% by 2030. Should the EU reduction target of 55% prove to be too ambitious, the Netherlands will strive to achieve more ambitious agreements with like-minded North-Western European countries. Given that the outcome of the international talks to be held in 2019 is not yet certain, the national goal ultimately established for 2030 may differ from the intended 49% emission reduction.

[45] ECN, 2017.

The following indicative sectoral allocation for the reduction target is used for the Climate Agreement:

Sector	Indicative sectoral allocation for the Climate Agreement*	Emissions in 2030 following implementation of the Climate Agreement
Industry	14.3	35.7
Mobility	7.3	25.0
Built environment	3.4	15.3
Electricity	20.2	12.4
Agriculture & land use	3.5 (**)	22.2 (***)
Total	48.7 (**)	110.6

(*) Including the effects of the circular economy.
(**) Including 1.5 Mt of reduction from land use that does not count toward achieving the 49% reduction.
(***) Excluding emissions from land use.

In respect of the Netherlands, there is a statutory Effort Sharing Regulation target of 36% in emission reductions by 2030 compared to 2005. Assuming emissions of 122 Mt in 2005, this would be a decreasing budget of up to 78 Mt by 2030. The Netherlands is expected to achieve that target as a result of the implementation of the Climate Agreement.[46]

What is known as the "no-debit" rule applies in respect of the Land Use, Land-Use Change and Forestry target, which means that, under the application of the accounting rules of the LULUCF Regulation, the Netherlands may not have any net emissions for the cumulation of all LULUCF accounting categories. If any credits are generated in the LULUCF sector, these may be deducted from the ESR target up to a cumulative maximum of 13.4 Mt (over 10 years). However, if there are debits in the LULUCF sector, such debits must be compensated. This can be done through surplus performance in the ESR, for example, in addition to any other options under the LULUCF Regulation.

At present, unchanged policies could result in LULUCF debits for the Netherlands. The Netherlands strives to achieve 1.5-2 Mt in "performance improvements" in the LULUCF category through smarter land use. In this way, all economic sectors will be contributing to the climate efforts of the Netherlands.

ii. Other national objectives and targets, including sector targets and adaptation goals

In December 2016, the government adopted the National Climate Adaptation Strategy (NAS).[47] The NAS comprises all climate adaptation policies and complements the Delta Programme. The Delta Programme focuses on mitigating the effects of climate change that are associated with the water system, such as a rise in sea levels, the increase of prolonged rainfall and the resulting increase in river discharge and flooding in regional water systems, peak rainfall, drought and heat (as well as a combination of those elements). The Delta Programme is a large-scale, inter-administrative

[46] Netherlands Environmental Assessment Agency (PBL) memorandum "Costs of the Energy and Climate Transition in 2030 – Update 2018", April 2018.
[47] For more information, please visit https://ruimtelijkeadaptatie.nl/nas/

programme in which the national government, the provinces, water boards and municipalities work together under the auspices of the Delta Commissioner.

With regard to the Delta Programme, the Coalition Agreement has set out that "the implementation of the Delta Programme will continue. More than ever, the focus of spatial planning will be on making the Netherlands climate-proof and ensuring it is resilient in terms of water management."[48]

The purpose of the Delta Plan on Spatial Adaptation (September 2017), which is part of the Delta Programme, is to achieve the climate-proof and water-resilient spatial organisation of the Netherlands by 2050.[49] To this end, the national government, provinces, municipalities and water boards must act in a climate-proof and water-resilient manner from 2020.

The Implementation Programme for the NAS (UP NAS 2018-2019) was completed in April 2018.[50] The UP NAS contains a number of priorities that focus on those sectors and issues that have as yet been insufficiently mapped out, including heat stress, agriculture, nature and the built environment.

The Coalition Agreement also set out that the government's policies on the circular economy will be implemented as part of the climate commitments, where the government will be focusing chiefly on the development and dissemination of knowledge and best practices. As highlighted in the government response to the transition agendas regarding the circular economy, the transition to a circular economy has the potential to make a significant contribution to the realisation of the targets in the context of the Climate Agreement.[51]

Finally, investments will be made in a smart and sustainable transport system, the individual parts of which align seamlessly with one another. An integrated approach to the traffic system is crucial to keeping the Netherlands accessible. The government has announced its intention to restructure the infrastructure fund into a mobility fund to ensure the integrated approach. In addition, the Coalition Agreement has also announced a levy on heavy goods traffic. The Netherlands Environmental Assessment Agency has calculated that, upon implementation, this will result in roughly 0.2 Mt in carbon reduction.[52]

2.1.2 Renewable energy

i. Contribution to the binding EU target of at least 32% renewable energy by 2030

The Netherlands is committed to the goals set out by the Paris Agreement, which is why the reduction of greenhouse gas emissions play an essential role in our climate and energy policies. Renewable energy is a crucial means to achieve the carbon emission reduction targets. This being the case, the Netherlands supports the increase of the European 2030 renewable energy target to 32%.

The forthcoming Climate Agreement will focus on achieving carbon reductions and will be developing a package of measures and targets in the ongoing negotiations, which should lead to a national reduction in carbon emissions of at least 49%, with the possibility of an increase to 55%. For the Netherlands, with regard to determining the national contribution to the European targets, it is vital that the degree of national flexibility be retained in respect of the forthcoming Climate Agreement.

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[48] Coalition Agreement 2017-2021 "Confidence in the future", page 46.
[49] Please also see https://deltaprogramma2018.deltacommissaris.nl/viewer/chapter/1/2-deltaprogramma-/chapter/deltaplan-ruimtelijke-adaptatie.
[50] See https://ruimtelijkeadaptatie.nl/nas/.
[51] Parliamentary Paper 32 852, no. 59.
[52] See https://www.klimaatakkoord.nl/binaries/klimaatakkoord/documenten/kamerstukken/2018/10/05/kabinetsappreciatie-mobiliteit/Kabinetsappreciatie+Sectortafel+Mobiliteit.pdf.

The Netherlands will be assuming a bandwidth of 27 to 35% as the national contribution to the EU target for renewable energy, based on calculations conducted by the Netherlands Environmental Assessment Agency (PBL) of a cost-efficient translation of the target of 49% reduction in carbon emissions to a share of renewable energy. This contribution depends on the extent to which Carbon Capture and Storage (CCS) and nuclear power are used, the share of renewable energy in transport that is included in Dutch law as a result of the revised renewable energy directive and the technological saving measures in addition to the autonomous efficiency improvements that are expected.[53] The Netherlands' ultimate goal within this bandwidth depends on specific policy decisions and measures and will be set out in more concrete terms in the Climate Agreement. This goal will be included in the final NECP.

ii. Estimated trajectories for the share of renewable energy in the electricity, heating, cooling and transport sectors

The government is committed to increasing the share of renewable energy in the energy mix between 2020 and 2030. Specific goals and trajectories regarding the proportion of renewable energy in energy consumption are yet to be developed in the Climate Agreement.

The indicative trajectory of the Dutch contribution to the EU renewable energy target between 2020 and 2030 is non-linear due to the nature of large-scale renewable energy projects, which are completed intermittently. The indicative trajectory is determined based on the measures of the Climate Agreement and will be included in the final NECP.

For example, this applies to the share of renewable energy in transport. The government has specifically chosen in favour of multiple energy carriers for all transport modes and intends to encourage innovations (toward zero emissions in 2050) in heavy goods road transport and in inland shipping, maritime shipping and aviation.[54]

The percentage of electric vehicles will be increased. The exact method of stimulation is yet to be set out in the Climate Agreement. Until that time, the government will adhere to the objectives outlined in the 2014 "A vision on sustainable fuels for transport",[55] which includes the ambition to reduce average emissions from passenger cars by 44% by 2030 in respect of 2010, those of vans by 33%, lorries and buses by 20%, shipping by 24% and aviation by 17%.

In order to reduce the emissions of modes of transport that use an internal combustion engine, efforts are ongoing to make the fuels that are used more sustainable. This is in part accomplished through the use of advanced biofuels for methods of transport for which no alternatives are as yet available, such as heavy goods road traffic, inland shipping, maritime shipping and aviation. In addition, innovations are being encouraged for the development of green hydrogen, Power-to-X and synthetic fuels. The Climate Agreement will also set out the way in which production plants for advanced fuels will be facilitated in more detail, and to what extent the standards relating to the required share of renewable energy can be raised. This will be included in the national translation into legislation of the new Renewable Energy Directive – RED II – part of the Clean Energy package. This will also involve drawing up a plan for the required charging and fuelling infrastructure.

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[53] http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2017-verkenning-van-klimaatdoelen-van-lange-termijnbeelden-naar-korte-termijn-actie-2966.pdf p 89-90.

[54] Government appraisal of the Climate Agreement with regard to the Mobility sector platform, 5 October 2018, Annex to Parliamentary Paper 32 813, no. 220.

[55] See https://www.energieakkoordser.nl/~/media/files/energieakkoord/nieuwsberichten/2014/brandstofvisie/duurzame-brandstofvisie-met-lef-2e-druk.ashx.

With regard to making the built environment more sustainable, the government is committed to ensuring a substantial percentage of buildings are no longer heated using natural gas. The heat supply of the built environment should be low-carbon by 2050.[56] At present, a review is being conducted regarding whether any specific targets and measures aimed at the share of renewable energy should be developed as a result of the new Renewable Energy Directive (RED II).

iii. Estimated trajectories by renewable energy technology

The measures of the Climate Agreement will include the drafting of estimated trajectories for the various renewable energy technologies, which will be included in the final NECP. At present, an estimated trajectory can only be included for offshore wind.

The Agreement on Energy for Sustainable Growth from 2013 (see Chapter 1) includes the ambition to increase the capacity of offshore wind to 4.5 GW of installed capacity by 2023. The Offshore Wind Energy Roadmap 2030 pursues this avenue at an accelerated pace.[57] Between 2024 and 2030, offshore wind farms will be realised with an average expansion of 1 GW per year, resulting in roughly 11.5 GW of installed capacity by 2030. In the years to come, new offshore areas will be designated as future zones for offshore wind energy. In addition, wind energy is being discussed in the context of the Climate Agreement.

iv. Estimated trajectories on bioenergy demand and on biomass supply, including the of the assessment of the source of forest biomass and its impact on the LULUCF sink

The use of biomass is one of the issues being discussed in the development of the Climate Agreement, with the guiding principle being the 2016 strategic vision on the use of biomass,[58] which is yet to be translated into the specific proposals made by the sectors for the Climate Agreement.

In the context of the Climate Agreement, there will have to be more clarity regarding the use of biomass. In this regard, in the long term, the Netherlands aims to prioritise high-grade applications in those economic sectors where there are few alternatives. Examples include use as a raw material for industry and use as a fuel for heavy-duty vehicles and in shipping and aviation.

As part of the Climate Agreement, the Netherlands will also specify how domestic production can be increased.[59] Regarding the use of forest biomass for bioenergy, the same requirements for the source shall apply as will be included in the new Renewable Energy Directive, regarding which a political agreement has already been reached between the European Commission, Parliament and the Council.[60]

With regard to the impact of the forest biomass on the LULUCF emissions sink, there will be compliance with the LULUCF Regulation; the level of the impact will depend on the eventual Climate Agreement and the corresponding estimate will be included in the final NECP.

v. Other national trajectories and objectives, including long-term or sectorial ones

Within the context of the Climate Agreement, the Netherlands is pursuing specific measures and trajectories in various fields. The results of the negotiations for the Climate Agreement will be included in the final NECP.

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[56] Parliamentary Paper 32 813, no. 163.
[57] Parliamentary Paper 33 561, no. 42.
[58] Parliamentary Paper 33 043, no. 63.
[59] Annex to Parliamentary Paper 32 813, no. 220.
[60] Quarterly report on EU legislative negotiations, 18 October 2018, Parliamentary Paper 22112, no. 2702.

2.2 Energy efficiency dimension

i. Indicative national energy efficiency contribution to achieving the energy efficiency target of the Union of at least 32.5% by 2030, including cumulative energy savings in end use (Art. 7 of the Energy Efficiency Directive) and total floor area that must be renovated (Art. 5 of the Energy Efficiency Directive)

Indicative national energy efficiency contribution to achieving the energy efficiency targets of the Union of at least 32.5% by 2030

The indicative national contribution of the Netherlands to the European energy efficiency target of 32.5% is based on the expected primary energy consumption of the Netherlands in 2030 in the event of a cost-efficient package of measures capable of achieving a 49% reduction in carbon emissions by 2030 in respect of 1990.[61]

The Netherlands has chosen to make its contribution based on primary energy consumption in 2030. This contribution may still change, depending on the final package of measures that will be agreed upon in the Climate Agreement.

The Netherlands aims to achieve a primary energy consumption of 1950 petajoules by 2030 (excluding use for non-energy purposes).[62] This contribution is based on the definitions used in Eurostat. So far, no indicative trajectory has been determined beyond 2021 due to the uncertainty regarding the results of the Climate Agreement. In terms of final energy consumption, this contribution can be translated into an expected final energy consumption of 1864 petajoules by 2030.[63]

Cumulative energy savings of the final consumption in the period of 2021-2030 (Article 7 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC)

The Netherlands will determine cumulative energy savings in the 2021-2030 period based on 0.8% in savings per year of the average final energy consumption in the years 2016, 2017 and 2018. The level will be determined as soon as the energy consumption for 2018 is published or can be reasonably estimated, after which it will be reported in the final plan.

Total floor area that must be renovated or the equivalent in annual energy savings (Article 5 of Directive 2012/27/EU)

Article 5 of the Energy Efficiency Directive (2012/27/EU) requires Member States to renovate at least 3% of the total floor area of buildings that are owned and occupied by the central government each year. The Netherlands chose an alternative approach for the 2014-2020 period (Energy Research Centre of the Netherlands, 2013[64]). During the 2021-2030 period, the Netherlands wishes yet again to take an alternative approach. The Netherlands wishes to establish a minimum energy savings target for buildings that are owned and occupied by the central government. The Energy Efficiency Directive, however, provides that an alternative approach may only be used if the results are at least equivalent to the 3% renovation provision. A study will be conducted to ascertain the level of the energy savings target in order to yield at least equivalent results. The results of the study will be included in the final NECP.

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[61] https://www.rijksoverheid.nl/documenten/kamerstukken/2018/05/14/kamerbrief-bij-verslag-informele-energieraad-19-april-2018-en-uitkomsten-studies-naar-eu-doelen-voor-hernieuwbare-energie-en-energie-efficientie-voor-2030.

[62] https://www.rijksoverheid.nl/documenten/rapporten/2018/04/19/het-effect-op-het-nederlandse-energieverbruik-van-maatregelpakketten-voor-49-emissiereductie-van-broeikasgassen.

[63] Ibid.

[64] https://ec.europa.eu/energy/sites/ener/files/documents/2013_nl_eed_article5_nl.pdf.

ii. The indicative milestones for 2030, 2040 and 2050, the national progress indicators and their contributions to the energy efficiency targets of the European Union

The built environment accounts for approximately 30% of the overall energy consumption in the Netherlands. As such, in order to meet the long-term energy and climate targets, it is essential that efforts continue to make the national building stock more sustainable in the run-up to 2050. In line with the Netherlands' broader energy and climate policy, any further efforts aimed at making the built environment more sustainable shall primarily be driven by achieving carbon reductions.

This means that carbon reduction targets will be selected as indicative milestones for the process of making the built environment more sustainable. The progress will be measured according to the number of Mt in carbon reduction. The indicative milestones for 2030, 2040 and 2050 will be determined based on the Climate Agreement and will be included in the final version of the NECP.

iii. Other national objectives in areas such as energy efficiency in the transport sector

In relation to the reduction of carbon emissions, the government has identified a key future role for the logistics industry in goods and other mobility and intends to raise this issue with those parties.[65] This will be accomplished through the continuation of the Logistics Top Sector (roll-out and strengthening of the Lean and Green programme). This continuation will focus on innovation and logistics optimisation in order to strengthen competitiveness and achieve a higher level of carbon efficiency within the chain.

At the same time, the government remains committed to strict EU standards applicable to passenger cars, heavy-duty vehicles and vans and encourages the development and implementation of zero-emission technologies, including through various green deals.[66] The Zero-Emissions City Logistics Green Deal, for example, has been created to make municipalities greener. In addition, the government is working with the sector to realise a Green Deal for inland shipping, maritime shipping and ports in order to make this sector more sustainable. Furthermore, agreements will be made with the aviation industry.

[65] Government appraisal of the Climate Agreement with regard to the Mobility sector platform, 5 October 2018, Annex to Parliamentary Paper 32 813, no. 220.
[66] Ibid.

2.3 Energy security dimension

i. Increasing the diversification of energy sources and supply from third countries, increasing the flexibility of the national energy system and coping with constrained or interrupted supply of an energy source

The national target for natural gas is an uninterrupted, secure supply of natural gas to end consumers (households, institutions and companies) by way of a gas market that performs effectively. Given that the earthquakes in the Groningen gas field are an increasing source of concern and attention in relation to the safety of the inhabitants of Groningen, particular focus will be on achieving the security of the supply of natural gas from the Groningen gas field. In addition, the natural gas concerned is low-calorific natural gas of particular quality, which cannot be obtained elsewhere. At present, steps are being taken to reduce gas extraction operations from the Groningen gas field from the current 21 billion m3 to 12 billion in 2022 and zero by 2030 (see Section 3.3 and Chapter 1).[67]

Oil is already a sufficiently diversified product. The origin of oil processed in the Netherlands can be traced back to various sources. The oil market is a global market that is not formally regulated by state actors, and the security of the supply of oil is primarily dependent on the stability of net export countries and unimpeded passage along the major oil routes in the world. Despite the developments in recent years, oil is to remain a key part of the energy mix and the commodity market.[68] The market exists at the level of interplay between supply and demand, where both the use of oil for energy and the use of feedstock compete with one another. A disruption of supply almost immediately results in market turmoil and a rapid increase in oil prices, resulting in significant economic impact. In order to prevent any negative economic consequences, the Member States of the EU and the IEA retain emergency oil stocks that can be used in a joint effort by the Member States to quell any unrest on the oil market. The mere possession of these stocks has rendered the oil embargo as a weapon – as used in the 1970s - far less effective. As such, the stocks themselves contribute to stabilisation even without their actual use.

Dutch policy aims for a supply of electricity that is reliable in addition to being affordable and sustainable. The competitive electricity market contributes to this, including through the system of programme responsibility and the imbalance market. The growth of the share of intermittent sources will lead to an increase in demand for flexibility on the market. The Netherlands already has a high degree of flexibility, which allows it to respond to the disappearance of supply and demand in a manner that is in accordance with market conditions. The Netherlands does not have separate targets with regard to extending the flexibility within the system. Flexibility in the form of demand response, storage or adjustable capacity is woven into the electricity market and is traded across the various markets without flexibility being a clearly identifiable factor.[69]

ii. The increase of the diversification of energy sources and supply from third countries

In the field of natural gas, efforts are chiefly focused on significantly reducing the use of primarily low-calorific natural gas from Groningen within the short term (please see Chapter 1), with users of low-calorific natural gas being encouraged to make the transition to sustainable energy sources.[70] For

[67] Letter to Parliament on Groningen gas extraction of 29 March 2018 – Parliamentary Paper 33 529, no. 457.
[68] Rules governing the holding of petroleum products – Parliamentary Paper 33 357, no. 6.
[69] Energy Agenda – Parliamentary Paper 31 510, no. 64.
[70] Letter to Parliament on Groningen gas extraction – Parliamentary Paper 33 529, no. 457.

years, the level of production of natural gas from the Groningen gas field and the small fields fluctuated around 80 bcm, but it showed a sharp decline from 2015 onwards due to the restrictions on the Groningen gas field and the decrease in supply from the small fields.

The government has no specific policy aimed at the diversification of suppliers of natural gas from third countries, given that the Netherlands has a very open and liquid gas market (the Title Transfer Facility, TTF) on which a large number of parties operate. On the TTF, natural gas is traded based on energy content rather than quality (high-calorific or low-calorific natural gas). In respect of diversification, the Netherlands feels it is vital to maintain the required infrastructure (including with regard to the rise of LNG).

The Netherlands also has sufficient transport and storage capacity of natural gas, which has allowed it to make preparations for the decline in domestic production. Gas storage facilities in the Netherlands currently offer approximately 14 bcm in storage capacity or working volume, allowing coverage of more than a third of the total domestic demand for natural gas.

A large number of small consumers in the Netherlands depend on natural gas. In order to prevent small consumers from being cut off from natural gas during an extreme cold spell as a result of a shortage in production and transport capacity, the network manager GTS has a statutory obligation to reserve volume and capacity that allows small consumers to be supplied with natural gas. GTS is responsible for peak supply to small consumers in cases where temperatures fall into the range of -9 °C to -17 °C. The transport infrastructure takes into account a temperature of -17 °C, enabling GTS to transport the required volumes in such cases.[71]

There are no targets for the increase of the diversification of energy sources and suppliers from third countries with regard to electricity. The targets for decarbonisation and expansion of the share of energy generated from renewable sources will lead to a further diversification of generation techniques on the electricity market. Please see Sections 2.1.1 and 2.1.2 in this regard.

In addition, the government is committed to increasing the security of supply of raw materials for the energy transition under its circular economy policy, particularly in relation to the critical metals (such as for solar-PV panels, wind turbines and batteries for electric cars), for which innovative design, recycling and substitution of materials are being encouraged.[72]

iii. Reducing energy import dependency from third countries

At a European level, the Netherlands is committed to the use of sustainable biofuels, through which a reduction of energy imports from developing countries can be achieved. The Dutch government also intends to increase the production of so-called more advanced sustainable biofuels in the Netherlands.[73]

As outlined above, the government has no specific policy aimed at reducing dependence on natural gas imports from third countries. Extraction of natural gas from the small gas fields in the Netherlands, where such extraction can be carried out in a safe and responsible manner, is preferred over gas imports, however.

[71] Security of supply (Gas Act) Decree, Bulletin of Acts and Decrees 2004, 170.
[72] Letter to Parliament on the Government response to the transition agendas for the circular economy – Parliamentary Paper 32 852, no. 59.
[73] Government appraisal of the Climate Agreement with regard to the Mobility sector platform, 5 October 2018, Annex to Parliamentary Paper 32 813, no, 220.

Furthermore, the Netherlands has no specific policy aimed at reducing dependence on oil imports from third countries. As set out previously, the oil market is an unregulated global market that in itself is highly diversified in terms of sources. As long as the market continues to function, security of supply is guaranteed and the market will determine the price and allocation of the available oil around the world.

It is expected that oil and the products refined from oil shall remain a key component of the energy and raw material mix for the foreseeable future, despite the reduction of greenhouse gases and efforts to make the energy mix more sustainable. For that reason, the Netherlands, as a Member State of the EU and the IEA, takes the security of the supply of oil and the stability of the oil market very seriously. If called on to do so by the EU or IEA, the Netherlands is prepared to commit part of its strategic oil stocks in a joint effort to maintain the stability of the oil market. The Netherlands has made all the necessary preparations in this regard and is able to implement the measure without delay if called upon.

Finally, the Netherlands has no specific policy aimed at reducing electricity imports from third countries.

iv. Increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

As long as, and to the extent that, the built environment and businesses remain dependent on natural gas, the extraction or import of natural gas remains a necessity. In this regard, gas extraction from the small gas fields in the Netherlands, where this can be done safely and responsibly, is to be preferred over gas imports, as gas extraction from small fields is more beneficial to the climate as well as to the economy and the security of supply. High-calorific gas is extracted from the small gas fields and is for a large part converted into low-calorific gas through quality conversion, in order to reduce extraction from the Groningen gas fields as much as possible. Set against this backdrop, the Netherlands intends to encourage the extraction of gas from small gas fields in the Dutch part of the North Sea.[74]

Through the legislative agenda for the coming years, the market regime of the electricity market will be organised in such a way as to allow investments in the use of flexibility (including by/of small consumers) to be rewarded in line with the market. Due to the growth in the number of smart meters, consumers, if they so wish, are enabled to respond to real-time rates, whether or not through the use of aggregators. In addition, any obstacles to storage will be removed.[75] The transition to electric cars might be able to contribute to this.

[74] Letter to Parliament on gas extraction from small fields of 30 May 2018, Parliamentary Paper 33 529, no. 469.
[75] Legislative agenda, Parliamentary Paper II, 2017-2018, 30 196, no. 566.

2.4 Internal energy market dimension

2.4.1 Electricity interconnectivity: the level of electricity interconnection envisaged by the Member State by 2030 in relation to the electricity interconnection target of at least 15% by 2030

An indicative interconnection target for 2030 of 15% was agreed upon in the European Council. For some time, the Netherlands has already had an interconnection rate above 15%; in 2016, this was 16.0% (see Table 4.7 in Section 4.5.1, Chapter 4).

The Netherlands does not have a specific target with regard to a rate of interconnection by 2030.

2.4.2 Energy transmission infrastructure: key projects for electricity and gas transmission infrastructure and infrastructure modernisation projects

In the field of electricity, investments are being made in the national grid to increase domestic capacity. The Randstad 380 kV Noordring grid project is set to be completed in 2019. Various related sub-projects have already been completed. Furthermore, preparations are underway to increase the grid capacity in the north-west of the Netherlands (the Noord-West 380 kV project), given that the Eemshaven region is a key production location and has become a major switching point in the international electricity network. In addition, the Zuid-West 380 kV grid project is meant to resolve existing problems in this part of the country.

The Dutch electricity market is linked to four (to increase to five in 2019) neighbouring countries. In the next ten years, interconnection capacity is expected to double from 5.55 GW in 2016 to 10.8 GW in 2025.

With regard to the connection of the offshore wind farms, TenneT uses a concept that assumes standard platforms where 700 MW of wind energy capacity can be connected per platform. The five projects of Borssele Alpha, Borssele Beta, Hollandse Kust (zuid) Alpha, Hollandse Kust (zuid) Beta and Hollandse Kust (noord) are to be connected to the grid between 2019 and 2023.

The gas transmission and distribution infrastructure of the Netherlands is mature and robust and, as such, no major projects are envisaged. The only notable exception is the construction of a new, large-scale nitrogen plant that will allow 5 to 7 bcm of high-calorific gas to be converted into low-calorific gas annually. Furthermore, a survey is being carried out into the extent to which that part of the industry that currently still makes use of low-calorific gas can transition to another, possibly sustainable form of energy. Should this lead to a transition to the use of high-calorific gas, then investments in the high-calorific gas transmission system will be required. It will only become possible to accurately assess the scale of these investments once it is clear which companies are making this transition and how they are situated in respect of the existing high-calorific transmission grid.[76]

Furthermore, the government has announced its work on the National Agenda for Charging Infrastructure (*Nationale Agenda Laadinfrastructuur*).[77] The agenda sets out the required charging infrastructure and provides the frameworks within which this infrastructure is to be rolled out. This will also be done for the other fuel types, such as LNG, hydrogen and biofuels, within the context of the recalibration of the Alternative Fuels Infrastructure Directive (AFID).

[76] Letter to Parliament on Groningen gas extraction – Parliamentary Paper 33 529, no. 457.
[77] Government appraisal of the Climate Agreement with regard to the Mobility sector platform, 5 October 2018, Annex to Parliamentary Paper 32 813, no. 220.

2.4.3 Market integration

i. Increasing system flexibility

The Netherlands considers more flexibility in the system to be necessary as a result of a continuing increase of intermittent sources in the electricity system. The Netherlands will be organising the market regime based on the legislative agenda for the coming years, in such a way as to allow further flexibility (including for small consumers) and to ensure small consumers are given better access to the market and are rewarded in line with the market. To that end, small consumers should be accommodated by an aggregator. The Netherlands will be focusing on rolling out smart meters, to allow consumers to respond and benefit from real-time rates to a greater extent.[78]

In addition, further flexibility will be created by the introduction of dynamic rates on the retail market. There is already a high degree of flexibility in the system, thanks to large-scale users, for example, which are flexible and can respond to real-time rates by connecting, calibrating or disconnecting, and parties with storage assets that offer their assets on the various markets. Where necessary, any obstacles to storage will be removed.[79]

The Independent Grid Management Act (*Wet Onafhankelijk Netbeheer*) guarantees the independence of grid management, to allow for honest competition on supply and wholesale markets and to enhance the reliability of the systems. Competition between various providers on the energy market benefits the degree of affordability.

In addition, the system of "programme responsibility" or balance responsibility ensures that suppliers and consumers themselves maintain the balance of supply and demand on the energy market. They receive an economic incentive to actually realise the deliveries and purchases agreed upon.[80]

ii. Non-discriminatory participation of renewable energy, demand response and storage in all energy markets

In general, the Dutch government strives to foster frameworks for the electricity markets that encourage honest competition between market players and do not discriminate against any one party. This includes parties that provide renewable energy, demand response and storage, including through aggregation. No separate, national objectives have been formulated to this end.

Agreements on heat will be made within the framework of the Climate Agreement.

iii. Consumer participation in the energy system, benefitting from self-generation and new technologies, including smart meters

There are no specific targets in place in this regard, with the exception of the target for 80% of Dutch small consumers of electricity and gas to make use of a smart meter by 2020. In a general sense, the Netherlands' aim is to ensure that consumers are able to benefit from competition on the energy market to the fullest extent, are able to make conscious choices and receive fair remuneration for investments in microgeneration. No separate, national objectives have been formulated to this end.

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[78] Stimulation of Sustainable Energy Production – Parliamentary Paper 31 239, no. 263.
[79] Legislative agenda, Parliamentary Paper II, 2017-2018, 30 196, no. 566.
[80] Memorandum following the report – Amendment of the Gas Act (*Gaswet*) and the Electricity Act 1998 (*Elektriciteitswet 1998*) concerning the strengthening of the operation of the gas market, improvement of the security of supply and establishing rules on the priority of sustainable electricity, as well as a number of other amendments of these Acts – Parliamentary Paper 31 904, no. 7.

Furthermore, consumers in a competitive Dutch market are able to choose from a multitude of different types of providers. Providers offer various types of contracts, such as, for example, agreements for the supply of 100% renewable energy, the supply of 100% renewable electricity of Dutch origin, etc. At present, 58 different licensed providers who often offer multiple propositions operate on the Dutch retail market. The Netherlands also has a relatively high percentage of annual switchers (16% in 2017), with half of all consumers having switched providers at least once in the last three years.

In addition, a growing number of consumers have begun feeding in electricity to the grid, for which they are remunerated through the netting scheme. This scheme will eventually (beyond 2020) be replaced by a feed-in grant.[81]

Agreements on heat will be made within the framework of the Climate Agreement.

iv. Ensuring electricity system adequacy and the flexibility of the energy system with regard to renewable energy production

The Netherlands has not formulated any separate, national objectives with regard to guaranteeing the adequacy of the electricity system. Naturally, the overriding principle is that the security of supply of the Dutch electricity system should not be jeopardised. The TSO (Tennet TSO) monitors developments on the electricity market that may affect the security of supply, such as the temporary or permanent closure of power plants and publishes an annual report on this.[82]

In general, the Netherlands expects an efficient and effective electricity market to provide the market parties with the right incentives to invest in production capacity where and when needed – in other words, an energy-only market. In addition, the Netherlands has a large number of interconnectors with neighbouring countries, which also allow Dutch electricity demand to be met.

Likewise, the Netherlands has not set out any separate, national targets for the flexibility of the energy system with regard to the production of renewable energy.

v. Consumer protection and the competitiveness of the retail energy sector

The Netherlands has not set out any specific targets in this regard. In general, however, the Dutch government strives to have frameworks in place for the electricity market that encourage fair competition between market players and, as such, do not discriminate against any particular party, including parties that offer renewable energy, demand response and storage, including through aggregation. The regulatory authority monitors developments on the small consumer market each year. The Dutch retail energy market is highly competitive with relatively high switch rates (16%). Last year, some 1.3 million households switched to a new energy provider. In order to be able to supply to small consumers, providers must request a supply license. The national regulatory authority monitors these licenses. The license obligations are regulated, inter alia, by Chapter 8 of the Electricity Act 1998 and cover several requirements, including a test for how reasonable rates are. As of mid-2018, 59 providers operate on the Dutch retail market with a license for the supply of electricity and/or gas to small consumers.

[81] Stimulation of Sustainable Energy Production – Parliamentary Paper 31 239, no. 287.
[82] Monitoring Security of Supply, 2017, TenneT, https://www.tennet.eu/fileadmin/user_upload/Company/Publications/Technical_Publications/Dutch/Rapport_Monitoring_Leveringszekerheid_2017_web.pdf.

In addition, Dutch consumers are protected against disconnection in the winter months and the potential bankruptcy of a supplier. As outlined above, a license system is in place in the Netherlands for energy supply to small consumers. In the event that a supply license is revoked, for example, due to liquidation, the customers of the relevant provider would theoretically have to be disconnected forthwith if they had not taken any action themselves. After all, such customers would no longer have a valid supply agreement, as they may only be supplied by a license holder. In practice, these types of quick disconnections are socially undesirable. The rules and regulations on this issue, first and foremost, include the possibility for the license holder to sell the customer base or part thereof to one or more other license holders prior to the actual withdrawal of the supply license. If the license holder is unsuccessful, in part or otherwise, the remaining small consumers who stand to lose their provider upon the withdrawal of the supply license will be divided across the other licensed providers. As such, all providers who supply small consumers on the market collectively function as an emergency provider. This arrangement applies both to electricity[83] and to gas.[84] The national network managers for electricity (TenneT) and gas (GTS) respectively have a central and coordinating role with regard to this arrangement.

2.4.4 Energy poverty

The Netherlands takes the view that the best way to support lower income households is through general social policy. After all, people who cannot afford to pay their energy bills may also have trouble paying other fixed expenses, such as their rent or the costs of health care. The Netherlands is committed to balanced income development and this is an area of continued focus (data on purchasing power). Furthermore, the Netherlands is not in favour of income policy based on citizens' energy bills. Hence, the Netherlands does not have a definition of energy poverty.

[83] Security of Supply (Electricity Act 1998) Decree, Bulletin of Acts and Decrees 2006, 104.
[84] Security of Supply (Gas Act) Decree, Bulletin of Acts and Decrees 2004, 170.

2.5 Research, innovation and competitiveness dimension

i. Public and, if available, private funding of research and innovation

Innovation objectives – Generic

The objective of this business policy is sustainable economic growth, which is achieved through the strengthening of Dutch earning power and by tackling challenges in society. The business policy is chiefly generic in nature – this is to encourage innovation and entrepreneurship. The Netherlands considers investments in R&D to be a crucial means to achieve innovations, productivity and solutions to challenges in society, by way of the development and absorption of knowledge and technology. R&D is a fundamental source of innovation and has strong spillover effects on the economy in the form of knowledge spillovers, through which it contributes to the prosperity of the Netherlands.

The Netherlands aims to invest 2.5% of GDP in R&D, with the percentage of private funding being increased. This is not a goal envisaged for 2020, but rather a target for the medium to long term. Among other methods, innovation is encouraged through the Research & Development Tax Credit (*Wet Bevordering Speur- en Ontwikkelingswerk*, WBSO) and innovation credit. The policy also increases access to capital market funding, ensures a healthy business environment and attracts foreign investment, alleviates the regulatory burden and helps parties make use of the opportunities provided by digitisation and sustainability.

The Netherlands will be gradually increasing the budget for both fundamental and applied research to €200 million a year by 2020. The key focus will be on aligning with the needs of the market, public-private partnerships and strengthening SMEs in innovation policy, with particular emphasis being placed on the economic opportunities in relation to challenges in society.

In this way, Dutch innovation policy is geared toward increasing prosperity and maintaining the Netherlands' present competitive position. Expenses for research, development and demonstration of new technologies should partly form the basis of new economic activities. The decrease of the costs of technology plays a key role in that regard.

Innovation targets – Energy and Climate

The task of achieving a low-carbon energy system by 2050 is a massive one, and numerous innovations are required to implement this transition in a responsible and affordable manner. Investments in innovation can lead to new knowledge that allows the target of 80 to 95% reduction of carbon dioxide by 2050 to be achieved at less cost than with currently existing technologies. Low-carbon options are often more expensive than the fossil options available and require major system changes to allow the transition to a low-carbon economy. This requires the integration of a variety of technologies, changes to the necessary infrastructure and knowledge, changes to the corresponding business models and other roles for the parties involved. For these reasons, investments in low-carbon innovations are by no means a given. Targeted energy and innovation policies encourage the necessary innovations in relation to the energy and climate targets and provide economic opportunities.

As outlined in Chapter 1, Dutch energy and climate policy will be shaped through the Climate Agreement. The social players, national, regional and local authorities and NGOs that are developing the objective of this agreement within these sector platforms will also indicate which knowledge and innovation targets this entails. These targets will come together in an integrated climate and energy knowledge and innovation agenda that, linked to the Climate Agreement, will determine the course for the required efforts regarding knowledge and innovation.

The Dutch government has recommended a number of frameworks for the Climate Agreement. Specifically with regard to innovation, the package of measures must be future-oriented and must focus on:

- roll-out of proven techniques and measures;
- pilots and demonstrations of promising techniques in terms of reduction potential and cost-effectiveness;
- research, development and innovation of techniques that have the potential to make a significant contribution to the Dutch and global climate target and the earning power of the Dutch economy upon successful continued development.

Dutch energy-innovation policy, first and foremost, is designed to make a contribution in respect of the climate and energy targets that have been proposed by the Coalition Agreement and are the starting point of the Climate Agreement (see Chapter 1).

ii. Promotion of clean energy technologies, including long-term targets for the deployment of low-carbon technologies and the corresponding transport and storage infrastructure

Innovation target for carbon transport and storage and carbon conservation in the chain

The government regards CCS as an unavoidable transition technology that can be used to reduce carbon emissions in sectors where no cost-effective alternatives will be available in the near future.[85] In addition to the use of CCS for emissions reductions in industry, CCS may, in the future, play an important role in the realisation of negative emissions and may pave the way for the development of green hydrogen and CCU. CCS policy is currently being developed using the Climate Agreement as a basis. No irreversible decisions will be taken in this regard.

Biomass and biobased products play a key role with regard to carbon conservation in the chain, particularly within the industry and agriculture sectors. The circular economy policy formulated in the Government-wide programme for a Circular Economy, among others, focuses on reuse of raw materials, including biomass, and will contribute to low-carbon industry by 2050.

iii. Competitiveness

The competitiveness of the Dutch economy is a major focus of the Dutch government. As yet, however, no specific national objectives have been set out in this regard.

[85] Letter to Parliament on the Government appraisal of the proposal for key points of a Climate Agreement, 5 October 2018, Parliamentary Paper 32 813, no. 220 (Annex, p15)

Chapter 3. Policies and measures

In line with what was set out in Chapter 1 on the current status of the Dutch process of realising the Climate Agreement, this chapter of the draft NECP will chiefly contain existing and established policies and proposed measures from the Coalition Agreement that contribute to the objectives and targets for 2021-2030 outlined in Chapter 2. The final NECP will lay down the new goals and target figures as established in the Climate Agreement, which will additionally be translated into concrete policies and measures.

3.1 Decarbonisation dimension

3.1.1 Greenhouse gas emissions and removals

i. Emission reduction target for greenhouse gases, ESR and LULUCF

The greenhouse gas reduction target proposed by the Coalition Agreement, comprising a reduction of 49% by 2030 compared to 1990, means a reduction of approximately 49 Mt of carbon dioxide equivalents by 2030 compared to unchanged policy. This includes the impact of policy on the circular economy. The Climate Agreement uses an indicative allocation of CO_2 targets for the five sector platforms of industry, mobility, built Environment, electricity, and agriculture and land use.

The National Climate Agreement contains measures that are specifically aimed at industry and the electricity sector as well as measures that go toward achieving the ESR target (of 36% reduction by 2030 compared to 2005) and the LULUCF target (toward no-debit).

The government's approach to the Climate Agreement[86] and the government appraisal of the proposal for key points of the Climate Agreement[87] highlight a number of issues.

Much of the requisite reduction of carbon emissions will be achieved in the electricity sector, due to the fact that the Netherlands will be phasing out coal-based production of electricity by 2030. A legislative project has been initiated for that purpose. At present, the SDE+ grant scheme plays a key role in making electricity production more sustainable. This scheme will be expanded to stimulate other emissions reduction technologies, such as in industry, alongside the production of renewable energy. In addition, the government has indicated that it will be introducing a minimum carbon price for electricity production, that the netting scheme is to be replaced and that additional sites will be made available for offshore wind farms.

The government has used the recently published "Vision on agriculture, nature and food" to set the course for the development of agriculture, in which an ever greater emphasis is placed on circular agriculture. It is important for the parties in the chain to investigate ways in which individual companies can be held to account as regards their climate performance.

A number of measures are being considered for LULUCF land use, which include adjustments to the management of peat meadow areas, of agricultural soils (both pasture and arable land) and of forests and the natural environment, as well as land use changes, such as the planting of forests. Smarter land

[86] Parliamentary Paper 32 813, no. 163.
[87] Parliamentary Paper 32 813, no. 220.

use, in order to achieve the desired no-debit (LULUCF Regulation), is expected to account for between 1.5 and 2.0 Mt in emissions reductions. It is expected that this commitment will yield a sufficient amount of credits to balance the debits, in accordance with LULUCF accounting. In line with the LULUCF Regulation, the National Accounting Plans for the Forestry Sector, including a Forest Reference Level (FRL) will be drafted and submitted in a timely manner. In addition, LULUCF accounting will be provided with an adequate module that is able to report and account for the carbon performance of agricultural soils no later than 1 January 2021.

With regard to the Mobility sector, the Coalition Agreement includes a number of measures, including that the government will be focusing on making the mobility sector more sustainable by committing to all new cars being zero-emissions vehicles as of 2030, in conjunction with the phasing out of fiscal stimulation once electric becomes the new normal.

A structured, area-specific approach has been devised for the built environment, whereby sustainability measures and the task of making neighbourhoods free of natural gas are delegated to municipalities themselves. On 1 October 2018, the first 27 pilot projects were announced, which were put forward by the municipalities and for which the central government made available €120 million. Housing associations have an important role to play in driving the transition forward. Their housing stock includes a large number of comparable housing types, which offers good potential for scaling up the efforts to make housing more sustainable. In view of the increasing tax burden and the government's ambitions in relation to the housing market, 2019 will see a structural reduction in the landlord levy in the amount of 100 million euro a year, with the aim of increasing the investment capacity of housing associations.

With regard to the circular economy, the government's focus is on sharing knowledge and best practices, for example in the field of transition-oriented procurement, sustainable production and consumption and the substitution and recycling of raw materials. As referred to in Chapter 1, agreements from the Government-wide programme for a Circular Economy and the transition agendas from the Raw Materials Agreement will be implemented as part of the climate commitments.

ii. Regional cooperation

Mobility
In addition to the government's cooperation with surrounding countries to facilitate rapid connections between countries, collaboration also takes place in other fields within a European context. In relation to making the mobility sector more sustainable, European standards are of critical importance. For that reason, the Netherlands is collaborating with like-minded countries to ensure these standards are made stricter, in order to stimulate sustainable transport. Furthermore, collaborative efforts are taking place with neighbouring countries to enable electric cars to cross borders. These efforts relate to the standardisation of protocols and charging infrastructure.

iii. Applicability of the rules on state aid, funding measures in this field at a national level, including support from the Union and the application of Union funds

All schemes in the Netherlands are assessed for such issues as a rule.

3.1.2 Renewable energy

i. Policies and measures to achieve the national contribution to the binding EU target of at least 32% renewable energy by 2030

In the negotiations on the Climate Agreement and parallel processes, a great many existing policy measures are reviewed and new policy initiatives are developed. Policy initiatives and measures that contribute to the realisation of the national contribution to the EU target for renewable energy will be specified in the final NECP.

At present, only the policy on offshore wind energy can be included, given that it has already been determined up to 2030. The Energy Agreement from 2013 included an ambition to increase the capacity of offshore wind energy to 4.5 GW of installed capacity by 2023. The Offshore Wind Energy Roadmap 2030 pursues this objective at an accelerated pace. Between 2024 and 2030, offshore wind farms will be realised with an average expansion of 1 GW per year, resulting in roughly 11.5 GW of installed capacity by 2030. In the years to come, new offshore areas will also be designated as future zones for offshore wind energy. It is possible that the Climate Agreement may lead to a more ambitious goal regarding offshore wind energy moving toward 2030. The most recent tender for offshore wind energy led to a provider who intends to construct and operate the wind farms without a subsidy (excluding the costs of the grid). At present, legislation is being amended to allow future permits for offshore wind farms to be tendered by way of an auction.

ii. Specific measures for regional cooperation

The Netherlands has an open economy that is focused on international cooperation. Close cooperation with our neighbours, in particular, but also with other European and third countries, takes place with regard to energy. For example, the Netherlands is an active member of the Pentalateral Energy Forum and the North Seas Energy Forum (please see Chapter 1). These bodies primarily focus on the exchange of knowledge and information, but they also deal with the coordination of national plans and measures. Until now, there has been no reason for the development of joint projects in the field of renewable energy production, but the Netherlands recognises the potential that joint renewable energy production, for example on the North Sea, can offer.[88] Due to the principle of driving the reduction of greenhouse gas emissions and the ambitious national targets in this regard, the Netherlands will not take part in projects in the field of transferring national contributions.[89]

iii. Specific measures on financial support for the promotion of the production and the use of energy from renewable sources in electricity, heating and cooling, and transport

The Netherlands has various mechanisms to stimulate renewable energy. The key schemes include:

The Sustainable Energy Production Incentive (SDE+) grant scheme: under the SDE+ grant scheme (and its predecessors, the MEP subsidy scheme and the SDE scheme), producers are eligible to receive a subsidy for the sustainable energy that they produce. The production of renewable energy is not always profitable, as the cost of production is higher than for fossil energy. The SDE+ grant scheme reimburses the difference between the cost price of renewable energy and the market value of the energy supplied: the non-profitable share. As of 2020, the SDE+ grant scheme is set to be expanded to also stimulate other techniques that reduce carbon emissions.

Renewable Energy Scheme (HER): The purpose of the HER is to realise the energy targets for 2030 in a more cost-effective manner through innovative projects. Renewable energy projects should lead to renewable energy production by 2030 and to savings on future expenditure on grants under the SDE+ grant scheme. These savings must be greater than the subsidy that is requested for the project.

[88] Letter to parliament on the Energy Council: 21 501-33, no. 606.
[89] Responses to Questions from Parliament on the Sustainable Energy Production Incentive (SDE+) scheme 2018; https://www.rijksoverheid.nl/documenten/kamerstukken/2018/01/15/antwoorden-op-kamervragen-over-stimulering-duurzame-energieproductie-sde-2018.

Energy Innovation Demonstration (DEI) grant scheme: The DEI grant scheme is a result of the Energy Agreement and focuses on the demonstration of energy innovations and technologies that have potential to strengthen the Dutch economy in terms of turnover, employment and exports of Dutch manufacturers, technical service providers or suppliers. In this way, these projects contribute to green economic growth in the Netherlands.

Energy Top sector tender scheme (TSE): The TSE stimulates and subsidises innovations in the field of energy. These include innovations in the field of offshore wind energy, solar energy in the built environment, hydrogen, Carbon Capture Utilisation and Storage (CCUS), bioenergy, recycling, etc.

Climate, technologies and Innovations Demonstration Scheme (DKTI): This involves the allocation of €32 million to boost the DTKI in transport scheme. The objective is to challenge companies and knowledge institutes to formulate new ideas and solutions in order to contribute to an acceleration of the transition to ultimately achieve zero emissions in transport and mobility. The Netherlands Enterprise Agency is the executing party, with the Directorate-General for Public Works and Water Management carrying out monitoring activities through Routeradar.

In addition to national public and private funding, it may be relevant to make use of support provided by the Union and/or Union funds to further stimulate the production of renewable energy. European resources, including funds such as the Connecting Europe Facility (CEF), the European Fund for Strategic Investments (EFSI) and Horizon2020, are considered for individual projects.

iv. Assessment of the support for electricity from renewable sources

The Netherlands regularly evaluates the relevant support mechanisms for the stimulation of the production of renewable energy. The largest stimulation scheme (SDE+) was evaluated in 2016. At present, this scheme is set to be expanded. It will be evaluated again after several years. Each year, an independent consultation process takes place on the categories of technologies, levels of stimulation grants and their degree of effectiveness, specifically with regard to the extent to which projects have actually been realised. This independent consultation process also involves an extensive market consultation.

In addition, Parliament is informed twice a year on the outcome of the applications and the projects that were funded, including the cost impacts of those projects. The distributional impact (what the grant is spent on) of the gains of the stimulation is an indication of this. The distributional impact of the stimulation scheme for consumers is separate from the scheme, since the latter is recovered through a specific energy tax (levy). The distributional impact of this levy is regularly mapped out and evaluated.

v. Specific measures to introduce one or more contact points, streamlining administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements

The Netherlands has not set out any specific policies in this regard.

vi. Summary of the policies and measures to promote and facilitate the development of self-consumption and renewable energy communities

At present, the Netherlands encourages renewable self-consumption through a fiscal measure for solar panels used by small consumers. In addition to a repayment of VAT, owners of solar panels that are connected to a small-consumer connection (3X80A) can make use of the so-called netting scheme.

The electricity that is fed back into the grid through renewable energy production is deducted from the electricity purchased from the grid. As a result, small consumers are not required to pay supply costs, energy tax, the surcharge for sustainable energy (ODE) or VAT for the electricity purchased from the grid, insofar as this is offset with the electricity fed back to the grid. Small consumers only pay for the balance of the electricity fed back to the grid and purchased within the consumption period of a year. The netting scheme is laid down in the Electricity Act 1988 and the Environmental Taxes Act (*Wet belastingen op milieugrondslag*, Wbm). The netting scheme is to be replaced by a subsidy for feeding back energy with a lower financial incentive, which will be gradually phased out leading up to 2030. The new scheme will make it relatively more attractive for small consumers to use the energy produced simultaneously. The scheme is currently being fleshed out by the government. In addition, the government has introduced a fiscal incentive scheme for energy cooperatives that stimulates regional renewable energy communities (energy cooperatives). Members of such cooperatives within the first energy tax bracket are no longer required to pay tax on the percentage of the jointly produced renewable electricity attributed to them. The reduction of the rate of the first bracket to zero is applied to the personal energy bills of members' private consumption (up to 10,000 kWh per year). In this way, these cooperatives are able to produce energy in a more cost-effective manner. At present, the government is also examining whether this scheme can be integrated into the subsidy for feeding back energy in the future. In addition, the government is examining whether a development facility can be set up that allows energy cooperatives to fund development costs (Parliamentary Paper 31 239, no. 287).

vii. Assessment of the necessity to build new infrastructure for district heating and cooling produced from renewable sources

With regard to making the built environment more sustainable, the government is committed to ensuring a substantial percentage of buildings are no longer heated using natural gas. This will require major investments in the overall energy infrastructure of the Netherlands. As part of the sustainability efforts for the built environment, municipalities will first have to determine how sustainability is being achieved per neighbourhood and what infrastructure is necessary. This approach is to be developed further under the Climate Agreement.

viii. Specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation

It is apparent to the government that biomass is of crucial importance in making our economy more sustainable, both now and in the period up to 2030 and 2050. On 27 January 2016, the government formulated a strategic vision on the use of biomass toward 2030 (Parliamentary Paper 33 043, no. 63). Although this vision is still current, concrete translation is necessary into the proposals that have been made by the various sectors in the context of the Climate Agreement. The government will tackle this in the coming period, so that the specific implementation can be included in the Climate Agreement.

The government realises that only sustainable biomass can be used for the transition, as it must not adversely affect ecosystems, soils or the availability of food. The exclusive use of sustainable biomass will also require the Netherlands to set priorities. For the purpose of the Climate Agreement, the government will explain more precisely how it arrived at this ranking of priorities and discuss the cascading of biomass as part of this. Sustainable biomass in particular is currently only available to a limited degree, meaning it is necessary to boost the sustainability and volume of the available quantities. The government will therefore work to promote domestic production and utilisation of sustainable biomass where available.[90]

[90] Government appraisal of the Climate Agreement cross-sectoral themes, 5 October 2018, Parliamentary Paper 32 813, no. 220.

3.1.3 Other elements of the dimension

i. National policies and measures affecting the EU-ETS sector

The government has initiated legislation with a view to phasing out coal-fired electricity no later than 2030 and for the introduction of a carbon price for electricity. In addition, the Climate Agreement may result in measures that have an impact on the EU-ETS sector.

ii. Policies and measures to achieve other national objectives: circular economy

The circular economy policy laid down in the **Government-wide programme for a Circular Economy**[91] and the Raw Materials Agreement[92] focuses on the sustainability of the use of raw materials, including biomass, and contributes to a low-carbon industry by 2050.

iii. Policies and measures to achieve low-emission mobility

The government has announced its intention to transition toward low-emission mobility through a set of four distinct themes.[93] These are:

1. electric cars;
2. sustainability improvements in logistics;
3. sustainable energy carriers in mobility;
4. sustainability improvements for passenger mobility (including bicycles, public transport and MaaS).

With regard to electric vehicles, the focus is on the ambition set out in the Coalition Agreement – the aim for all new cars to be zero-emissions vehicles by 2030 at the latest and for tax incentives to be phased out once electric vehicles have become the standard.

In the government's view, it is important to improve access to clean cars for all, including in the used car market. To this end, the government is exploring the possibilities of making agreements with the sector to allow electric lease cars to be offered on the Dutch market for a fixed period after the lease period has expired, for example. In addition, the government has noted that the autonomous rejuvenation of fleets also contributes to reducing carbon emissions. The government believes that it is vital to have an insight into the required stimulation of electric transport beyond 2025. For that reason, the fiscal budget will be extended and budgeted at the level that is achieved in the rapid transition scenario by 2025. The government has developed concrete cover for this within the passenger vehicle domain.

The government wishes to work alongside market parties to effect sustainability improvements in logistics, partly in continuation of the efforts of the Logistics Top Sector, for example through the roll-out and reinforcement of the Lean and Green programme. Continuation focuses on innovation and logistics optimisation in order to strengthen competitiveness and achieve a higher level of carbon efficiency in the chain. This will result in more bundling of cargo, increased loading levels and more efficient return logistics. Concurrent to a commitment to achieving more stringent EU standards for heavy goods vehicles and vans, the government will promote the development and implementation of zero-emission technologies, with the aim of introducing zero-emissions zones in urban logistics (standardisation) by 2025. This will be facilitated for municipalities as part of the government's

[91] See https://circulaireeconomienederland.nl/rijksbreed+programma+circulaire+economie/default.aspx.
[92] See https://circulaireeconomienederland.nl/grondstoffenakkoord/default.aspx.
[93] Government appraisal of the Climate Agreement with regard to the Mobility sector platform, 5 October 2018, Parliamentary Paper 32 813, no. 220.

proposal for the harmonisation of environmental zones. Greening and optimising urban logistics requires the range of clean vehicles to be scaled up and knowledge about clean purchasing and efficient logistics to be shared. This will be facilitated through the Urban Logistics Green Deal, which will be further expanded.

Fuels will remain crucial to modes of transport with a combustion engine. However, in order to make such forms of transport more sustainable, the government is examining the priority use of sustainable, advanced biofuels, renewable Power-to-X fuels and synthetic fuels in sectors where, at present, no alternatives are available, or for modes of transport that still use a combustion engine.

Furthermore, there are opportunities to stimulate forms of mobility other than cars. Employers in particular have a significant role to play in making mobility more sustainable, not only through their car fleet, but also by having their employees travel or work in a sustainable manner. The working methods and best practices of the "Transforming Travel" Coalition and the "Smart and Sustainable Mobility programme" (formerly the "Better Utilisation" programme) can ensure that measures become embedded at a systemic level. The government will provide support for the parties involved that wish to achieve a large-scale roll-out of tried-and-tested measures for sustainable mobility among employers. The parties participating in the Transforming Travel coalition have already expressed their ambition to double the number of participants by 2022. In this way, we will jointly be able to achieve a reduction of business mileage by 2030 in respect of 2016, and will also be able to improve accessibility.

iv. National policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

The Netherlands has no grants or subsidies for fossil fuels.

3.2 Energy efficiency dimension

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030, including planned measures and instruments to promote the energy performance of buildings, in particular with regard to the following:

i. Energy efficiency obligation schemes and alternative policy measures under Article 7a and 7b of Directive 2012/27/EU and to be prepared in accordance with Annex III

For the period of 2014-2020, the Netherlands opted to take an alternative approach to meeting the requirements of Article 7 of the EED.[94] In the upcoming period of 2012-2030, the Netherlands wishes yet again to use an alternative approach and make use of various policy instruments in order to meet the national energy savings target. In respect of Article 5 of the EED, the Netherlands wishes to continue using the alternative approach and wishes to set an energy savings target for buildings that are owned and occupied by the central government.[95]

The negotiations on the Climate Agreement have currently not yet reached agreement on the package of measures to realise the 49% carbon reduction by 2030. Therefore, it is not yet known what new energy savings measures will be taken in the period leading up to 2030 to realise the obligation scheme under Article 7. The continuation of a number of policy measures beyond 2020 has already been established:

- introduction of the Environment and Planning Act (*Omgevingswet*) as a successor to the Environmental Management Act (*Wet Milieubeheer*), with the obligation for businesses with a consumption greater than 25,000 m3 gas per year and/or 50,000 kWh per year to implement all energy saving measures. The implementation of the Environment and Planning Act is currently being negotiated in relation to the Climate Agreement;
- energy tax: tax on the consumption of electricity and gas within all sectors;[96]
- energy-saving investment credit: continuous tax scheme for the deduction of investments in energy efficiency.

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings (both public and private) in accordance with Article 2a of Directive 2010/31/EU

The long-term strategy will depend on choices made in the Climate Agreement and will therefore only take shape in the final NECP.

iii. Policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency services models

The policy in this domain depends on choices made in the Climate Agreement and will therefore only be included in the final NECP.

iv. Other planned policies, measures and programmes

[94] https://www.ecn.nl/publications/ECN-E--13-061.

[95] However, Article 5 of Directive 2012/27/EU provides that an alternative approach may only be used if the results are at least equivalent to the 3% renovation provision. A study will be conducted to ascertain the level of the energy savings target in order to yield at least equivalent results.

[96] Coalition Agreement 2017 "Confidence in the future", page 38;

Following the finalisation of the Climate Agreement, the package of policy measures for the period up to and including 2030, which will impact the realisation of the Dutch contribution to the primary energy consumption target, will become known.

v. Description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures referred to in points i, ii, iii and iv

The policy in this domain depends on choices made in the Climate Agreement and will therefore only be included in the final NECP.

vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure

The policy in this domain depends on choices made in the Climate Agreement and will therefore only be included in the final NECP.

vii. Potential regional cooperation in this area

The policy in this domain depends on choices made in the Climate Agreement and will therefore only be included in the final NECP.

viii. Financing measures, including Union support and the use of Union funds, in the area at national level

The policy in this domain depends on choices made in the Climate Agreement and will therefore only be included in the final NECP.

3.3 Energy security dimension

i. Policy and measures related to the elements set out in point 2.3

As outlined previously, with regard to natural gas, in relation to the phasing out of gas extraction from the Groningen gas field, steps will be taken to reduce the consumption of low-calorific gas:

- encouraging large-scale industrial users to switch from low-calorific gas to other forms of energy;
- phasing out natural gas as a heat source from the built environment, starting with new construction projects;
- reducing the foreign demand for low-calorific gas in consultation with Belgium, Germany and France;
- construction of a new, large-scale nitrogen plant that will allow 5 to 7 billion m3 of high-calorific gas to be converted into low-calorific gas each year.[97]

Furthermore, the Netherlands will be taking steps to boost the extraction of natural gas from small fields in the North Sea. The current conditional investment allowance of 25% is to be replaced by a generic investment allowance of 40% for all new investments for the exploration and extraction of small gas field in the Dutch part of the North Sea.[98]

As outlined in Chapter 2, the government has no specific policy aimed at the diversification of gas suppliers from third countries. This is because the Netherlands has a very open and liquid gas market (TTF) on which a large number of parties operate. On the TTF, producers sell their gas to suppliers, either with or without facilitation through intermediary traders. The suppliers then provide the consumers (businesses and households) with gas. On the TTF, natural gas is traded based on energy content rather than quality (high-calorific or low-calorific natural gas). The Dutch network manager, GTS, ensures that the correct quality is supplied at the exit points. This effective, efficient and highly liquid gas market, with the corresponding gas exchange (ICE Endex), in conjunction with an extensive transport network, ensures that international gas flows are attracted, which has a favourable effect on the security of supply, even when domestic gas consumption decreases. In respect of diversification, the Netherlands feels it is vital to maintain the required infrastructure (including with regard to the rise of LNG).

The Netherlands also has sufficient transport and storage capacity of gas, which has allowed it to make preparations for the decline in domestic production. In order to prevent small consumers from being cut off from gas during an extreme cold spell as a result of a shortage in production and transport capacity, the network manager GTS has a statutory obligation to reserve volume and capacity that allows small consumers to be supplied with gas.[99]

There are no specific measures for diversification in respect of oil. The oil market is an unregulated global market that in itself is highly diversified in terms of sources. As long as the market continues to function, security of supply is guaranteed and the market will determine the price and allocation of the available oil around the world.

There are no targets for the increase of the diversification of energy sources and suppliers from third countries with regard to electricity. The targets for decarbonisation and expansion of the share of energy generated from renewable sources will nevertheless inevitably lead to a further diversification

[97] Letter to Parliament on Groningen gas extraction – Parliamentary Paper 33 529, no. 457.
[98] Letter to Parliament on gas extraction from small fields – Parliamentary Paper 33 529, no. 469.
[99] Security of Supply (Gas Act) Decree, Bulletin of Acts and Decrees 2004, 170.

of generation techniques on the electricity market. Please see Sections 2.1.1 and 2.1.2 in this regard. The calculations of the NEV 2017 (adopted and proposed policies) roughly show a doubling of the number of petajoules of electricity generated by solar and wind energy.[100] In addition, the intended expansion of the interconnection capacity between the Netherlands and other European Member States will lead to the expansion of the supply of electricity from other Member States. In the next ten years, interconnection capacity is expected to double from 5.55 GW in 2016 to 10.8 GW in 2025. For more information, please see Chapter 4. There are currently no plans to expand the interconnection capacity with third countries.

With regard to increasing flexibility in the system, the market regime of the electricity market, through the legislative agenda for the coming years, will be organised in such a way that investments in flexibility (including by/of small consumers) will be rewarded in line with the market. To this end, small consumers should be given better access to the short-term electricity market and be accommodated by an aggregator.[101]

ii. Regional cooperation

In respect of natural gas, the government is working closely with Belgium, Germany, France and Luxembourg through the Pentalateral Gas Platform. This Platform is supported by the Benelux Secretariat and is also home to the risk group for low-calorific gas that was created under Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010. In addition, collaboration takes place through and in the following risk groups that were created pursuant to the foregoing Regulation: Belarus, Baltic Sea, Norway, Denmark and UK.

In respect of electricity, the Netherlands is working closely with Belgium, Germany, France, Luxembourg, Austria and Switzerland in a regional context through the Pentalateral Energy Forum, on issues in the field of market coupling, security of supply and market flexibility.

iii. If applicable, financing measures in this area, including Union support and the use of Union funds

Not applicable.

[100] NEV 2017, Table 13, page 230.
[101] Legislative agenda, Parliamentary Paper II, 2017-2018, 30196, no. 566.

3.4 Internal energy market dimension

3.4.1 Electricity infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in Article 4, under d)

The target of 15% interconnectivity has already been achieved. Nevertheless, interconnection with Germany, Belgium and Denmark is to be expanded between now and 2030 (please see Chapter 4).

We do not consider a higher, generic interconnection target to be of immediate use. The added value of additional interconnection differs per border. The levels of the price differences between regions are the most significant indicator of the expected added value of new investments in interconnection. Efforts to make more efficient use of existing interconnection or the achievement of better cross-border agreements are valid alternatives to new, physical interconnection. In this context, the Netherlands, as a participating country in the Pentalateral, has actively contributed to the implementation of the flow-based market coupling system. In principle, the Netherlands is in favour of new interconnectors, on the condition that the socio-economic and ecological cost-benefit analyses indicate positive outcomes.

The Dutch electricity market is linked to four (to increase to five in 2019) neighbouring countries. In the next ten years, interconnection capacity is expected to double from 5.55 GW in 2016 to 10.8 GW in 2025. Key projects in this regard are the laying of the COBRA cable to Denmark, for 0.7 GW (commissioning by end of 2020); interconnection capacity with Germany to 5 GW (fully operational by end of 2018); and increase of the interconnection capacity with Belgium from 2 GW to 3.4 GW.

ii. Regional cooperation

There is no specific target for interconnectivity between individual Member States. The target is fixed as a percentage of the national production capacity of a country, and not on each border with a neighbouring country. Regional cooperation with neighbouring countries is based on the optimisation of flows and capacity through so-called Flow-based market coupling. This cooperation takes place between the countries of the Pentalateral Energy Forum. In addition, network managers collaborate by sharing information through RSCs (Regional Security Coordinators). Network managers work closely with one another when planning infrastructure projects (through ten-year development plans), including through the European network of network managers (ENTSO-E). In the context of the new market design, there are proposals to further expand the role and responsibilities of the RSCs.

iii. If applicable, financing measures in this area at national level, including Union support and the use of Union funds

Infrastructure projects of common interest may, under certain conditions, be eligible for funds from the Connecting Europe Facility (CEF). In addition, the European Fund for Strategic Investments is available through the European Investment Bank (EIB).

3.4.2 Energy transmission infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including any specific measures to enable the delivery of Projects of Common Interest and other key infrastructure projects

In the field of electricity, investments are being made in the national grid to increase domestic capacity. The Randstad 380 kV Noordring grid project is set to be completed in 2019. Various related sub-projects have already been completed. Furthermore, preparations are underway to increase the grid capacity in the north-west of the Netherlands (the Noord-West 380 kV project), given that the Eemshaven region is a key production location and has become a major switching point in the international electricity network. In addition, the Zuid-West 380 kV grid project is meant to resolve existing problems in this part of the country.
With regard to the connection of the offshore wind farms, TenneT uses a concept that assumes standard platforms where 700 MW of wind energy capacity can be connected per platform.

The Dutch electricity market is linked to four (to increase to five in 2019) neighbouring countries. In the next ten years, interconnection capacity is expected to double from 5.55 GW in 2016 to 10.8 GW in 2025.

A new, large-scale nitrogen plant is to be constructed to improve Dutch gas transmission and distribution, which will allow 5 to 7 billion m3 of high-calorific gas to be converted into low-calorific gas each year. At the end of March 2018, the government decided to move forward with the construction of the nitrogen plant to allow the decrease in production from the Groningen field to be compensated by importing high-calorific gas. The plan is for the plant to be commissioned in the first quarter of 2022 (Gasunie, 2018).

The energy transition legislative agenda includes the following laws: The Electricity Act 1998, the Gas Act, the Heating Supply Act (*Warmtewet*), the Offshore Wind Energy Act (*Wet windenergie op zee*) and the Mining Act (*Mijnbouwwet*). The purpose of this legislative agenda is to prepare these acts for the transition to a low-carbon energy supply through a series of clear and coherent steps, where reliability, affordability and security are ultimately guaranteed. The Coalition Agreement indicates that the key points of the agreements in the field of climate and energy policy will be embedded in a Climate Agreement.

ii. Regional cooperation

Continuation of existing cooperation through the Pentalateral Energy Forum and the Pentalateral Gas Platform.

iii. If applicable, financing measures in this area at national level, including Union support and the use of Union funds

Not applicable.

3.4.3 Market integration

i. Policies and measures related to the elements set out in point 2.4.3

The government recognises the necessity of greater flexibility in relation to a further increase of intermittent sources in the electricity system. The Netherlands will be organising the market regime based on the legislative agenda for the coming years, in such a way as to allow further flexibility (including for small consumers) and to ensure small consumers are given better access to the market and are rewarded in line with the market. To that end, small consumers should be accommodated by an aggregator. The Netherlands will be focusing on the roll-out of smart meters (target: 80% by 2020) to allow consumers to respond to real-time rates to a greater extent.[102]

[102] Stimulation of Sustainable Energy Production – Parliamentary Paper 31 239, no. 263.

Dynamic rates are increasingly gaining more ground on the retail market as well. There is already a high degree of flexibility in the system, thanks to large-scale users, for example, which are flexible and can respond to real-time rates by connecting, calibrating or disconnecting, and parties with storage assets that offer their assets on the various markets. With the Energy Top Sector (TSE), systems integration and flexibility are increasingly attracting more attention and financial support for research (innovation). In addition, the TSO is running several pilots using bundled/aggregate storage of small-scale storage equipment, such as home batteries and electric cars.

The Independent Grid Management Act guarantees the independence of grid management, to allow for honest competition on supply and wholesale markets and to enhance the reliability of the systems. Competition between various providers on the energy market benefits the degree of affordability.

In addition, the system of "programme responsibility" or balance responsibility ensures that suppliers and consumers themselves maintain the balance of supply and demand on the energy market. They receive an economic incentive to actually realise the deliveries and purchases agreed upon. This system, combined with an effective and efficient market-based imbalance market, guarantees the balance of the system. As such, this system will remain the basis of the Dutch market design. Moreover, the Dutch market system has no regulated price caps and the technical price limits for the imbalance market are so high that they ensure the market is stimulated to the maximum extent to remain in balance. External studies recognise that this leaves the Netherlands with a highly effective and efficient market system for electricity.[103]

ii. Measures to increase the flexibility of the energy system with regard to the renewable energy production

A number of areas of improvement have been identified in this area, but the obstacles to the measures referred to here are generally minor. The most significant measure to make the energy system more flexible involves amending the regulatory framework in the proposed legislative agenda.

The government recognises the necessity of greater flexibility in relation to a further increase of intermittent sources in the electricity system. We will be organising the marked regime based on our legislative agenda for the coming years, to allow further flexibility (including for small consumers) and to ensure small consumers are given better access to the market and are rewarded in line with the market. To this end, small consumers should be given better access to the short-term electricity market and be accommodated by an aggregator. This is pursuant to the new Electricity Directive. The possibility of two meters for a single connection currently already exists and allows multiple suppliers to provide a variety of services.[104]

It is expected that dynamic rates will increasingly become available on the retail market; the relevant legislation is not an obstacle in this regard. The system already offers a high degree of flexibility, but this is not earmarked as such (bulk users that are flexible already respond to real-time rates and use their assets to bid on the various markets, but this is not measured separately; this is simply part and parcel of the market). Within the Energy Top Sector (TSE), systems integration and flexibility are increasingly attracting more attention and financial support for research and research innovation; for example, this is the case with regard to seasonal rates and conversion.

[103] Frontier Economics (2015) Scenarios for the Dutch electricity supply system; IEA (2014) Energy policies of IEA.
[104] Legislative agenda, Parliamentary Paper II, 2017-2018, 30 196, no. 566.

iii. Measures to ensure non-discriminatory participation of renewable energy , demand response and storage, in all energy markets

There is no discrimination regarding the participation of energy from renewable sources. Priority access and (re)dispatching of these sources is determined by law, in accordance with European obligations.

iv. Policies and measures to protect consumers and to improve the competitiveness and contestability of the retail energy market

In general, the Dutch government strives to have frameworks in place for the electricity market that encourage fair competition between market players and, as such, do not discriminate against any particular party, including parties that offer renewable energy, demand response and storage, including through aggregation. The regulatory authority monitors developments on the small consumer market each year. The Dutch retail energy market is highly competitive with relatively high switch rates (16%). Last year, some 1.3 million households switched to a new energy provider. In order to be able to supply to small consumers, providers must request a supply license. The national regulatory authority monitors these licenses. The license obligations are regulated, inter alia, by Chapter 8 of the Electricity Act 1998 and cover several requirements, including a test for how reasonable rates are. As of mid-2018, 59 providers operate on the Dutch retail market with a license for the supply of electricity and/or gas to small consumers.

In addition, Dutch consumers are protected against disconnection in the winter months and the potential bankruptcy of a supplier. As outlined above, a license system is in place in the Netherlands for energy supply to small consumers. In the event that a supply license is revoked, for example, due to liquidation, the customers of the relevant provider would theoretically have to be disconnected forthwith if they had not taken any action themselves. After all, such customers would no longer have a valid supply agreement, as they may only be supplied by a license holder. In practice, these types of quick disconnections are socially undesirable. The rules and regulations on this issue, first and foremost, include the possibility for the license holder to sell the customer base or part thereof to one or more other license holders prior to the actual withdrawal of the supply license. If the license holder is unsuccessful, in part or otherwise, the remaining small consumers who stand to lose their provider upon the withdrawal of the supply license will be divided across the other licensed providers. As such, all providers who supply small consumers on the market collectively function as an emergency provider. This arrangement applies both to electricity[105] and to gas.[106] The national network managers for electricity (TenneT) and gas (GTS) respectively have a central and coordinating role with regard to this arrangement.

v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

The government recognises the necessity of greater flexibility, including through demand response, in relation to a further increase of intermittent sources in the electricity system. The Netherlands will be organising the market regime based on the legislative agenda for the coming years, in such a way as to allow further demand response (including for small consumers) and to ensure small consumers are given better access to the market and are rewarded in line with the market. To that end, small consumers should be accommodated by an aggregator. The Netherlands will be focusing on rolling out smart meters, to allow consumers to respond and benefit from real-time rates to a greater extent. It is

[105] Security of Supply (Electricity Act 1998) Decree, Bulletin of Acts and Decrees 2006, 104.
[106] Security of supply (Gas Act) Decree, Bulletin of Acts and Decrees 2004, 170.

expected that dynamic rates will increasingly become available on the retail market; the relevant legislation is not an obstacle in this regard.[107]

3.4.4 Energy poverty

The Netherlands takes the view that the best way to support lower income households is through general social policy. After all, people who cannot afford to pay their energy bills may also have trouble paying other fixed expenses, such as their rent or the costs of health care. The Netherlands is committed to balanced income development and this is an area of continued focus (data on purchasing power). Hence, the Netherlands does not have a definition of energy poverty.

[107] Stimulation of Sustainable Energy Production – Parliamentary Paper 31 239, no. 263.

3.5 Research, innovation and competitiveness dimension

i. Policies and measures related to the elements set out in point 2.5

The Dutch government encourages innovation both in a generic and in a specific sense. The generic pathway of Dutch business policy is aimed at entrepreneurs and entails the stimulation of innovation, the reduction of the regulatory and administrative burden, increasing access to capital market funding, good public services for businesses and fiscal and other support for entrepreneurs, including through tax measures such as the Research and Development (Promotion) Act (*Wet bevordering speur- en ontwikkelingswerk*, WBSO), Innovatiebox and innovation credit.

The government's specific innovation policy is aimed at a group of nine so-called "top sectors", which are clusters of companies and knowledge institutes in which entrepreneurs, researchers and public authorities collaborate on international competition strategies, earning power and innovation. One of these nine top sectors is the Energy Top Sector. The Letter to Parliament on the revision of top sector policy[108] indicated that the Dutch Top Sectors intend to focus more on the four social themes that were formulated in the Coalition Agreement[109] (in addition to the focus on the formulated key technologies). "Energy transition and sustainability" is one of these major social themes, with the implementation and further development of this theme in terms of various "missions" taking place in the Climate Agreement and the corresponding Integrated Knowledge and Innovation Agenda for climate and energy. This agenda will determine the course for the required knowledge and innovation commitment for climate and energy issues.

In terms of innovation, formulating an integrated knowledge agenda and missions means explicitly formulating knowledge questions and situating them in a broader perspective of public and private commitment (extending beyond innovation to, inter alia, market creation, laws and regulations, etc.) In many cases, these missions will be significantly cross-sectoral in nature, which will benefit an integrated approach as well as cooperation. The missions will be determined by the government in 2019. The missions are evidence of the Netherlands' cross-theme perspective on the transition and will define the innovation commitment and the commitment of resources by research institutes, top sectors and ministries.

As of 2012, the Energy Top Sector (TSE) has been stimulating innovations that are necessary for the transition to an affordable, reliable, safe and sustainable energy system. The Energy Top Sector has divided its work up into a number of thematic clusters, each with its individual top consortium for knowledge and innovation (TKI) in which relevant knowledge institutes and businesses collaborate with one another.

- The TKI Offshore Wind Farms facilitates research, development, demonstrations, knowledge transfer, domestic and international cooperation and market development, to make the cost reductions and economic impact as substantial as possible.
- The TKI Urban Energy focuses on the development and application of innovations for the transition to a sustainable, reliable and affordable energy system in the built environment and infrastructure.
- The TKI Energy and Industry focuses on the sustainability of the processing industry. Recently, a transition pathway was developed, under the auspices of the Ministry of Economic Affairs and Climate Policy, focusing on making industry more sustainable by 2050. This pathway centred on electrification and other sustainability improvements of high temperature processes.

[108] Letter to Parliament "Mission-oriented innovation policy with impact".
[109] Coalition Agreement 2017-2021 "Confidence in the future" (2017).

- The TKI Gas focuses on implementing a systematic approach for innovations that build on the strong knowledge position traditionally held by the Netherlands in the areas of exploration and production, transport and trade, and end uses for gas.
- The TKI Biobased Economy (shared TKI with the Chemistry and Agriculture & Food Top Sectors) focuses on biobased innovations across the entire biomass value chain, from the field to the end product, including recycling of industrial and domestic waste streams.

The Energy Top Sector also focuses on more cross-sectoral issues surrounding systems integration and socially responsible innovation and has a human capital agenda as well. In addition, collaboration takes place with other top sectors on the energy theme.

The targeted innovation policy is linked to the social challenges that were formulated and to the strengths of Dutch businesses and knowledge institutes. Top Sector policy, for example, focuses on the economic opportunities of social themes.[110] The Netherlands has a strong tradition of public-private partnerships, in which the government, the private sector and knowledge institutes work closely together in the "triple helix".[111] As such, innovation commitments are also given shape in the form of jointly formulated social agreements, such as the Energy Agreement,[112] the forthcoming Climate Agreement and the corresponding Integrated Knowledge and Innovation Agenda.

Policies within energy and climate innovation policy

The National Climate Agreement and the Energy and Climate Integrated Knowledge and Innovation Agenda will form the most recent basis for energy innovation policy.

ii. Cooperation with other Member States in this area, including information on how the SET plan objectives and policies are being translated to a national context

In terms of energy innovation, especially for a relatively small country like the Netherlands, finding good matches on the international playing field is crucial. This can strengthen the knowledge base, lead to economies of scale, accelerate the innovation process and provide economic opportunities. In addition, it may be attractive to apply any innovations that have been developed abroad first, as a testing ground. By collaborating on a number of strategically chosen subjects at an international level, we will be able to realise our ambitions in the field of energy and climate change in a cost-effective manner, strengthen our knowledge base and competitive position and position our Dutch solutions in a highly globalised energy market.

The Netherlands also participates in targeted partnerships on energy innovation at an international level, including through the European Strategic Energy & Technology (SET) plan, the European Research Area network and Horizon 2020, the International Energy Agency, Mission Innovation and the Clean Energy Ministerial. In this way, the government's energy innovation policy contributes to the objectives of the Energy Agreement and will soon contribute to the national Climate Agreement and the EU energy and climate targets.[113]

Cooperation with European Member States

Strategic Energy and Technology Plan[114]

The Netherlands is actively involved in the implementation of the identified activities of the implementation plans of the various working groups of the SET plan of the Energy Union. For example, the Netherlands is also a member of the working group that focuses on offshore wind energy. After

[110] Coalition Agreement 2017-2021 "Confidence in the future" (2017).
[111] http://mission-innovation.net/participating-countries/netherlands/.
[112] Energy Agreement for Sustainable Growth (Social and Economic Council in the Netherlands, 2013).
[113] Letter to Parliament on the "Status of activities in the field of energy innovation" (30 September 2016).
[114] Letter to Parliament on the "Status of activities in the field of energy innovation" (30 September 2016).

all, offshore wind energy plays a key role in achieving the objectives and targets of the Energy Agreement. The Netherlands is one of the leaders in the field of offshore wind energy and is highly ambitious within the framework of the national Climate Agreement. In addition, the Netherlands plays a leading role in the strengthened international collaboration on the North Sea and shares the Presidency of the CCUS working group with Norway. This allows the Netherlands to help direct and supervise the activities that are crucial to the ongoing development of CCUS and provide concrete projects from Dutch research institutions and businesses. In addition, the Netherlands takes part in all SET programmes, with the exception of Concentrated Solar Power, Ocean Energy and Batteries & e-mobility.

In this way, the Netherlands' focus within the context of the SET plan aligns effectively with the national focus in the Top Sector. Within the occasionally broader SET plan programmes as well, the focus of the Netherlands is on comparable priorities to the ones within the Top Sector or within energy transition policy. Within the SET programme on energy efficiency in industry, for example, the Netherlands' participation is mainly focused on alternative, more sustainable high-temperature processes (through the electrification of processes, new separation processes and new processes for the steel industry, such as Hisarna). Within the programme, the Netherlands additionally focuses on HT heat recovery techniques and systems.

European Research Area Network (ERA-NET)
The Netherlands also takes part in the networks of the European Research Area Network (ERA-NET). The ERA-NETs serves to coordinate the research programmes within the individual Member States and to encourage collaboration between national research councils and research funding agencies. The principal activity of the ERA-NETs is usually the organisation of joint calls for research proposals. The Netherlands focuses on the following networks:

- ERA-Net Solar and ERA-Net Solar Co-Fund (continuation of the ERA-Net);
- Biomass Sustaining the Future BESTF II and BESTFIII ERA-Net Co-Funds;
- Demowind I and II;
- Eco Innovera ERA-Net;
- Ocean ERA-Net;
- Geothermal ERANET – FP7 ERANET and GEOTHERMICA – ERANET Cofund under H2020;
- ACT ("Accelerating CCS Technologies");
- Electromobility + ERA-Net;
- Electric Mobility Europe ERA-Net Co-Fund.

Other international cooperation

Mission Innovation[115]
Through Mission Innovation, the Netherlands works alongside a group of 22 leading industrialised nations and the European Commission to accelerate energy innovation by striving to double public investment in the period leading up to and including 2020. In this way, Mission Innovation contributes to the realisation of the agreements of the Paris Climate Agreement.

Participation in Mission Innovation provides opportunities for Dutch research institutes and businesses to attract additional private funding for energy innovation. The Netherlands is deliberately focusing on a number of innovation challenges that align with its national commitments, such as the innovation challenges in relation to Heating & Cooling, Sustainable Biofuels, Carbon Capture and Off-grid access

[115] For the Dutch commitments under Mission Innovation, please see http://mission-innovation.net/participating-countries/Netherlands/ and the Letters to Parliament on the "Status of activities in the field of energy innovation" (30 September 2016) and "Dutch participation in Mission Innovation" (26 May 2016).

to electricity. Recently, the Netherlands has also joined the new innovation challenge in the field of hydrogen.

In addition, the Netherlands has also joined various working groups and programmes within the framework of the International Energy Agency (IEA) and joined several bilateral and multilateral partnerships in the field of energy.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The Netherlands' commitment to innovation consists of both a specific and a generic approach. Below is an outline of the schemes that can be used for energy and climate innovations.

Generic innovation schemes

Future Fund
This fund makes funding available for innovative and fast-growing SMEs and for fundamental and applied research that will also benefit future generations, through the co-financing of investments in R&D and innovation, the facilitation of access to and funding of (risk) capital for businesses and the co-financing of European and international partnerships in the field of research and innovation. This fund includes:

- *innovation credit;*
- *the Seed Capital Scheme;*
- *the Dutch Venture Initiative (DVI-I and II);*
- *Early-Stage Funding (VFF);*
- *co-investment venture capital instrument/EIF;*
- *start-ups/SMEs;*
- *Onco Research;*
- *Smart Industry;*
- *feasibility studies TO2 innovative start-ups.*

Innovation box
A special rate box within corporate income tax. Profits falling within this rate box are taxed at a rate of 7% instead of 25%.

R&D tax deduction scheme
A scheme under the Salaries Tax and National Insurance Contributions (Reduced Remittances) Act (*Wet vermindering afdracht loonbelasting en premie volksverzekeringen*, WVA). The R&D tax deduction is based on the labour costs of employees carrying out research and development work and on the other costs and expenditure for research and development.

Small Business Innovation Research Programme (SBIR)
SBIR is a flexible procurement method through which the government is able to challenge entrepreneurs to solve specific social issues with innovative products and services.

National Science Agenda (NWA)
An investment programme in innovative and socially relevant research via the 25 routes of the National Science Agenda, allowing knowledge to be developed for scientific breakthroughs and for social tasks. The research programme covers all disciplines and is focused on the entire chain of fundamental, applied and practice-based research.

Ministry of Economic Affairs and Climate Policy co-financing with Horizon 2020 for public-private partnerships (JTI) and innovative SMEs (Eurostars)
Horizon 2020 funds a number of long-term programmes in which Member States can participate. The Ministry of Economic Affairs and Climate Policy co-finances a number of those programmes that focus on top sectors and innovative SMEs.

Stimulation of Horizon 2020
Alongside the Ministry of Education, Culture and Science, the Ministry of Economic Affairs and Climate Policy coordinates Dutch participation in the European Framework Programme for Research and Innovation. The Netherlands Enterprise Agency (RVO) advises and trains potential participants. In order to lower the participation threshold, public knowledge institutes are given an allowance via the Netherlands Organisation for Scientific Research (NWO) to reduce indirect costs that are not covered.

European Regional Development Fund (ERDF)
The Ministry of Economic Affairs and Climate Policy finances the regional structural fund programmes of the EU. The main objectives of the programmes are innovation and the low-carbon economy.

Generic top sector policy
In addition to the generic innovation schemes, a number of instruments are available that are aimed at the nine top sectors in the Netherlands. These are the following schemes:

Regional and Top Sector Incentive Scheme for SMEs (MIT)
This scheme provides incentives for innovation projects by SMEs across the regional borders that may align with the innovation agenda of the top sectors. The MIT provides a number of different instruments that entrepreneurs can apply for: knowledge vouchers, feasibility projects, R&D partnership projects, networking activities and innovation brokers.

PPP allowance
The PPP allowance is provided for private contributions for public-private partnerships for research and innovation within the Top Sectors. The TKI applies for the allowance and distributes the funds across the public-private partnerships. Large PPPs may also apply for the allowance directly.

Specific energy and climate innovation schemes
Finally, energy and climate innovations can also apply for specific energy and climate schemes. These are the following schemes:

Renewable Energy Scheme (HER)
Funding for cost-reducing innovations that are able to make the production of renewable energy cheaper in the future.

Energy Innovation Demonstration (DEI) grant scheme
Funding for the initial demonstrations of energy-saving innovations and innovations that lead to renewable energy production in relation to which export potential is a key criterion.

Climate technologies and Innovations Demonstration Scheme (DKTI)
The objective is to challenge companies and knowledge institutes to formulate new ideas and solutions in order to contribute to an acceleration of the transition to ultimately achieve zero emissions in transport and mobility.

Energy Investment Allowance
Tax deduction or allowance for investments that yield energy savings (deduction of up to max. 55% of the investment costs from the taxable profit).

ERA-NET Energy Call Accelerating CCS Technologies (ACT)
Call for the funding of research and innovative projects that can lead to safe and cost-effective technology. This call is open until 2019. It may be that, in the period of 2020-2030, new calls will be held in respect of CCS, based on the applicable needs at the time.

Environmental Investment Rebate (MIA) and the Arbitrary depreciation of environmental investments (VAMIL)
Tax deduction for investments in innovative environmental investments in the field of, inter alia, climate, mobility, agriculture, construction and the circular economy.

Energy Top Sector Tender Schemes (for 2018)
The tender schemes for the Energy Top Sector are aimed at stimulating specific issues within the programme lines of the Top Consortia for Knowledge and Innovation (TKIs). These schemes are tightened and adjusted each year. The schemes for 2018 have been outlined below by way of indication:

- Energy Studies Top Sector;
- Socially Responsible Energy Innovation (MVI Energy);
- Biobased Economy, Green Gas and Recycling innovation (BBEGR);
- gas:
    - hydrogen (pilot scheme and tender);
    - Carbon Capture, Utilisation and Storage (CCUS) (pilot scheme and tender);
    - geothermal Energy;
- built environment:
    - short-term innovations in natural gas-free districts;
    - solar technologies (PV);
    - thermal plants;
    - physical integration;
    - flexible energy infrastructure;
    - energy regulation systems and services;
- energy and industry: joint industry projects (JIP);
- offshore wind energy:
    - offshore wind energy R&D;
    - systems integration on the North Sea.

PART B ANALYTICAL BASIS

Chapter 4. Current situation and projections with existing policies and measures[116,117]

This chapter will outline the developments within the Dutch energy system based on the five dimensions of the Energy Union on the basis of existing policies. The National Energy Outlook (NEV) published by the Energy Research Centre of the Netherlands (ECN) and the Netherlands Environmental Assessment Agency (PBL) in 2017 (ECN, 2017a) is the primary source for this chapter. References have been provided where sources other than the NEV have been used. For all other instances, we shall suffice with this single reference to the NEV 2017.

The final NECP will be based on the next NEV that is to be published in 2019. In addition to an updated overview of the existing policies, the next National Energy Outlook will also take into account the new policies of the government, including the measures and agreements that are to be established in the Climate Agreement.

As outlined in Chapter 1, the NEV covers both the realization (from 2000) and expected future developments (up to 2035). Unless otherwise indicated, all figures relating to the realization will have been provided by Statistics Netherlands (CBS). The projections in the NEV 2017 are based on all relevant data that were available on 1 May 2017, such as expectations with regard to economic and sectoral developments, technological developments, energy and carbon prices, and policies (also see Section 4.1). Figures for the years 2015 and 2016, where available, have been used as the base year for the projections. Where possible, more recent information has been referred to in the text and has been incorporated into the diagrams, but such data were not used in the projections. Such information relates to, inter alia, the new preliminary energy and emissions statistics, recent economic developments and energy and carbon prices.

The NEV provides the developments in the field of energy and greenhouse gas emissions that are considered most plausible. However, the outlined developments contain inherent uncertainties, such as regarding the development of the prices of energy carriers and carbon emissions rights, uncertainties on the impact of policies and the interaction with foreign energy markets. For that reason, bandwidths that reflect those uncertainties have been provided for the key parameters.

This chapter will use the variant in the NEV 2017 of "adopted and proposed policies without new rounds of the SDE+ scheme beyond 2019" as the scenario with existing policies.[118] As discussed in

[116] The current situation shall reflect the date of submission of the national plan (or the latest available date). Existing policies and measures encompass implemented and adopted policies and measures. Adopted policies and measures are those for which an official government decision has been made by the date of submission of the national plan and there is a clear commitment to proceed with implementation. Implemented policies and measures are those for which one or more of the following applies at the date of submission of the national plan or progress report: directly applicable European legislation or national legislation is in force, one or more voluntary agreements have been established, financial resources have been allocated, human resources have been mobilised.

[117] The selection of exogenous factors may be based on the assumptions made in the EU Reference Scenario 2016 or other subsequent policy scenarios for the same variables. In addition, Member States-specific results of the EU Reference Scenario 2016 as well as results of subsequent policy scenarios may also be a useful source of information when developing national projections with existing policies and measures and impact assessments.

[118] The annex tables of the NEV provides a full list of which policies have been included. See http://www.pbl.nl/sites/default/files/cms/data/pbl-2017-nationale-energieverkenning-2017-overzicht%20beleidsvarianten.ods.

Chapter 1, we will be basing our analysis on this variant, given that it creates the possibility for the available resources to be applied in a different way and for the allocation of the SDE+ resources to be weighed comprehensively for a cost-effective implementation of the reduction target. This chapter will assume that the proposed policies at the time of the NEV 2017 will be adopted and will become established policies in the NECP for 2021-2030. Most of these policies chiefly relate to realising the targets of 2020/2030 and the implementation of more stringent standards from European legislation.[119]

4. 1 Factors influencing energy system and GHG emission developments

This section will outline the key factors in relation to the expected development of the energy system and greenhouse gas emissions, such as economic developments and energy prices. It is based on the figures and insights as they were assumed in the NEV 2017. More recent insights and/or figures have not been incorporated.

i. Macro-economic projections

Demographic and economic development have a major impact on energy consumption. This section will discuss the key developments in the Netherlands.

Population growth on the decrease

In 2017, the population consisted of 17.1 million people (see Table 4.2). According to the population projection conducted by Statistics Netherlands, the population is set to increase to 17.9 million people by 2030 (Statistics Netherlands, 2017a).[120] The population is expected to continue to grow beyond 2030, but the rate will plateau slightly. The annual growth rate in 2017-2030 will be roughly half of the growth seen for the 2000-2017 period. Due to the ageing population, the potential workforce has stabilised in recent years. With regard to the retirement age, it has been agreed that this will be increased to 67 by 2021 and will subsequently continue to go up commensurate to the life expectancy of 65-year-olds. As such, the retirement age is expected to increase to 68 by 2030 (Statistics Netherlands, 2014). The increase of the retirement age will see the potential workforce increase in the years to come, but gradually decrease beyond 2025.

Increase in the number of small households

In terms of the energy consumption of consumers, the number of households is more important than the size of the population. Larger households have economies of scale in comparison to smaller households, so they consume less energy per person. The average size of households has been decreasing in the past decades and this trend is set to continue in the future (see Table 4.2). The growth of the number of households is therefore greater than the growth of the population. It is expected that the difference in growth will decrease somewhat beyond 2020.

[119] In addition, the variant also includes the assumed implementation of European laws and regulations that were not yet adopted at the time the NEV 2017 was drafted, such as the tightening of carbon emissions standards for vehicles, the blending of biofuels, more stringent energy efficiency standards in the Ecodesign Directive and more stringent requirements in the revision of the EPBD (also known as the NZEB standard).

[120] The NEV 2017 is based on a slightly lower forecast, of 17.8 million people by 2030.

	Realization			Projections				
	2000	2010	2017	2020	2023	2025	2030	2035
Population (million)	15.9	16.6	17.1	17.3	17.5	17.6	17.8	18.0
Potential workforce [1] (million)	10.8	11.1	11.1	11.5	11.6	11.6	11.5	11.3
Private households (million)	6.8	7.4	7.8	8.0	8.1	8.2	8.4	8.5
of which single households (million)	2.3	2.7	3.0	3.1	3.2	3.2	3.4	3.5
Average household size	2.30	2.20	2.16	2.10	2.10	2.10	2.10	2.10

Table 4.2 Demographic developments (Sources: realization according to Statistics Netherlands and projections by ECN, 2017a)

1) The potential workforce consists of all persons aged between 15 years old and retirement ("old-age pension") age.

Economic activity recovered from crisis

In the period of 2000 to 2015, the Dutch economy (expressed in gross domestic product, or GDP) grew by an average of 1.1% a year. The economic recession left its mark during that period. Since the beginning of the crisis in the autumn of 2008, GDP up to and including 2013 shrank by 2.3%. During the crisis, production and investments decreased sharply. Recovery occurred thereafter. In 2014, the economy grew by 1.4%, after which growth rose each year, to 3.2% in 2017 (Statistics Netherlands, 2018a).

At the beginning of the recession in 2008, exports showed a sharp decrease, but they recovered as soon as 2010 and have not experienced a second dip, as observed in domestic consumption and investments. For that reason, the economic recovery was initially chiefly borne by exports. However, from the end of 2014, the recovery of the housing market also had a positive impact on economic growth (expressed in the investments made by households), and from 2015, private consumption contributed to the economic recovery as well. The level of consumption per household is expected to achieve pre-crisis levels by 2021. Figure 4.1 illustrates the development of the key macroeconomic variables that are assumed in the NEV 2017.

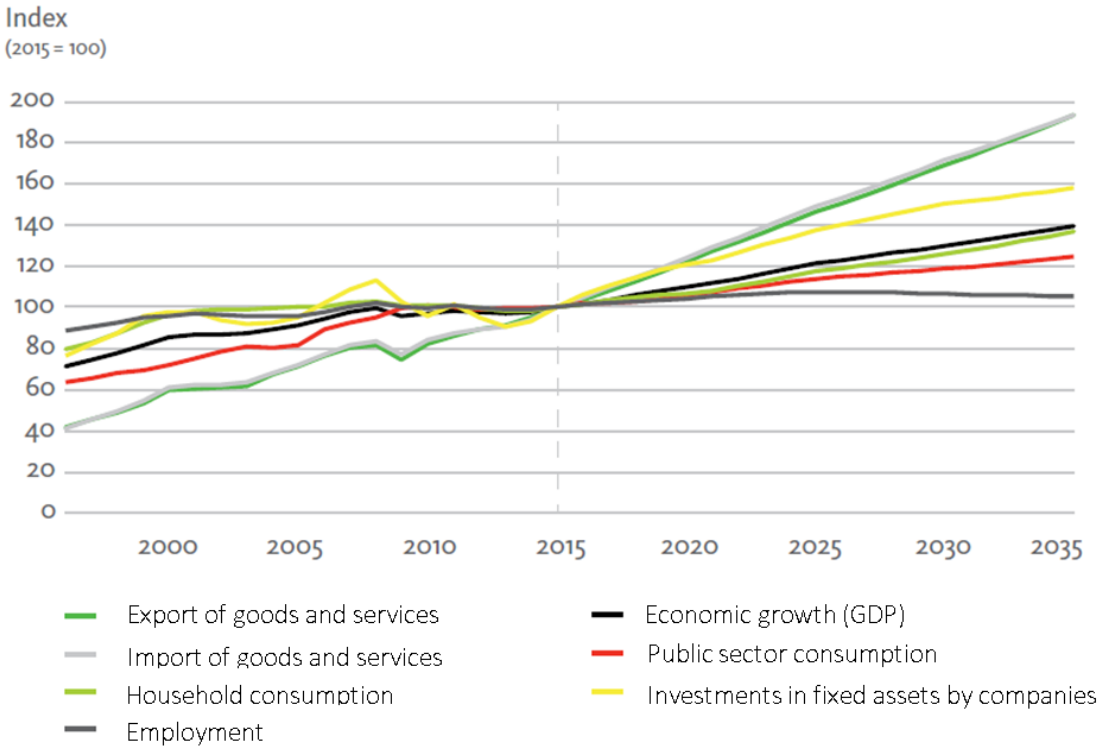

Figure 4.1 Development of the key macroeconomic variables (Source: ECN, 2016a).

Expected lower growth chiefly due to low workforce growth

Despite the continued economic recovery, it is expected that the average economic growth will not reach the level of the 2000-2008 period until 2030 – during that period, growth averaged 2.3% a year. It is expected that average growth for 2015-2030 will be 1.75% a year. A significant cause of the expected lower growth of GDP until 2030 is the moderate growth of employment. According to international studies (such as the study carried out by the European Commission; see EC, 2011), labour productivity in the Netherlands, which is a key determiner of economic growth, is expected to grow by an average of 1.4% per year up to 2020, after which this will increase to 1.5%. This growth roughly corresponds to the average annual growth in labour productivity of the three decades preceding the crisis (1978-2007).

It is expected that exports will continue to make a significant contribution to economic growth until 2035. Between 2015 and 2030, the growth of exports will remain roughly one percentage point above economic growth. The growth of imports is expected to be slightly lower than that of exports, resulting in the surplus on the current account of the balance of payments increasing further. Up to 2035, the growth of private consumption will be higher than the economic growth. This is a change from the past twenty years, when the growth of private consumption lagged behind economic growth. Private consumption growing more rapidly in the years to come is largely due to the dissavings in pensions as a result of the ageing population. Public consumption shows an opposite development, having grown more rapidly than the economy in recent years, but that growth will slow down leading up to 2035.

ii. Sectoral changes

Sectoral changes as a determining factor for energy consumption

This section will discuss sector-specific developments in broad strokes. In general, activities in the services sector require far less energy than activities in industry or agriculture. Nevertheless, there may be significant differences within the sectors themselves. Basic industry within the heavy industry

sector and greenhouse horticulture within the agricultural sector, for example, are relatively energy-intensive.

Services industry dominates the economy

At present, over three quarters of GDP is realised in the services industry (see Figure 4.2). In recent decades, the percentage of the services industry has increased and, despite a decrease in the rate of growth, it is likely to continue to increase in the future. The commercial services are mainly responsible for this growth. Budget cuts in health care, education and public administration have led to a lower average growth of these semi-public sectors. The growth of the commercial services sector, however, is so high as to put the overall growth of the services industry above the average despite these cuts. Industry was the first to benefit from the economic recovery after the crisis, resulting in its percentage in the Dutch economy increasing initially, although that percentage will eventually fall again. Around 2020, the percentage of industry is expected to be at the current level again, after which it is expected that industry's percentage in the GDP will drop further.

Energy consumption chiefly impacted by production

In terms of energy consumption, rather than the added value, physical production is key. This section will examine the value of production, expressed in euros. The percentage of the services industry in production is far lower than the percentage of the services industry in terms of added value or employment. In 2015, the percentage of the services sector accounted for over 60% of production (in euros). Industry, which uses relatively many materials and semi-manufactured products, has a significantly higher percentage (in euros) in production than in added value or employment. In 2015, the production percentage (in euros) of industry was at 21%, and it is expected to maintain roughly the same level until 2020 and to subsequently decrease to 20% by 2030.

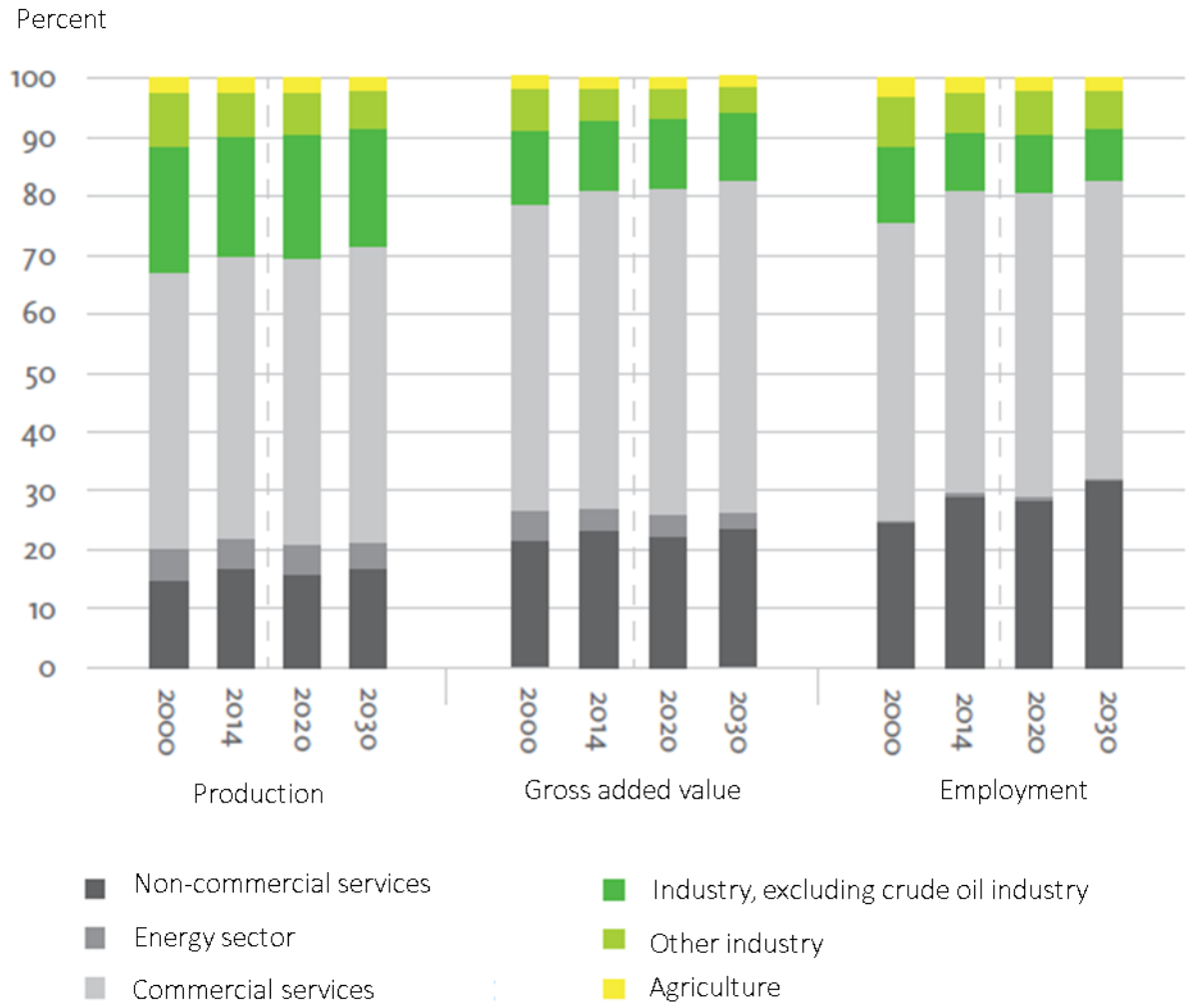

Figure 4.2 Percentages of the various sectors in terms of production, added value and employment (Source: ECN, 2015)

iii. Global energy trends, international fossil fuel prices, the EU-ETS carbon price

This section will discuss the price developments of energy carriers that are fully or to a large extent imported by the Netherlands from international markets. In addition, this section will cover the development of the prices of emissions rights in the European ETS, which are key exogenous parameters for the projections of energy consumption, the energy mix and greenhouse gas emissions.

Global energy trends

Sharp rise in global energy demand

The global energy demand is set to rise significantly in the decades to come as a result of a growing population, economic development and, most importantly, an increase in the prosperity of developing countries. The International Energy Agency (IEA) assumes an increase of 30% of global energy consumption up to 2040 (IEA, 2017), with that growth chiefly taking place in India and Southeast Asia. The growth in the energy demand in OECD countries will, by contrast, be stagnating as a result of efficiency improvements, despite economic growth. In Europe, energy demand will even decrease by 10%.

Growth of renewable energy production

The global increase in the energy demand will be primarily absorbed by investments in energy efficiency and renewable energy. Although fossil fuels will still dominate energy consumption in the decades to come, their importance will continue to decrease. By 2040, the IEA, in its New Policies Scenario, expects a 40% share of renewable energy. The use of coal is stagnating. The consumption of petroleum products, however, is still gradually increasing, chiefly due to the growing level of prosperity in South and Southeast Asia. This shift in demand will lead to a large number of investments taking place in the refining sector in Asia in the future. The use of natural gas, as a relatively clean fuel, is similarly expected to increase further. The implementation of the Paris Climate Agreement will see the consumption of fossil energy carriers fall even further.

International prices of energy carriers

The prices of fossil energy carriers such as crude oil, natural gas and coal have shown a sharp decline on the global and regional markets in recent years. However, more recently, they have gone on the rise again. In order to gain insight into price developments in the longer term, the expectations outlined in the World Energy Outlook[121] (WEO) of 2016, published by the International Energy Agency (IEA), have in principle been used as the basis for the projections in the NEV 2017. In addition, the report has made use of prices on the short-term markets. The figures illustrating the price projections below include bandwidths around the main projection in order to indicate any uncertainties present. The bandwidths were determined in line with the Welfare, Prosperity and the Human Environment (WLO) long-term study (CPB & PBL, 2015), which published long-term price projections for high and low reference scenarios. These WLO scenarios include the key uncertainties surrounding energy and the climate, for example, such as the realisation of global climate policy and the size of fossil fuel reserves.

Crude oil price recovers following years of relatively low prices

The oil price took a sharp drop from the end of 2014 and reached a low at the start of 2016, with prices of around 30 euros a barrel in February. On average, the oil price in 2016 amounted to approx. 40 euros a barrel (Figure 4.3). A critical reason for this low price was the relatively high supply in comparison to the demand. The production of unconventional oil has seen a substantial increase in the United States in recent years. At the same time, countries that had previously reduced their production of oil during periods of low oil prices chose not to do so during this period. The low oil price led to production in countries like the United States coming under pressure, as well as to production in countries in the Middle East, producing at low costs, increasing. Under the influence of the low prices, the investments in exploration and extraction declined significantly, which in the longer term will lead to a lower supply and, consequently, to higher prices. The NEV 2017 has assumed a price of around 50 euros a barrel for the years to come.

[121] New Policies Scenario.

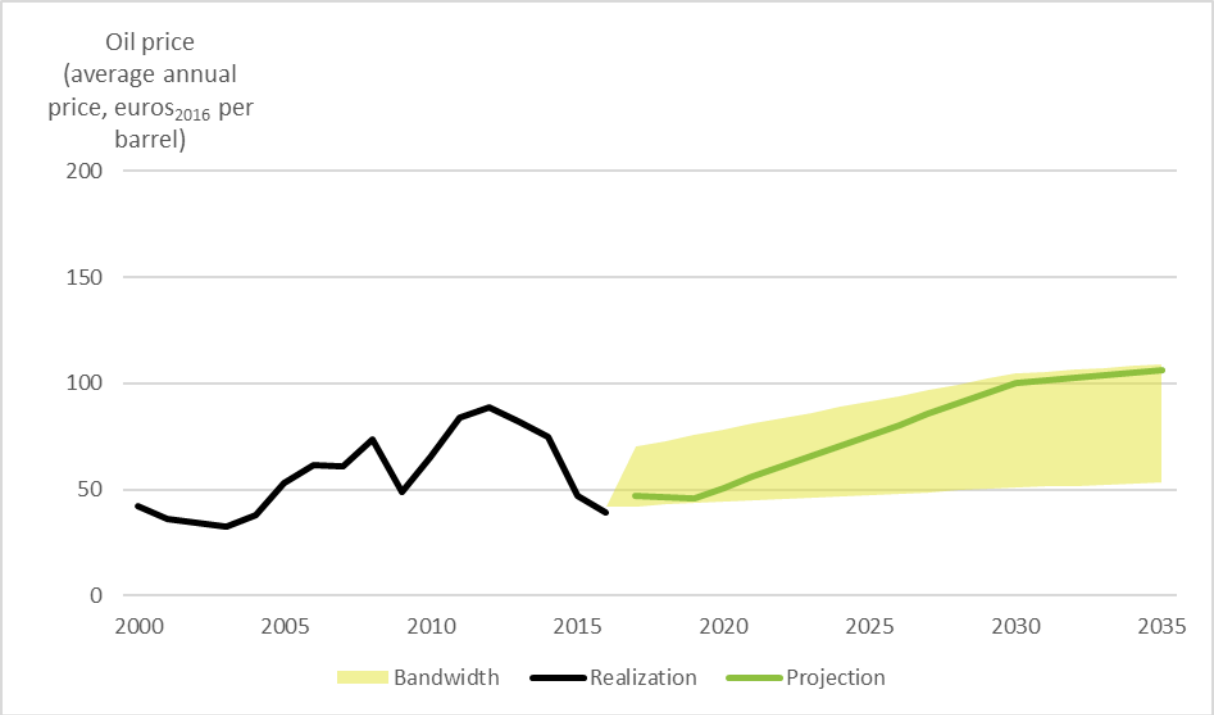

Figure 4.3 Historical and assumed future oil price (Source: ECN, 2017a).

Gas price seems to have hit bottom

In 2008, the wholesale price of natural gas seemed to have peaked. Since then, it has declined significantly, remaining approximately at 15 cents per m3. In 2016, the average price was at 15 cents per m3 (Figure 4.4). The drop in gas prices was caused by the low oil price and by the limited growth of the worldwide demand for gas, in conjunction with a high level of supply. The latter was partly the result of the production of shale gas in the US. It is expected that the gas price has now reached bottom. Given that natural gas is a relatively clean and cheap fuel, demand is expected to grow. That growth is likely to be less strong than we have seen in recent decades. Supply from outside Europe is on the increase, including through the increase of natural gas extraction in Australia and shale gas in the United States. In China, the production of shale gas is expected to increase, resulting in the country purchasing less gas on the global market. Production in Europe has been decreasing for many years and this trend is set to continue. This is partly compensated by production in Russia and the growing import of LNG. The growing role of LNG on the global market has resulted in regional markets becoming more integrated, with price differences between these markets set to become smaller in the future.

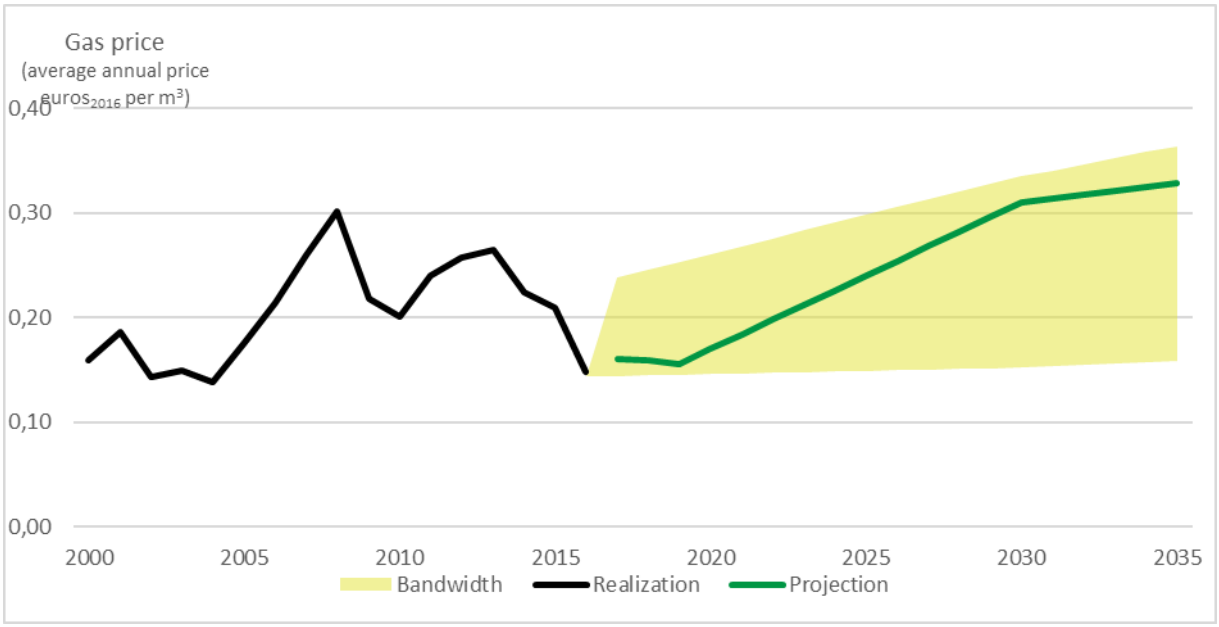

Figure 4.4 Historical and assumed future gas price in the Netherlands (Source: ECN, 2017a)

Low price of coal

In 2016, the price of coal, similar to the price of gas, seemed to have hit rock bottom following a sharp drop in previous years, with an average price of roughly 50 euros per tonne (Figure 4.5). The question is whether the coal market will be able to recover from the current situation of oversupply and the resulting low prices. The WEO 2016 assumes that supply and demand on the coal market will be in balance with one another beyond 2020.

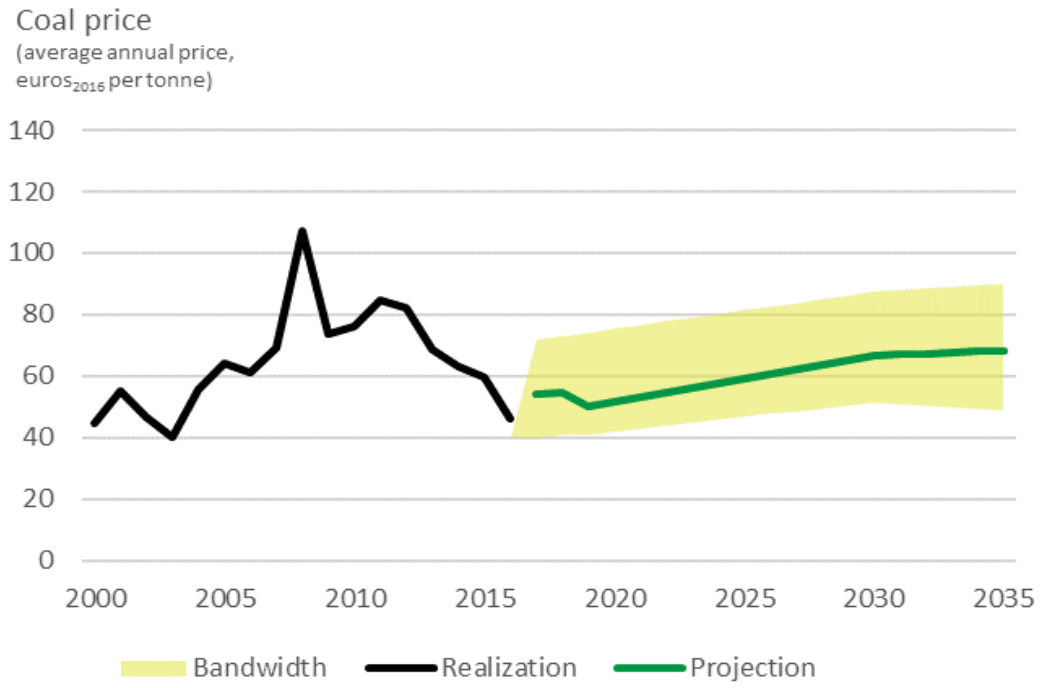

Figure 4.5 Historical and assumed future coal price (Source: ECN, 2017a)

Growing demand for wood pellets

A wide range of raw materials are traded on the market for biomass for energy or fuel production, also known as the bioenergy market. The products that are traded on the wood pellet market are

industrial wood pellets intended for use in large-scale electricity and heat production and pellets for smaller-scale use in pellet stoves and boilers.

In the European Union (EU), the consumption of wood pellets has grown by an average of 2 megatonnes a year in recent years. According to Eurostat, total EU production of wood pellets amounted to 14 Mt in 2015, with a net 6 Mt being imported. Imports from outside the EU seem to be levelling off, whereas the production of wood pellets within the EU seems to continue to grow, particularly in the Baltic states.

In the Netherlands, a surge in the demand for wood pellets is expected in the next few years, since it was agreed in the Energy Agreement that biomass could be used for auxiliary and co-firing in power plants, resulting in a growing demand for wood pellets for boilers. In 2015, consumption of wood pellets was 0.1 Mt (Statistics Netherlands, 2016). In order to achieve the level of auxiliary and co-firing of biomass agreed upon, over 3 Mt per year will be required.

The global market for wood pellets is far smaller than the market for fossil energy carriers. It is partly because of this that there are few public price projections available beyond the horizon of 2020. It is expected that the wood pellet price will increase up to 2020, as the demand will be increasing significantly until that time, outpacing supply (Figure 4.6). Beyond 2020, a greater supply is expected to enter the market. Due to a lack of analyses for the period beyond 2030, the price from 2030 onward has been kept constant.

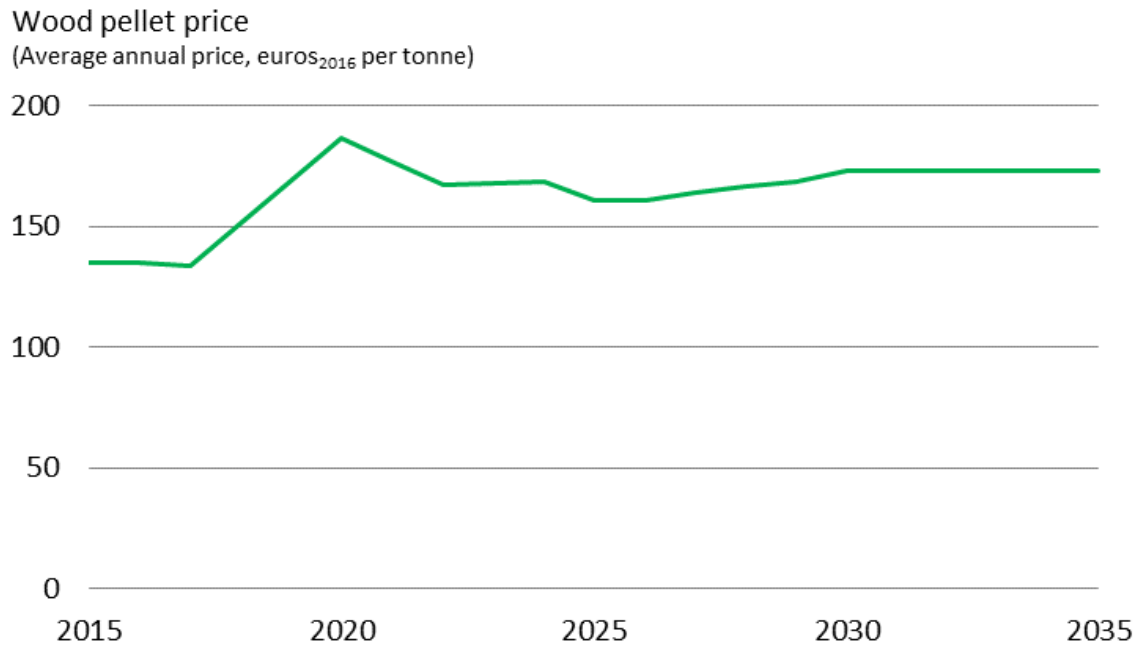

Figure 4.6 Historical and assumed future industrial wood pellet price in the Netherlands (Source: ECN, 2017a)

European market for carbon emission allowances

Since the economic crisis in 2008, the European market for carbon emission allowances has had to deal with relatively low prices due to a large surplus of emission allowances. Following a steady rise in prices in 2015, the price fell from 8 euros per tonne to 5 euros per tonne within a short period of time in January 2016. This was partly the result of uncertainty on the developments on the energy markets, the effects of Brexit and the outcome of the discussions on the revision of the European Emissions Trading Scheme (ETS) for the period beyond 2020 (Marcu et al., 2017). For the duration of 2016, the

price fluctuated around 5 euros per tonne, only occasionally rising above 6 euros per tonne and reaching a brief low of 4 euros per tonne in September. There were no significant changes in the first months of 2017 (Figure 4.7). Only in the second half of 2017 did the carbon price rise far more than expected, as a result of the introduction of the stability mechanism. More recently, the price of carbon per tonne has fallen again.

The NEV 2017 assumes that a price of seven euros per tonne in 2020 will rise to 16 euros per tonne in 2030 and 25 euros per tonne in 2035. There is a great deal of uncertainty on the development of the price of emission allowances, with the uncertainty on policy within the EU, but also outside the EU (for example regarding the implementation of the Paris Agreement), being a significant factor of influence. For that reason, a broad uncertainty bandwidth has been applied for the projection of the carbon price; by 2030, the bandwidth ranges between 12 and 77 euros per tonne of carbon dioxide. Unlike with regard to the fuel prices, the projections of the World Energy Outlook do not constitute the basis of the projection of the carbon price in the NEV. Rather, an approach has been used that aligns with the economic literature on emissions trading (Ellerman and Montero, 2007; Perino and Willner, 2016).

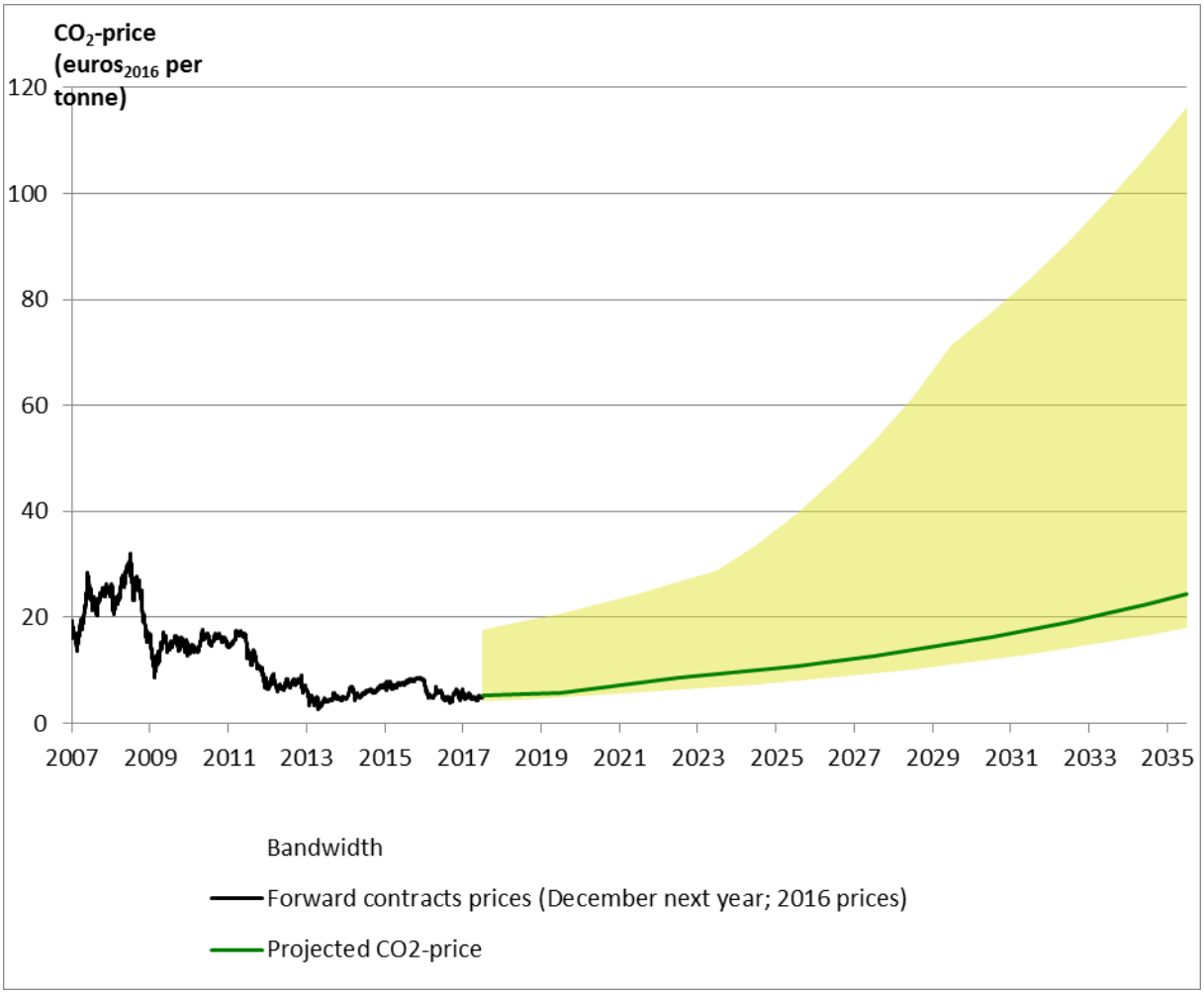

Figure 4.7 Historical and projected future prices for carbon emission allowances (Source: ECN, 2017a)

iv. Development of technology costs

The projections for the future developments in the energy system make use of the calculation system of the National Energy Reports, which is a modelling suite that offers various models for supply and demand sectors. The data and information on the costs, potentials and technical characteristics that

are used are regularly adjusted based on new insights from studies conducted by the IEA and IRENA and from scientific literature. The projections also make use of the detailed studies conducted within the Netherlands for the substantiation of the grants that are issued under the SDE+ grant scheme for various renewable energy technologies (please see ECN, 2017b).

At present, the information on the technologies in the various sectors is being updated in the run-up to the new projections of the NEV 2019 (which will be included in the final version of the NECP).

4.2 Decarbonisation dimension

4.2.1 Trends and projections for emissions and removals of greenhouse gases

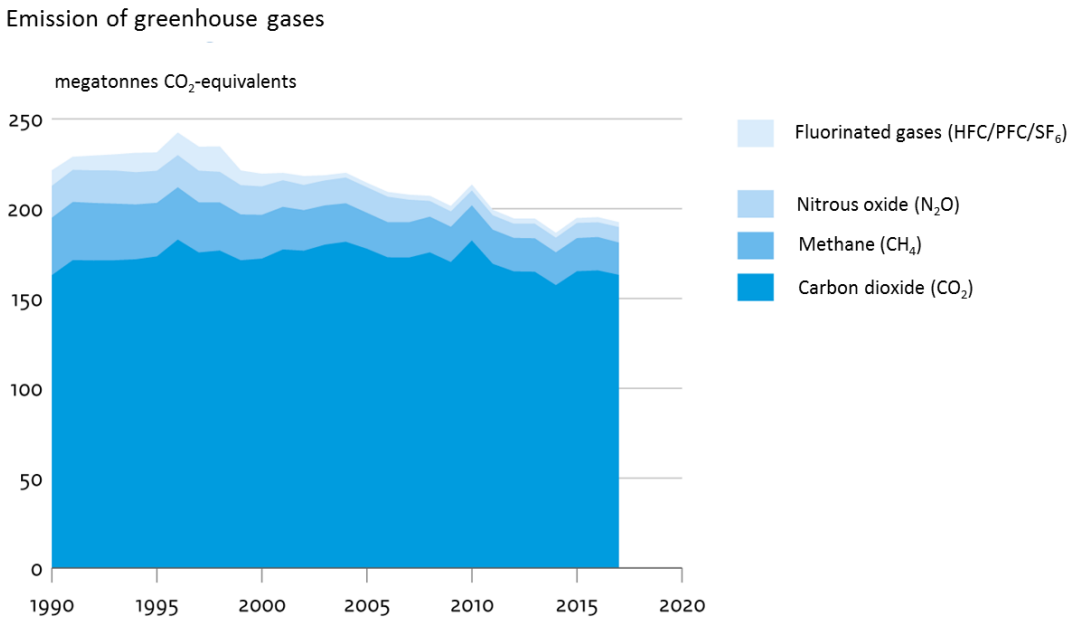

Figure 4.8 Emission of greenhouse gases in the Netherlands from 1990 to 2017 in Mt of carbon dioxide equivalents (excluding LULUCF) (Statistics Netherlands et al., 2018a)*
** 2017 is based on preliminary figures*

Historical trend of national greenhouse gas emissions up to the present
Following an initial increase between 1990 and 1996, greenhouse gas emissions in the Netherlands show a decreasing trend with a peak in 2010 (due to a relatively cold winter) and a limited increase in 2015 (see Figure 4.8). Since 1990, there has been a decrease particularly in the emissions of non-carbon dioxide greenhouse gases. In 2017, emissions based on preliminary statistics amounted to nearly 193 megatonnes of carbon dioxide equivalents (excluding LULUCF), 13% below the levels of 1990. This decrease can largely be attributed to a decrease in non-carbon dioxide greenhouse gases and to carbon reductions in the heavy industry sector and the built environment. Carbon emissions from the energy sector and from traffic and transport increased in 2017 in comparison to 1990, with those of agriculture (chiefly greenhouse horticulture) remaining more or less the same. Emissions of LULUCF increased slightly between 1990 and 2016, from 6.1 in 1990 to 6.7 Mt of carbon dioxide equivalents in 2016.

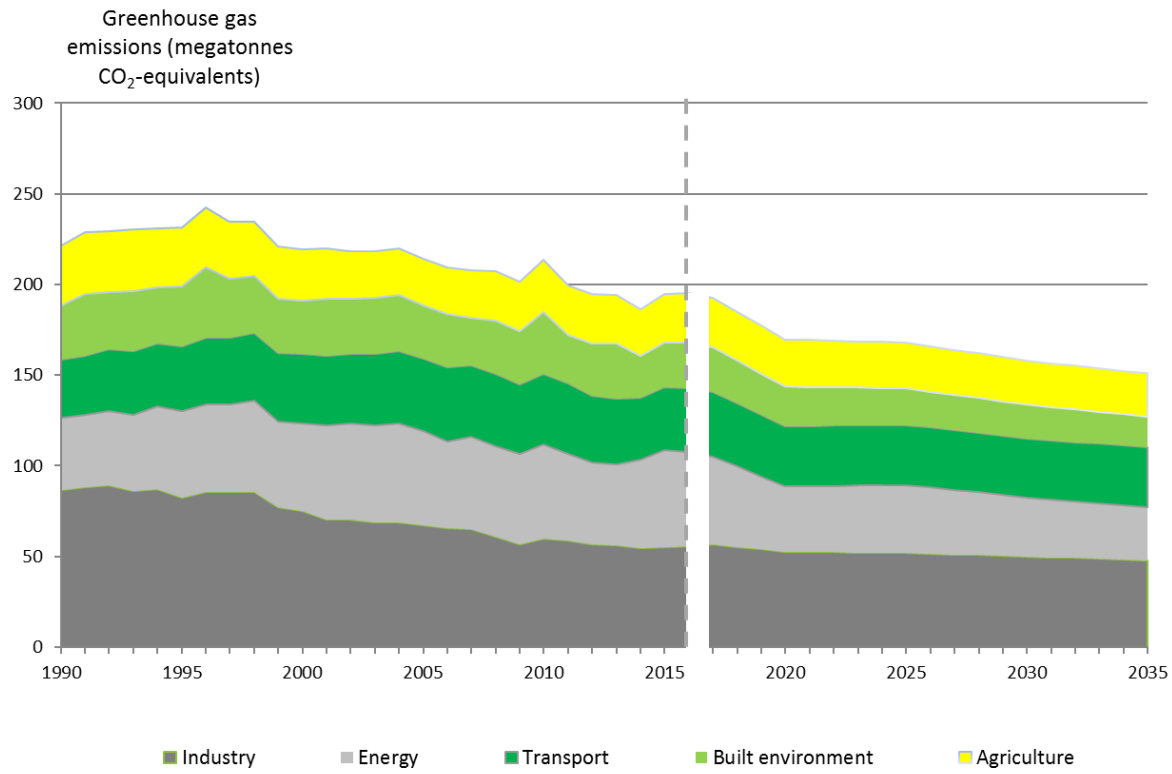

Figure 4.9 Historical and expected greenhouse gas emissions for the period of 1990-2035 (excl. LULUCF) (Sources: Pollutant Release and Transfer Register (realization) and ECN, 2017a (projections))

Projection of national emissions of greenhouse gases (excluding LULUCF)

Greenhouse gases to fall up to 2020

In the policy variant of "adopted and proposed policies with no new rounds of the SDE+ grant scheme after 2019", national greenhouse gas emissions drop to 169.7 [163-181] Mt of carbon dioxide in 2020 (see Figure 4.9). This means a decline of nearly 23 Mt of carbon dioxide equivalents between 2017 and 2020. Developments in the energy sector account for almost 13 Mt of those 23 Mt of carbon dioxide equivalents (see Table 4.3). Coal and gas-fired electricity production in the Netherlands is expected to decrease during this period due to a combination of factors: reduction of the established capacity (including the closure of five coal-fired power plants in line with the Energy Agreement), growth of renewable energy production in the Netherlands and in the surrounding countries and greater interconnection capacity (see Section 4.5.1). Emissions in industry will fall by almost 4 megatonnes in carbon dioxide equivalents. Furthermore, emissions from the built environment are expected to fall by nearly 3 Mt of carbon dioxide between 2017 and 2020, with those from traffic decreasing by over 2 Mt and those from energy consumption in greenhouse horticulture and other agricultural activities falling by over 1 Mt of carbon dioxide.

In the period beyond 2020, national greenhouse gas emissions are expected to fall even further, particularly after 2023. Between 2020 and 2030, the expected emissions are set to fall by nearly 12 megatonnes of carbon dioxide equivalents, down to 158 megatonnes, bringing the emissions reduction for 2030 to 29% compared to 1990. Emissions in the energy sector will be falling by over 3 Mt of carbon dioxide equivalents (see Table 4.3) during that period. At the end of that decade, the use of coal-fired plants will be lower. The use of decentralised, natural gas-fired cogeneration is also expected to fall sharply during this period (also see Section 4.3.3). The emissions in industry will fall by nearly 3 Mt in carbon dioxide equivalents during this period. Emissions from most other sectors are also expected to fall, with those from the built environment decreasing by over 3 Mt of carbon dioxide

equivalents, and those from the agriculture and horticulture sectors by nearly 2 megatonnes. Emissions from traffic and transport will be decreasing by nearly 1 Mt.

In the projection, total greenhouse gas emissions in the Netherlands are set to fall by a further approximately 7 Mt between 2030 and 2035, up to a total of approximately 151 megatonnes of carbon dioxide equivalents (reduction of 32% compared to 1990). The main contribution to this decrease will come from the energy sector and the built environment. Increasing energy production by solar panels, declining use of coal-fired power plants and increasing imports of electricity will result in emissions from the energy sector decreasing. Energy savings in existing buildings and new buildings with nearly zero emissions will lead to a further decrease in the consumption of natural gas in the built environment and to a corresponding decrease in carbon dioxide emissions.

Sector*	2005	2010	2015	2017**	2020	2025	2030	2035
Energy	52.1	52.0	53.3	48.6	36.0	37.6	32.6	29.5
Industry	67.0	59.7	55.3	56.5	52.7	51.7	50.0	47.8
Traffic and transport	39.9	39.1	34.7	35.4	33.1	33.2	32.4	32.9
Built environment	29.3	33.9	24.6	24.7	21.9	20.1	18.7	17.0
Agriculture and horticulture	26.0	28.7	27.0	27.2	26.0	25.4	24.2	23.9
Total	214.4	213.4	194.8	192.5	169.7	168.0	158.0	151.1

Table 4.3 Emissions of greenhouse gases from 2005 to 2035, excluding LULUCF (in megatonnes of carbon dioxide equivalents)
(Sources: Pollutant Release and Transfer Register (realization) and ECN, 2017a (projections))
* Classification per sector based on the Climate Agreement. This differs from the CRF format. In this table, emissions from mobile machinery, for example, all fall under traffic and transport. In the Annex, emissions are presented according to the CRF format.
** based on preliminary statistics

Projected greenhouse gas emissions uncertain due to electricity production and energy demand
The bandwidth of 19 to 27% reduction between 1990 and 2020 indicates a high degree of uncertainty. The key uncertainties lie in the field of conventional electricity production, in relation to which the developments abroad are a determining factor and are subject to significant uncertainties. Energy demand developments are linked to several factors, including economic growth and the rate of energy savings. Even the degree to which there may be a relatively cold or warm heating year is a significant uncertainty impacting emissions in a given year. For that reason, the projected emissions depend on uncertain factors that are controllable in domestic terms, but they also depend on factors that are virtually beyond control.

Trends and projections for emissions of greenhouse gases in EU ETS sectors
ETS emissions trend
Between 2005 and 2012, the emissions of Dutch businesses that took part in the European emissions trading system fluctuated around 80 megatonnes of carbon dioxide equivalents. After 2012, ETS emissions rose to 91 Mt of carbon dioxide equivalents in 2017. This increase was the result of a shift of activities from non-ETS to ETS in 2013 and the additional use of coal in electricity production.

ETS emissions expected to fall
It is expected that ETS emissions will fall in respect of 2017 by nearly 16 Mt of carbon dioxide equivalents to 76 [69-84] Mt by 2020 (see Figure 4.10). From 2017, electricity production using coal and gas is expected to decrease. The causes of this downward trend are the decrease in coal capacity

in the Netherlands cited previously, in addition to the increase of the production of renewable electricity in both the Netherlands and countries such as Germany. Furthermore, the transport capacity between the Netherlands and surrounding countries is set to increase, resulting in more freedom for the exchange of renewable and other electricity production between countries (see Section 4.5.1). This has resulted in a country requiring less conventional production to absorb periods with a low level of renewable production.

Beyond 2020, ETS emissions are set to continue to fall to 72 megatonnes of carbon dioxide equivalents by 2030. It is expected that, by 2030, more renewable and less conventional electricity will be generated, in conjunction with a somewhat lower electricity demand and a higher level of import of electricity. As a result, it is expected that ETS emissions from the energy sector will fall by over 3 Mt in carbon dioxide equivalents between 2020 and 2030. However, the expected electricity production and the corresponding carbon dioxide emissions will be highly sensitive to trade in electricity between countries, which depends on the development of the electricity price and domestic demand.

ETS emissions from industry are expected to fall by nearly 4 Mt in carbon dioxide equivalents between 2017 and 2030, as a result, on the one hand, of an increase in the efficiency and use of renewable energy and, on the other, decreasing oil and gas extraction activities and a decrease in the processing of crude oil in refineries.

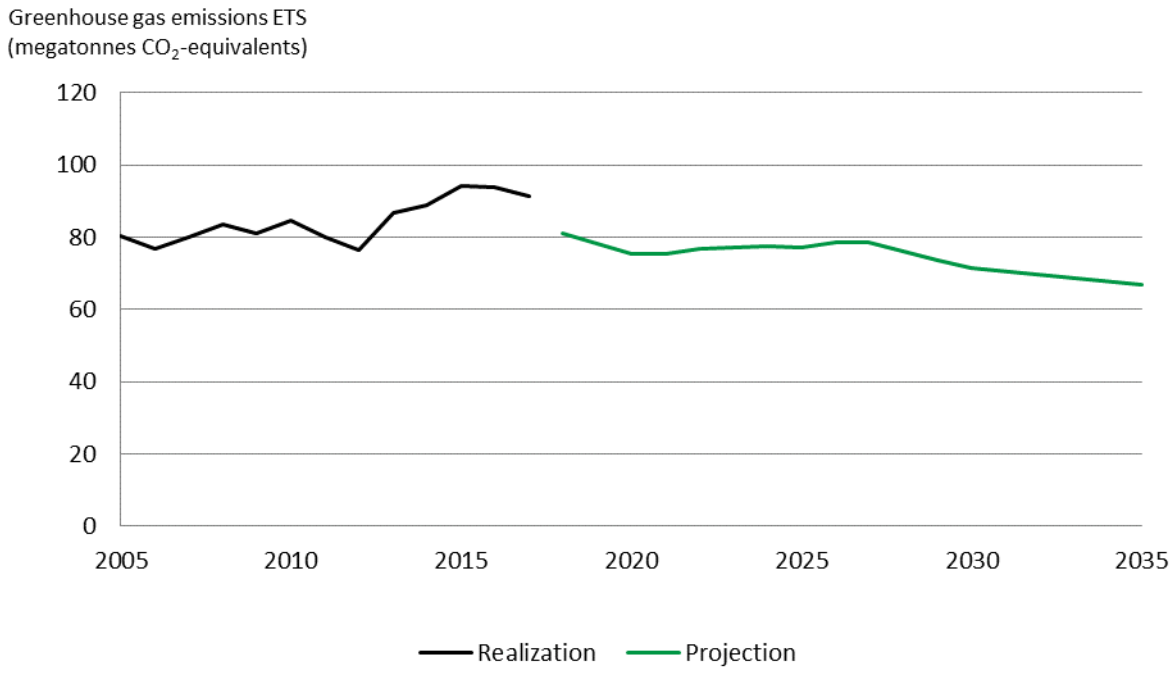

Figure 4.10 Historical and expected greenhouse gas emissions by ETS sectors in the period of 2005-2035 (Sources: Dutch Emissions Authority (realization) and ECN, 2017a (projections))

Trends and projections for emissions of greenhouse gases in non-ETS sectors

Cumulative target for non-ETS emissions

In Europe, national targets have been agreed upon for greenhouse gas emissions that do not fall under the European emissions trading system, the so-called Effort Sharing Decision (ESD). The ESD includes emissions from transport, the built environment (almost in its entirety), most of the agricultural sector and a limited part of industry. The objective in the ESD relates to a series of annual caps of the permitted amount of emissions between 2013 and 2020, which collectively make up the cumulative target for the whole period. The maximum permitted cumulative emissions for the

Netherlands under the ESD for the 2013-2020 period amount to 920 megatonnes in carbon dioxide equivalents. For the 2021-2030 period, new targets have been agreed upon within the framework of the new Effort Sharing Regulation (ESR). For the Netherlands, this is 36%, which is expected to lead to permitted cumulative emissions of 879 megatonnes.

Downward trend of non-ETS emissions

Non-ETS emissions have fallen from 134 megatonnes in carbon dioxide equivalents in 2005 to 101 Mt in 2017. This is mainly due to declining emissions by buildings (5 Mt) and traffic and transport (5 Mt), as a result of a gradual decrease of gas consumption by buildings and lower fuel consumption by traffic and transport since the economic crisis in 2008. Emissions of non-carbon dioxide greenhouse gases also significantly decreased during this period, namely by 8 megatonnes, primarily due to reduction measures in relation to the production of nitric acid. In addition, various companies (primarily in industry) came under the ETS as of 2013.

In the 2017-2020 period, a decrease between 7 megatonnes and over 94 [90-97] megatonnes in carbon dioxide equivalents is expected (see Figure 4.11). With the exception of the energy sector, all sectors will contribute to that decrease. Nearly 3 megatonnes in carbon dioxide equivalents will be due to reductions in the built environment, over 2 Mt due to reductions in traffic and transport and over 1 Mt will be achieved in agriculture and horticulture (see Table 4.4).

Sector*	2013	2015	2017**	2020	2025	2030	2035
Energy	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Industry	14.8	15.2	14.5	13.7	12.7	11.5	10.9
Traffic and transport	36.3	34.7	35.4	33.1	33.2	32.4	32.9
Built environment	29.7	24.1	24.2	21.6	19.8	18.4	16.8
Agriculture and horticulture	26.4	26.4	26.8	25.4	24.9	23.8	23.6
Totals	107.5	100.7	101.1	94.2	90.8	86.5	84.3

Table 4.4 – Emissions of non-ETS greenhouse gases from 2005 to 2035 (in megatonnes of carbon dioxide equivalents; excluding LULUCF; scope according to the third ETS trading period from 2013 to 2020) (Sources: Pollutant Release and Transfer Register (realization) and ECN, 2017a (projections))

* Classification per sector based on the Climate Agreement. This differs from the CRF format. In this table, emissions from mobile machinery, for example, all fall under traffic and transport. In the Annex, emissions are presented according to the CRF format.

** based on preliminary statistics

Non-ETS target for 2020 likely to be easily met – 2030 requires additional measures

The cumulative projected emissions for the 2013-2020 period amount to 798 megatonnes of carbon dioxide equivalents. This is well below the required cumulative emissions cap of 920 megatonnes of carbon dioxide equivalents.

A cumulative target for non-ETS emissions of 879 megatonnes of carbon dioxide equivalents is expected for the 2021-2030 period, assuming a linear decrease from over 99 megatonnes by 2020 to less than 79 megatonnes by 2030. Emissions are expected to be below the annual linearly declining emissions cap up to 2023, and above it after that. It is expected that the cumulative emissions for 2021-2030 will amount to 900 megatonnes, with a deficit remaining (which poses a policy challenge) for the established period of nearly 22 megatonnes in carbon dioxide equivalents.

The calculation for the cumulative target above already implicitly takes into account the possibility of compensation of deficit with surpluses between the years (banking and borrowing).

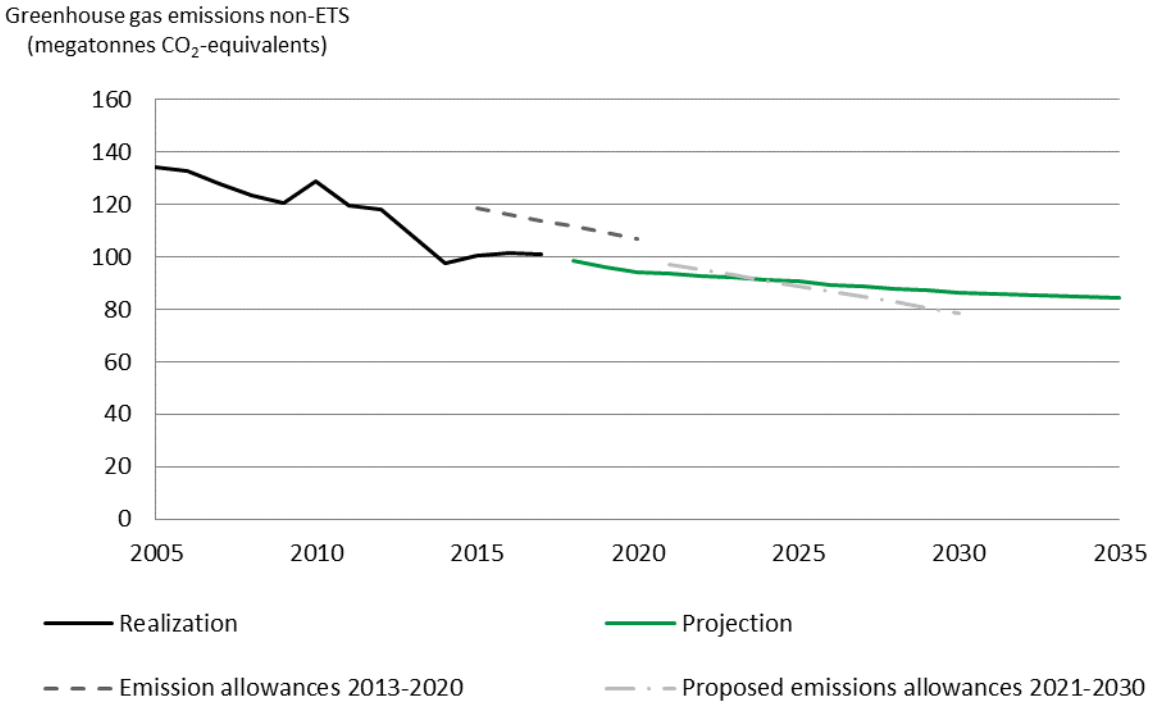

Figure 4.11 Historical and projected greenhouse gas emissions from non-ETS sectors in the 2005-2035 period (Sources: Pollutant Release and Transfer Register (realization) and ECN, 2017a (projections))

Sectoral developments for emissions of greenhouse gases in non-ETS sectors

Built environment
Since 1990, emissions in the built environment have gradually fallen from 30 megatonnes of carbon dioxide equivalents to 24.7 megatonnes in 2017 (without temperature correction, of which 0.5 Mt falls under the ETS), despite the fact that the number of households grew by 13% and the floor area of commercial buildings grew by 25% during this period. It is expected that carbon dioxide emissions will fall to 22 megatonnes by 2020 and to nearly 19 megatonnes by 2030 (of which 0.3 Mt falls under the ETS).

The decrease among households is the result of a reduction in the consumption of natural gas as a result of insulation measures and the use of more efficient boilers in existing buildings, demolition of existing buildings and the construction of energy-efficient new buildings. The decrease in the services industry is the result of energy savings in existing buildings, demolition, energy-efficient new buildings, reduction in space heating due to global warming, an increase in the use of electric heat pumps instead of boilers fired by natural gas and less use of cogeneration.

Industry
A limited percentage of greenhouse gas emissions from industry does not fall under the ETS (nearly 15 megatonnes of carbon dioxide equivalents in 2017). The developments that are relevant to the ETS emissions produced by industry are also relevant to the non-ETS emissions. It is expected that the non-ETS carbon emissions will decrease to approximately 12 megatonnes in the period up to 2030, chiefly as a result of declining emissions from methane from landfill sites and F-gases, as a result of the implementation of the European regulation on fluorinated greenhouses gases.

Traffic and transport

Between 1990 and 2010, carbon emissions increased by roughly 7 megatonnes due to an increase in domestic traffic and transport as a result of economic growth. Following the economic crisis of 2008, emissions rapidly fell. Despite the recovery of the economy, emissions have remained more or less stable around 35 megatonnes of carbon dioxide equivalents. This is a result of the vehicle fleet having become ever more efficient under the influence of European CO_2 standards, fiscal incentive policies and the blending of biofuels.

It is expected that greenhouse gases will fall slightly to 33 Mt of carbon dioxide equivalents by 2020, after which they will stabilise around 32 Mt. Traffic volumes are expected to continue to increase, particularly under the influence of economic growth. At the same time, the fuel efficiency of the vehicle fleet is increasing, particularly as a result of the ever more stringent European source-based policy for passenger cars and vans, and the mix of fuels. The percentages of biofuels and electricity in the energy mix will both increase, to 7% and 3% respectively.

Agriculture and horticulture

Most of the carbon emissions from the agricultural sector are produced by the greenhouse horticulture sector, where a large amount of energy is used to heat and light the greenhouses and fertilise them with carbon dioxide. Due to an increase in the area of greenhouses, carbon emissions increased from less than 8 Mt in 1990 to nearly 10 Mt in 2010 (of which 1.6 Mt at the time fell under the ETS). Thereafter, the area of greenhouses decreased by 12%, with carbon emissions currently situated around 7-8 Mt (of which approximately 0.5 Mt falls under the ETS). The carbon emissions in agriculture and horticulture are expected to remain around 7 Mt (of which 0.5 Mt ETS) up to 2020, after which they will decrease further to 5 Mt in 2030 (of which 0.4 Mt ETS) due to increasingly more efficient and innovative greenhouses.

Between 1990 and 2017, emissions of other greenhouse gases from the agriculture and horticulture sectors decreased by over 5 Mt in carbon dioxide equivalents to 20 Mt in carbon dioxide equivalents. In 2017, emissions from the agriculture sector were 0.4 Mt in carbon dioxide equivalents higher than in 2010. This increase was primarily related to the growth of the dairy herd following the abolition of milk quotas at the beginning of 2015 and, to a lesser extent, due to increased use of fertiliser. This increase is expected to halt once livestock herds shrink as a result of policies from 2017.

Trends and projections for emissions of greenhouse gases in LULUCF sectors

LULUCF emissions stable

In the Netherlands, grasslands, agricultural land and developed land are the principal sources of the so-called Land Use, Land Use Change and Forestry (LULUCF) emissions. Forests capture net CO_2. The net LULUCF emissions for the Netherlands for the 1990-2016 period fluctuated between 6.0 and 6.4 Mt of carbon dioxide per year (Figure 4.12). Between 2005 and 2014, forests gradually captured more carbon dioxide. This trend was the result of larger sequestration by existing forests, both in underground and overground biomass, such as forest floors and the planting of new forests. Emissions from grasslands decreased from 5.5 Mt of carbon dioxide in 1990 to 4.4. Mt in 2016. Most of the emissions from grasslands are the result of grasslands on peat soil where carbon dioxide is released as a result of drainage. The decrease after 1990 is due in large part to grassland having been converted into arable land, resulting in emissions from arable land increasing. This can be accounted for by the increase in area (conversion of grassland) and due to the fact that the conversion of grassland into arable land results in decreased carbon storage in the soil.

Due to new developments and construction of infrastructure, emissions of the developed land category increased from 0.9 Mt of carbon dioxide to 1.6 Mt. The changes are due to the deforestation of areas and changes of agricultural land use to urban uses, resulting in the release of carbon dioxide stored in the soil (and in the trees).

Projected LULUCF emissions to show slight increase

Total LULUCF emissions are expected to increase from 6.0 Mt of carbon dioxide in 2016 to 6.3 Mt by 2020, 6.8 Mt by 2030 and 6.7 Mt by 2035 (see Figure 4.12). The projection assumes that development and infrastructure, more than in the past, will take place through urban densification and that the expansion of new residential areas will be more limited as a result. Emissions of the built environment are consequently expected to increase, although less strongly than previously. In addition, it is assumed that agricultural use will not deviate from the management practices of the past decade. This means that emissions from grassland and arable land would collectively remain more or less the same for the period of 2015-2035.

With regard to the forests, it is expected that these will continue to absorb and capture carbon in the decades to come. It should be noted that this assumes a continuation of existing forest management practices and planting of forests (not as a result of climate policy). Simply judging by the current area of forests (371,000 hectares), it is expected that the annual carbon sequestration for the period of 2015-2035 will decrease from 2.6 Mt of carbon dioxide to 1.8 Mt, in part due to the ageing of the forests. If the sequestration in new forests were to be included, then the annual amount would decrease from nearly 3 Mt of carbon dioxide in 2015 to 2.2 Mt in 2035. This trend will determine the development of the total LULUCF emissions. To what extent the no-debit rule will be met in accordance with the European LULUCF Regulation is not yet clear. This will be included in the final NECP.

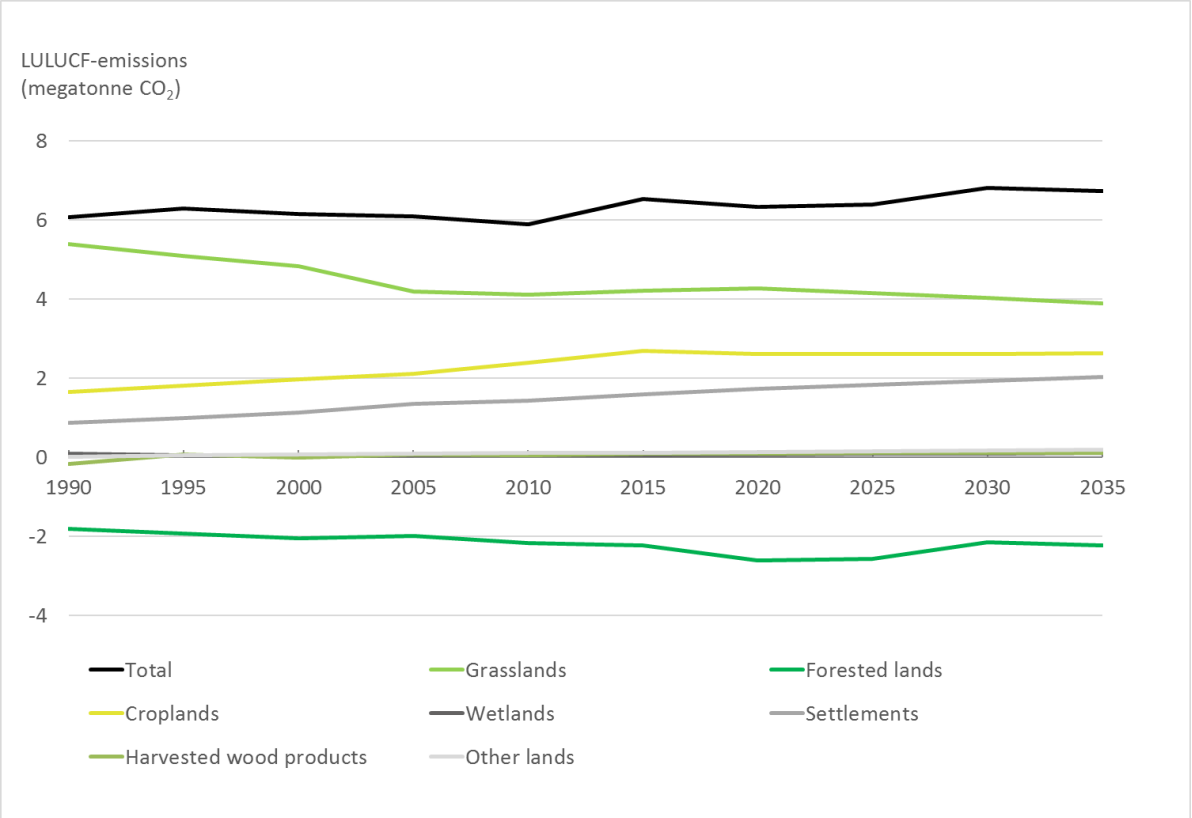

Figure 4.12 Emissions and sequestration of carbon dioxide by LULUCF sectors (Source: ECN, 2017a)

4.2.2 Trends and projection for renewable energy

Historical trend of the share of renewable energy

The share of renewable energy, according to the European Renewable Energy Directive (Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives

2001/77/EC and 2003/30/EC) has risen since 2000 from 1.6% to 6.6% in 2017 (Statistics Netherlands, 2018b). The principal causes for this increase were the introduction of the subsidy schemes for renewable energy (MEP in 2003 and SDE in 2008) and the blending requirement for renewable fuels in transport as of 2007. In 2017, total gross final consumption based on preliminary statistics amounted to 2,095 petajoules, of which 138 petajoules came from renewable energy sources. Consumption of energy from biomass in 2017 accounted for 61% of the total amount of renewable energy. In recent years, the contribution of solar, wind and soil has increased, which in 2016 accounted for over a third of renewable energy consumption.

The consumption of renewable electricity has also increased, with renewable electricity from biomass having stabilised in recent years, whereas electricity from wind and solar power sources have taken flight. In 2017, the share of renewable electricity roughly corresponded to 13.9% of electricity consumption.

The share of renewable heat in total final consumption of energy for heat has gradually increased since 2000 to 5.9% in 2017 (Statistics Netherlands, 2018b).

Since 2005, the share of renewable energy for transport based on the physical use of renewable energy has increased to 5.7% in 2017 (Statistics Netherlands, 2018b). The realised share of renewable energy for transport as a result of differences in definition does not run concurrent to the national obligation for companies that supply biofuels (Statistics Netherlands, 2018b). Fuel suppliers, for example, are able to hold administrative stocks. According to the Dutch Emissions Authority (NEa), fuel suppliers have met their national blending obligation for renewable energy (NEa, 2018).

Projection of the development of the share of renewable energy

Share of renewable energy to grow substantially in the period up to 2020

In the policy variant of "adopted and proposed policies with no new rounds of the SDE+ grant scheme after 2019", the share of renewable energy is set to increase from 6.6% in 2017 to 12.4% [bandwidth of 11-13%] by 2020 (see Figure 4.13). Within three years, the share is expected to increase as much as in the seventeen previous years. Although the share of renewable energy will increase significantly up to 2020, the expectation is that the target under the European Renewable Energy Directive of 14% renewable energy by 2020 will not be met. On the one hand, additional measures have been put in place within the framework of the Energy Agreement, such as a higher budget and an ascending target in the transport sector moving toward 2020, but on the other hand, there are setbacks, such as the resistance to wind power on land, which is difficult to resolve.

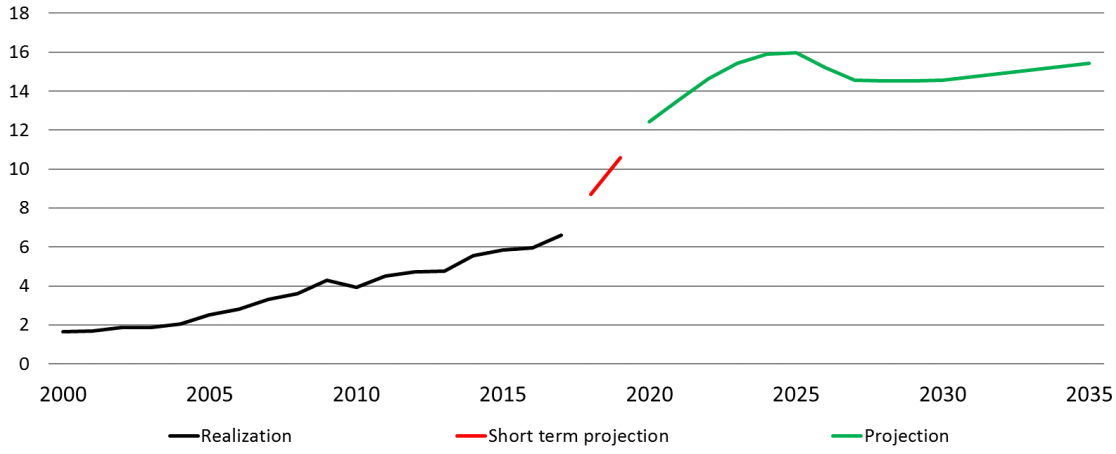

Figure 4.13 Development of the share of renewable energy as a percentage of the gross final consumption between 2000 and 2035 (Source: ECN, 2017a)

By 2020, more than half (60%) of renewable energy consumption will likely come from biomass. Consumption of biomass will continue to rise up to 2020, in part due to the use of biomass for auxiliary and co-firing in coal-fired power plants and the increased consumption of biomass in boilers, mono-fermentation and as a liquid biofuel in the transport sector. Although production by wind energy on land is increasing, growth in that area is running into more challenges than expected. The completion of new projects is being delayed, chiefly due to limited public support for various projects. It is expected that the established capacity of wind power on land will increase to 5,224 megawatts by the end of 2020 (RVO, 2018a), which falls short of the target in the Energy Agreement of 6,000 megawatts. The capacity of offshore wind energy is expected to increase drastically from 2020, due to the construction of new offshore wind farms that were agreed on in the Energy Agreement. The established solar-PV capacity is expected to triple between 2017 and 2020 to 6 gigawatts. Solar power is stimulated through several policies that focus on the various target groups. A major uncertainty for the continued growth of solar power (up to 2020) is the degree of realisation of SDE+ projects. Based on the degree of realisation for solar-PV projects in the past, it is assumed that approximately two-thirds of the SDE+ grants will actually lead to a solar energy project.

The expected share of renewable energy in gross electricity consumption is expected to double from 13.9% in 2017 to over 27% by 2020 due to these developments. The consumption of biofuels in transport will increase due to the progressive tightening of the annual obligation for renewable energy for transport up to 2020. The consumption of renewable energy in the built environment is expected to rise significantly in the years to come. This is due to the increased use of heat pumps in new buildings under the influence of building regulations and more stringent energy performance requirements. In addition, more heat pumps are being installed in existing buildings as a result of the Sustainable Energy Investment Subsidy scheme (ISDE) and the rolling out of "zero on the meter" renovations in rental properties.

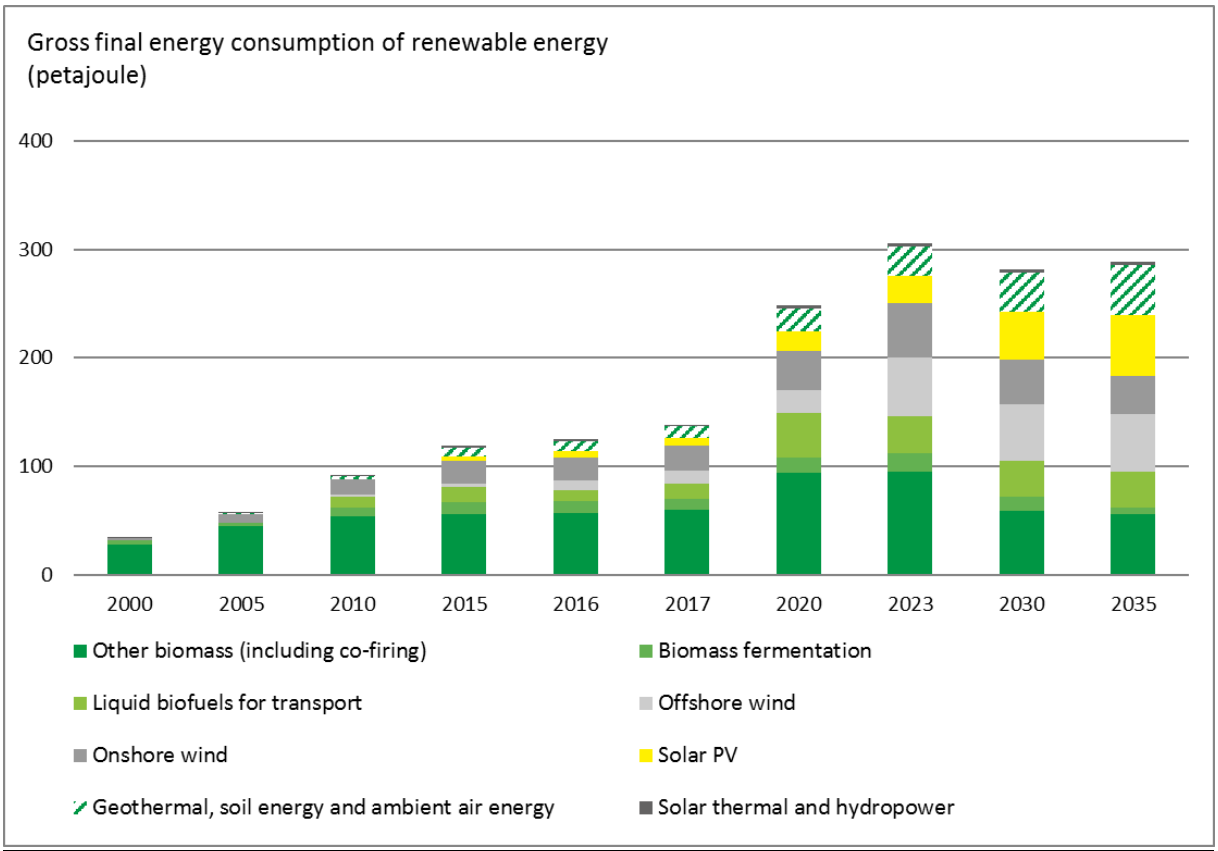

Figure 4.14 Development of renewable energy technologies (Source: ECN, 2017a)

Growth of renewable energy post-2020 to stagnate beyond 2023

Under the policy variant of "adopted and proposed policies with no new rounds of the SDE+ grant scheme after 2019" in the NEV 2017, the share of renewable energy is set to increase after 2020 up to 2023, after which the share is set to stabilise around 15%. This growth up to 2023 is chiefly the result of the expansion of offshore wind energy.

Beyond 2023, in the period up to 2035, only solar power and power from heat pumps are set to grow, from 27.8 to 56.2 PJ and from 16.7 to 35.7 PJ respectively, effectively more than doubling their share. These technologies are for a large part funded outside of the SDE+ grant scheme, including through the ISDE. In addition, the increase of heat pumps beyond 2020 will also be supported by the requirements for new residential properties being tightened to the extent that they have to become practically zero-energy. Depending on the amount of biofuel blending that is assumed beyond 2020, the share of renewable energy may slip back below 14% after 2023.

Due to the expiry of the SDE+ grant decisions, the use of other sources of renewable energy will decrease. The contribution of biomass, for example, to the total consumption of renewable energy of approximately 48% by 2023 is set to decrease to 37% by 2030. This is primarily the result of the decrease in auxiliary and co-firing with biomass. A large portion of the production of renewable energy during this period will still be subsidised, given that the energy will be produced by facilities or plants for which SDE+ grants had already been granted before 2020. The last of the subsidy obligations arising under the SDE+ grant scheme up to 2020 is not set to expire until 2040. Please see Figure 4.14 for a distribution per technology (2000-2035). Further growth of the share of renewable energy beyond 2023 depends on new policies such as the expansion of the SDE+ grant scheme (see Chapter 3).

These developments will result in a share of renewable energy in the production of electricity of over 27% by 2020. By 2030, this share is expected to rise to roughly 37%.
No data are available on the expected share of renewable energy in heat consumption and transport.

4.3 Energy efficiency dimension

4.3.1 Historical development of energy consumption

Decline in primary energy consumption 2005-2017

Total primary energy consumption[122] in the Netherlands showed a decline between 2005 and 2017, falling from 3,424 petajoules to 3,154 petajoules (please see Figure 4.15). Similar to final energy consumption, primary consumption shows a downward trend between 2005 and 2017. Primary energy consumption had been increasing as early as the oil crisis at the start of the 1980s, continuing up to 2010, at which time consumption was at 3,500 petajoules. After that, consumption fell sharply to 3,190 petajoules in 2017, approximately 8% below the level of 2005, whereas gross domestic product actually increased during that time by 34%. Energy intensity also decreased during this period.

During this period, consumption of natural gas experienced the sharpest fall, from over 1,479 petajoules in 2005 to over 1,299 petajoules in 2017, a drop of 12%. This decrease was primarily caused by declining final consumption of natural gas for heating purposes. Natural gas is the most significant energy source in relation to heat consumption. The contribution of natural gas to electricity production has also declined. Consumption of both renewable energy sources and coal, by contrast, showed an increase during this period. Consumption of renewable sources increased by 83%, with coal consumption increasing by 13% as a result of the commissioning of three new coal-fired plants. The rise in coal consumption at the expense of natural gas consumption was also the result of price developments. Consumption of crude oil and nuclear fuels in 2017 were roughly at the same level as 2005.

Between 2005 and 2017, non-energy consumption was roughly at 600 petajoules.

[122] In these sections, primary energy consumption (including non-energy consumption) has been based as much as possible on the new Eurostat definition that is to come into force from 2019. As such, the realization deviate from the figures that are currently available in Eurostat. The final NECP will make use of the official (new) Eurostat statistics as much as possible.

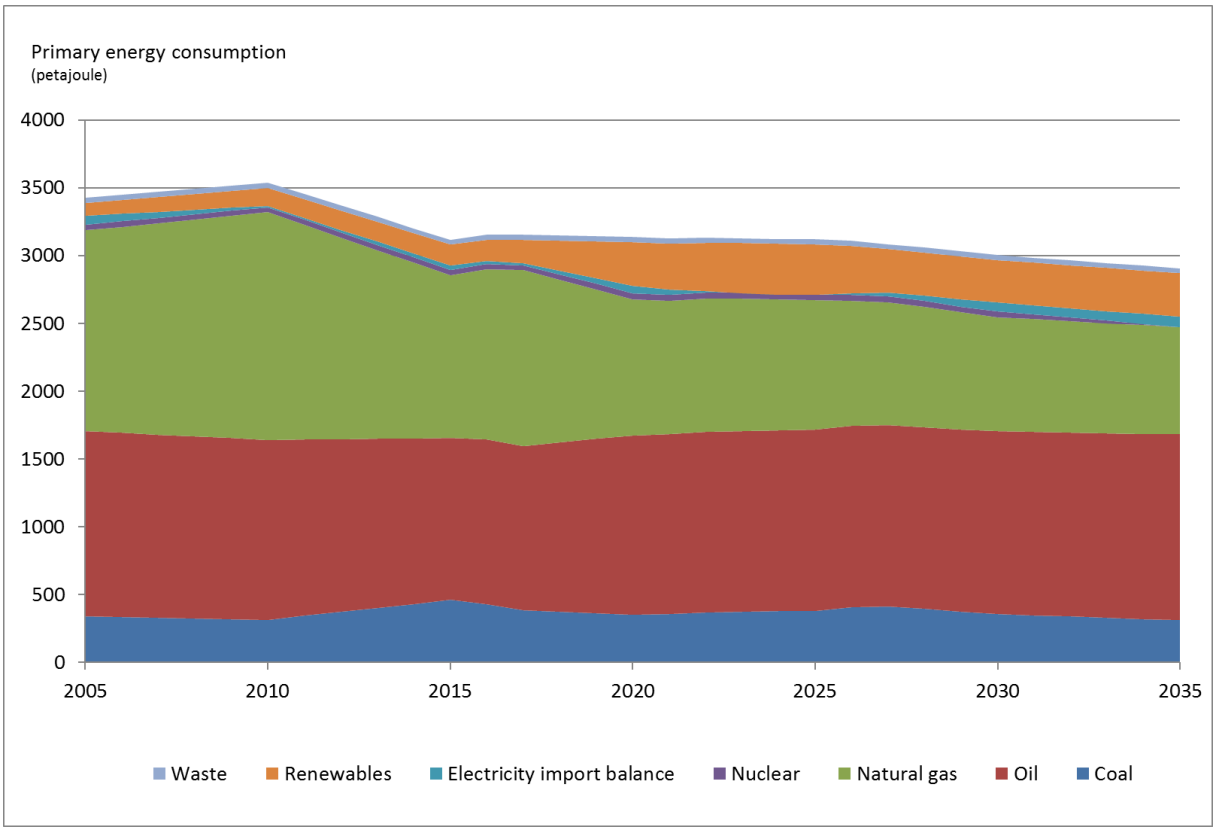

Figure 4.15 Realization and projection for primary energy consumption per energy carrier (including non-energy consumption) (Sources: Statistics Netherlands (realization) and ECN, 2017a (projections))

Decline in final energy consumption 2005-2017

Between 2005 and 2017, final energy consumption[123] in the Netherlands fell by 9% from 2,038 petajoules to 1,848 petajoules (see Figure 4.15). During this period, final consumption in the built environment fell by 7%, including as a result of an improved degree of insulation of buildings and efficiency improvements of the heat supply, both through renovations and through new construction. This is set against the fact that electricity consumption in the built environment during this time increased due to greater use of electrical devices.

Between 2005 and 2017, total final consumption in industry decreased by 14%. In traffic and transport, between 2005 and 2010, consumption was on the rise. However, by 2017, consumption ended up 6% below the level of 2005, due to more fuel-efficient cars, moderate economic growth and a shift in motorists refuelling across the borders chiefly between 2012 and 2014. In agriculture, final energy consumption, including in greenhouse horticulture, fell by 6%. Energy consumption for heat fell due to a reduction of the area of greenhouses and improvements in efficiency, whereas electricity consumption doubled, including through lighting intensification.

[123] In these sections, final energy consumption (excluding non-energy consumption) has been based as much as possible on the new Eurostat definition that is to come into force from 2019. As such, the realization deviate from the figures that are currently available in Eurostat. The final NECP will make use of the official (new) Eurostat statistics as much as possible.

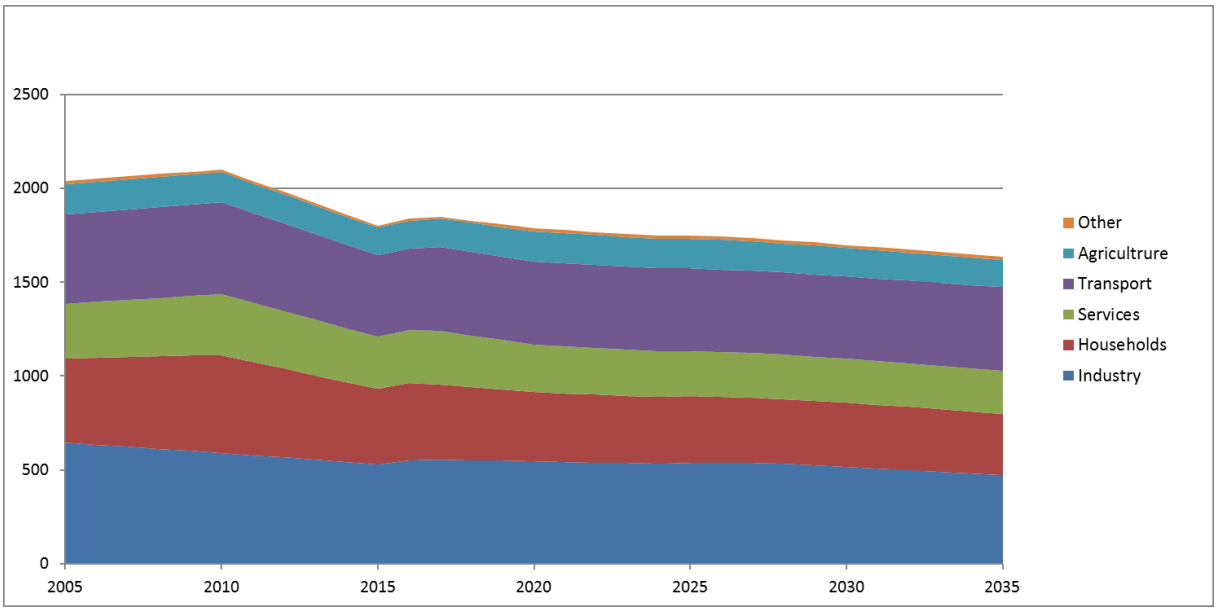

Figure 4.16 Realization and projection for final energy consumption per sector (excluding non-energy consumption) (Sources: Statistics Netherlands (realization) and ECN, 2017a (projections))

4.3.2 Projections for energy consumption

Use of fossil energy carriers to gradually decrease

Under the policy variant of "adopted and proposed policies with no new rounds of the SDE+ grant scheme after 2019", primary energy consumption is expected to decrease to 3,136 petajoules in 2020 and to 3,005 petajoules by 2030. Consumption of natural gas will decrease (see Figure 4.15) due to continued reduction of the use of natural gas in (primarily decentralised) production of electricity through cogeneration and reduced demand for natural gas for the heating of buildings. Although the opening of three new coal-fired power plants and low coal prices have led to an increase in coal consumption in recent years, the closure of five coal-fired power plants that has taken place in recent years will result in coal consumption being lower than in 2017 by 2020. For the time being, crude oil will maintain its dominant position as a fuel in transport and as a raw material in the chemical industry. Consumption of crude oil will remain roughly the same, at the level of 2005. It is expected that, in the years to come, crude oil will overtake natural gas as the principal energy carrier in the energy mix. Without new investments, the closure of the nuclear power plant in Borssele in 2033 will bring an end to the contribution of nuclear energy to the energy mix. The contribution of renewable sources is expected to increase significantly in the years to come, primarily due to the growth of renewable electricity production (see Section 4.2.2).

Final energy consumption to decline further

Under the policy variant of "adopted and proposed policies with no new rounds of the SDE+ grant scheme after 2019", final energy consumption is expected to decrease further to 1,786 petajoules in 2020 and to 1,698 petajoules by 2030. This further decline is chiefly caused by a further decrease in the consumption of heat in the built environment due to demolitions, new construction projects and further energy savings. Final energy consumption in the other sectors will remain relatively constant in the period up to 2020. In many cases, this development is the result of increasing activity levels that are compensated by increased energy efficiency. Uncertainty on the extent of economic activities is one of the key uncertainties, which can result in projected energy consumption turning out higher or lower.

Expected final consumption in the built environment is decreasing primarily due to the increase in insulation measures, efficiency measures and the number of heat pumps. In industry, consumption of heat and electricity is expected to remain the same, although non-energy consumption will increase slightly. The use of CHP in industry is decreasing due to adverse market conditions (please also see Section 4.3.3). Various sub-sectors in the industrial sector show a difference in growth or a decrease: the metallurgical industry is assuming growth, despite the uncertainty surrounding aluminium production. The food and beverage industry assumes a continuation of the growth of recent years, albeit at a more moderate pace. The production volume of the paper industry will shrink. The production of glass will decrease due to the closure of a glass factory in 2017. The production of the building materials industry is expected to increase in the future as a result of organic growth. It is assumed that the production of clinker bricks will cease from 2019, given that the marl extraction operations in Limburg are to be terminated at that time. Traffic volume will increase due to economic growth, which will compensate increasing efficiency. Energy consumption for passenger transport will decrease due to increasing efficiency, but it will increase in cargo transport by road and in shipping. In agriculture, final energy consumption will decrease due to savings and sustainability improvements for energy consumption.

Projected energy savings well above EED target

Article 7 of the European Energy Efficiency Directive (EED) requires the Netherlands to realise a cumulative energy savings target of 482 petajoules between 2014 and 2020. Only energy savings attributable to Dutch policy will count toward the target. It is expected that the Netherlands will save some 721 [693-754] petajoules through existing policy during this period, as a result of which the Netherlands is expected to achieve its target by a wide margin.

4.3.3 Developments and potential from combined heat and power and district heating and district cooling[124]

Production using CHP has decreased

Following a strong rise in combined heat and power (CHP) systems in agriculture and horticulture between 2007 and 2010, virtually no new CHP systems have been introduced since. In recent years, the number of systems remained reasonably stable, although there was a decrease in the production of electricity and heat (water/steam), due to the price ratio of natural gas and electricity. On the basis of the provisional figures for 2016, the percentage of CHP in respect of total electricity production is roughly 35%. The heat and electricity supplied is produced from natural gas to an amount of approximately 60% and for the remainder is produced principally from fuel waste, process gas and, for a small part, from coal. The efficiency benefit based on total fuel consumption in 2016 compared to separate generation can roughly be estimated at 20%.

[124] In accordance with Article 14(1) of Directive 2012/27/EU.

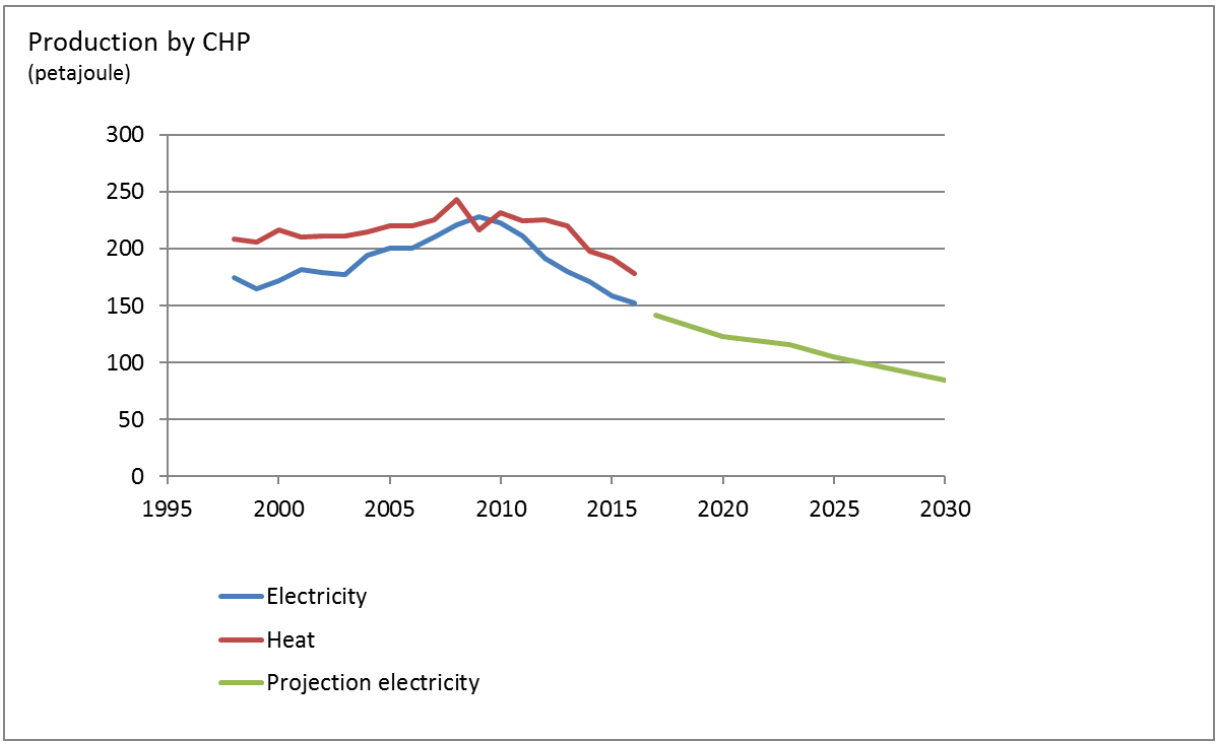

Figure 4.17 Development of heat and electricity production by CHP in the period of 2000-2030 (Sources: Statistics Netherlands (realization) and ECN, 2017a (projections))

Further decline of CHP in years to come

The use of CHP is expected to see a further decline in the years to come (see Figure 4.17). Due to the uncertainty on the development of natural gas and electricity prices, it is expected that CHP systems that need to be replaced will not be replaced by a new CHP system. Given present policy, a choice will rather be made in favour of electricity and heat production using renewable energy.[125] The NEV 2017 does not contain an individual projection for CHP, but much of the electricity from gas production comes from CHP units. There is no projection available for heat, although this is expected to decline in equal measure. Only flexible CHP units (for example, those that use heat storage) will be able to run on a profitable basis.

Small percentage of district heating in the Netherlands

Due to the extensive gas infrastructure in the Netherlands, natural gas is the most common form of heating for buildings. In 2015, a total 19.6 PJ of heat was supplied via 17 major networks and a further 2 PJ through smaller networks (ECN and Statistics Netherlands, 2017). In total, some 400,000 homes are connected to a heat grid, which corresponds to 5.5% of the number of homes in the Netherlands. The number of connections has grown since 2010 (4.6%), chiefly due to the completion of a number of major new construction projects.

Based on the expectations of the operators of heat grids for projects that are currently being developed, a percentage of growth is expected of 15% between 2015 and 2020. Further growth thereafter would be heavily dependent on new policy measures. In order to achieve the long-term climate targets, the Netherlands Environmental Assessment Agency (PBL) expects that 20-30% of homes should be connected to district heating by 2050 (PBL, 2017). This potential is only feasible if

[125] At present, the government does not have a specific incentive policy for CHP. Nevertheless, CHP is supported by the Energy-saving Investment Credit (EIA). Furthermore, the use of natural gas for CHP units is exempt from energy tax. The Sustainable Energy Production Incentive (SDE+) grant scheme provides an operating grant for CHP units with a renewable source, such as biomass CHP or biogas CHP.

natural gas were only available to homes to a very limited extent. For dense urban development, a heat grid would be the most promising alternative to replace natural gas.
Various industrial complexes also make use of a heating grid. In many cases, this relates to steam production from a CHP unit that is used for various companies. In total, this amounted to 89 PJ in 2015 (ECN and Statistics Netherlands, 2017). This totals more than all district heating combined (22 PJ). There is very little information available on these networks and their development. It is expected that some growth will still take place due to various initiatives for industrial heat exchange.

4.3.4 Development of energy performance standards in the built environment

Historical development of energy performance standards in the built environment
In December 1995, the energy performance standard for new buildings was introduced in the Netherlands and requirements were included in the building regulations for the minimum energy performance of new buildings, the so-called Energy Performance Coefficient (EPC).

The EPC reflects building-specific energy consumption. This consumption relates to heating, hot water supply, ventilation, lighting and cooling of a building, based on a standard resident/user. It does not include the energy consumption that is used, for example, for cooking, washing and watching television. In addition, the EPC assumes a standardised outdoor climate and standardised use of the building. The level of the EPC requirements for non-residential buildings depends on the function of the building, with a distinction being made between buildings with an educational function and buildings with an office function.

Between 1995 and 2015, the EPC standards were made more stringent on several occasions, to encourage energy savings and to ensure that the measures were technically and financially feasible for all buildings. In this way, and in accordance with the European Energy Performance of Buildings Directive (EPBD), the aim is to achieve cost-effective and cost-optimal policies within the built environment.

Cost-optimal energy performance requirements for the built environment
Under the EPBD II (2010/31/EU), Member States must report on the cost-optimal level of the minimum energy performance requirements every five years. In March 2018, the Netherlands submitted the calculation report for the period of 2013-2018 to the Commission (Arcadis, 2018). This study included calculations designed to determine the cost-optimal level for the energy performance of buildings. The cost-optimal level, however, can often not be precisely determined. Rather, there is a cost-optimal range. Current energy performance requirements for new buildings, according to the financial calculation, fall within this cost-optimal range.

According to the macro-economic calculation, the results for all building and element studies in general are comparable to the financial calculation. As such, there are no other insights in respect of the cost-optimal level. Nevertheless, there are still discernible differences. This is partly the result of the reduction of carbon emissions that is counted in the macro-economic calculation. In addition, the macro-economic calculation uses a lower discount rate compared to the financial calculation. The Netherlands chose to use the financial calculation as a basis to determine the cost-optimal level.

In accordance with the European Regulation (Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements), the requirements must be tightened if the cost-optimal level of the situations subject to building regulation requirements that were studied deviates more than 15% from the

established requirements. At present, this study does not highlight such a situation, with the exception of land-based holiday residences. This means the energy performance requirement for this type of residence should be made stricter. This potential tightening will be included in the cost-optimal level study for nearly zero-energy buildings (NZEBs).

Expected developments surrounding energy performance in the built environment

As of 1 January 2020, all permit applications for all new buildings, both residential and non-residential, must meet the requirements for nearly zero-energy buildings (NZEBs). NZEBs are a result of the Energy Agreement for Sustainable Growth and the EPBD. Energy performance for nearly zero-energy buildings is determined based on three requirements:

1. maximum energy consumption in kWh per m2 of useful floor area per year;
2. maximum primary fossil energy consumption in kWh per m2 of useful floor area per year;
3. minimum share of renewable energy.

In 2018, the new method to determine the energy performance of buildings is to be developed further, for both existing buildings (after renovation) and new buildings. In addition, an assessment will take place regarding whether the requirements are situated at a cost-optimal level. The results of the cost-optimal level study are expected by the end of 2018 and will provide direction with regard to the level of the requirements for new buildings. Subsequently, the laws and regulations will be amended, to allow the new methodology and requirements for new buildings to come into force as of 1 January 2020. Please also see Chapter 3.

4.4 Security of energy supply dimension

As discussed in Section 4.2, the energy mix is expected to change in the period up to 2035. The consumption of natural gas and coal will decrease, while the use of renewable sources will increase. As a result of the increase in production of renewable electricity and the subsequent price developments, the national and international transport of electricity will rise, which will require modifications of the electricity and gas network (see Section 4.5). This section will discuss the trends and projections per energy carrier.

4.4.1 Natural gas security of supply

The Netherlands has substantial stocks of natural gas that have been extracted on a large scale since the 1970s, both in order to meet the domestic gas demand and as an export commodity. Most natural gas in the Netherlands is located in the Groningen gas field. For years, joint annual gas production from the Groningen gas field and the small fields fluctuated around 80 billion cubic metres (bcm), but this figure began to drop from 2015, both due to the restrictions on extraction operations from the Groningen gas field and the declining supply from the small fields. In 2017, extraction from the Groningen gas field accounted for 23.6 bcm. Following the recommendation of the State Supervision of Mines (SODM), at the start of 2018, the government decided to fully phase out gas extraction from the Groningen gas field by 2030 (Letter to Parliament on Groningen gas extraction, 29 March 2018, Parliamentary Paper 33 529, no. 457).

Domestic consumption of natural gas amounted to nearly 50 bcm a year until it peaked in 2010, after which consumption began to decrease. Current consumption is around 35 to 40 bcm per year. Due to the decision to fully phase out gas extraction from the Groningen gas field, the Netherlands will have to become a net gas importer. The point at which this will happen depends on the measures the government puts in place in order to phase out gas extraction and reduce domestic demand. This will also take into account the security of supply of surrounding countries, within the context of the European Regulation on the security of gas supply in the EU, which is crucial, given that Belgium, Germany and France depend on gas from the Groningen gas field for a portion of their gas supply. The gas extracted from this field is known as low-calorific gas, whereas the gas that is extracted elsewhere in the world, including from the Dutch small fields, is known as high-calorific gas. As such, customers in Belgium, Germany and France, similar to customers in the Netherlands, are physically dependent on gas from the Groningen gas field, or more precisely, dependent on low-calorific gas that is supplied from (1) the Groningen gas field and (2) the GTS conversion plants where high-calorific gas is converted into low-calorific gas through the addition of nitrogen. Belgium, Germany and France will have to reduce their dependence on low-calorific gas from the Netherlands to zero between now and 2030 by transitioning to high-calorific gas or other forms of energy.

In order to phase out extraction in the short term, exports abroad will be reduced in accordance with the relevant agreements, additional nitrogen will be purchased and an additional nitrogen plant will be constructed that, according to the schedule, will be commissioned by the end of the first quarter of 2022 (GTS, 2018). A nitrogen plant allows high-calorific natural gas to be converted into low-calorific natural gas. In the longer term, the domestic demand for low-calorific and other natural gas by homes and companies will be reduced. As of 1 July 2018, there is no longer a requirement for newly built housing to have a gas connection. In this case, an "all-electric" solution is an alternative for these newly built housing areas, in addition to geothermal energy or other types of renewable energy. For existing buildings, heat grids fed from renewable sources are also an option.

In recent years, imports have increased rapidly as a result of the decline in gas extraction in the Netherlands. Whereas (net) imports in 2005 accounted for nearly 23 bcm, this has now increased to nearly 26 bcm in 2016 (Eurostat, 2018). Natural gas is chiefly and increasingly imported from Norway and Russia, with imports from Russia having doubled to 14 bcm between 2010 and 2016. At the same time, the import of Norwegian natural gas increased by over 50% to nearly 20 bcm. Imports from Denmark (-44%) and the United Kingdom (-18%) have decreased between 2010 and 2016 due to a decline in production in those countries. It may be that imports will increase further in the years to come, as a result of the decision to phase out extraction from the Groningen gas field. Natural gas is also imported in the form of liquid natural gas (LNG). LNG is supplied by tanker, in comparison to gaseous natural gas, which is transported via pipelines. In 2014, the Netherlands imported barely 1 bcm of LNG (calculated into gaseous state), whereas this amount had already more than doubled to 2.3 bcm in 2015. In 2016, this amount had fallen back to 1.7 bcm. Despite increasing imports, the security of supply of natural gas for the Netherlands seems to have been secured for the years to come, through our own – albeit decreasing – production (Groningen gas field, small fields) and an effective and efficient gas market on which a large number of suppliers operate. In addition, the demand for gas will decrease due to the phasing out of low-calorific gas and the transition to renewable alternatives.

4.4.2 Security of supply of coal

In the Netherlands, coal is used for the production of electricity and in the production of steel. The Netherlands has large coal reserves, consisting of nearly 1,300 Mt of mineable reserves, whereas only 12 Mt is used for domestic consumption (TU Delft, 2018). In the Netherlands, the mining of coal has been discontinued since the 1970s and, as such, the supply of coal depends wholly on imports. The import of coal amounted to 108 Mt in 2017, putting the Netherlands in the top 10 of coal importers worldwide. A large portion of the coal is subsequently exported to other European countries. There are relatively few concerns with regard to the security of supply of coal, the raw material being widely available on various continents (Statistics Netherlands et al., 2018b). Imported coal primarily comes from Colombia (25%), the US (19%), Germany (17%), South Africa (13%) and Russia (12%) (Statistics Netherlands, 2017b). During this decade, domestic consumption of coal is likely to decrease as a result of the closing of coal-fired power plants under the Energy Agreement. In the Coalition Agreement, as outlined in the previous chapters, the government decided to phase out the use of coal for the production of electricity by 2030 (Letter to Parliament – Elaboration of the agreement on coal-fired plants in the Coalition Agreement, 13 December 2017, Parliamentary Paper 30196, no. 567), which will further decrease the import dependence on coal.

4.4.3 Security of supply of crude oil

Crude oil is the Netherlands' most important import product, accounting for approximately 13% of the total import value (Statistics Netherlands, 2017b). A large percentage of the crude oil is directly exported to other European countries (approximately 40%), with the remainder of the crude oil being processed in the refining sector and largely subsequently exported as oil products. Crude oil is chiefly imported from Russia, Norway, the United Kingdom, Nigeria and Saudi Arabia. Imports from Saudi Arabia have fallen significantly since 2000, whereas imports from Russia have risen. Due to the major uncertainties on the future production and prices of crude oil per country and possible trade with the Netherlands, no projections are available on the future origin of oil.

The Netherlands has a relatively large and efficient refining capacity – more than enough to be able to meet domestic demand. Future developments are uncertain. The demand for oil products is expected to decrease in OECD countries, but will rise in non-OECD Asia, in any case up to 2035 (IEA 2016, IEA 2013). This shift in demand will result in a large number of investments in the refining sector in the

latter region, chiefly in China and India. In addition, there will be a high number of investments in refineries in the Middle East, chiefly due to the strategy of countries in this region, which focuses more on the supply of oil products and less on the supply of crude oil. At present, there is already overcapacity in the refining sector on a global scale. Due to the new refining capacity, global competition for available raw materials and markets in this sector will increase further (IEA 2016, IEA 2013). Within Europe, the consumption of oil products has stagnated in recent years (Eurostat, 2017). There is a relatively strong demand for diesel in comparison to the demand for petrol, which has resulted in the import of diesel and the export of petrol. However, it is uncertain how the market for these petrol exports, particularly North America and the west coast of Africa, will develop in the future (IEA, 2013). Based on global and European trends, it is expected that the throughput of oil in the Dutch refining sector will decrease. The projection assumes that the conversion of crude oil into oil products up to 2030 will decrease by approximately 16% in respect of the level of 2015.

In order to reduce the risks of disruptions in the supply of oil, the Netherlands has a mixed system for holding strategic oil stocks. Both the industry and the government (through the Netherlands National Petroleum Stockpiling Agency, COVA) are required to hold emergency stocks of oil under the Petroleum Products (Stockpiling) Act (*Wet voorraadvorming aardolieproducten*) of 2012. Any company that supplies the Dutch market with more than 100 kilotonnes of eligible petroleum products per calendar year is required to hold 5% in excess amounts as a mandatory stock. In total, this amounts to roughly 13.5 days of net imports. The COVA is responsible for supplementing this up to the total required stock of 90 days of net imports.

4.4.4 Security of supply of electricity

Domestic production capacity in the Netherlands has increased from nearly 21 MW_e in 2000 to nearly 35 MW_e in 2016 (Statistics Netherlands, 2018c). Due to the increased production capacity, the export of electricity has also risen from 4 billion kWh in 2000 to 19 billion kWh in 2016. During this period, imports fluctuated between approximately 15 billion kWh (in 2009 and 2010) and over 30 billion kWh since 2012 (Statistics Netherlands, 2018d). It is expected that imports and exports will increase in the period leading up to 2035, due to the strong growth in production capacity based on wind and solar energy, while conventional thermal capacity is being phased out under the Energy Agreement. The import balance in the period leading up to 2035 – barring a temporary dip around 2024 – is set to increase significantly. Due to the increase in connection with foreign countries, fluctuations in the production of electricity from solar and wind power can be absorbed

Security of supply is also regarded in terms of to what extent the *availability* of domestic production capacity is sufficient to meet demand at any given time. Up to 2024, domestic production capacity will be sufficient to meet the standard of sufficient production capacity (TenneT, 2017), which amounts to a maximum of four hours per year during which insufficient production capacity is available to be able to meet demand. Although still within the boundaries of the standard, the number of hours per year that the available production capacity is insufficient to meet demand (also known as the Loss of Load Expectation or LOLE) is set to increase from 2018. In 2024, the LOLE is set to rise to nearly four hours per year (see Table 4.5). This is due to a decreasing capacity surplus as a result of the phasing out of thermal power in the face of an increasing electricity demand. Under the commitments of the Energy Agreement, coal power has been phased out and two additional gigawatts of gas-fired capacity is conserved. The significant increase of solar and wind power makes a limited contribution to security of supply, due to its intermittent nature. Under normal circumstances, around 2024, a situation of temporary import dependence could occur, which need not necessarily constitute a problem to security of supply, since the connections with other countries provide sufficient capacity to absorb such dependence (please also see Section 4.5). In the past, the Netherlands has also had periods of import dependence (such as between 2005 and 2007). In addition, the Netherlands has a substantial

amount of relatively modern conserved gas-fired capacity (over 3 gigawatts), which under favourable market conditions could in a relatively limited period of time qualify for deconservation.

Main results of monitoring, realization 2013-2016 and projection 2017-2024 with non-availability of the means of production according to the indication of producers (base variant)								
year	Electricity demand	Non-operational capacity	Operational capacity				LOLE NA based on data	Firm capacity deficit
			Total	Solar-PV/wind/hydro	Thermal(excl. Waste)	Other (incl. waste)		
	TW/h	GW	GW	GW	GW	GW	H	GW
2013	115.6	0.8	26.5	2.8	22.7	1.0	0.00	-2.6
2014	114.0	2.7	28.7	3.5	24.2	1.1	0.00	-3.9
2015	113.9	4.4	28.7	4.0	23.7	1.1	0.00	-3.9
2016	115.6	4.1	28.4	4.9	22.3	1.1	0.00	-2.1
2017	115.6	3.7	29.5	6.3	22.0	1.2	0.00	-2.4
2018	116.2	3.2	28.8	7.3	20.4	1.1	0.02	-1.6
2021	116.1	3.6	31.4	12.0	18.2	1.2	1.68	-0.3
2024	116.6	3.8	36.0	17.0	17.8	1.2	3.92	0.0

Note: NA = non-availability of means of production

Table 4.5 Main results of monitoring, realization of 2013-2016 and projection for 2017-2024 with non-availability of production means according to the indication of producers (base variant) (Source: TenneT, 2017)

4.5 Internal energy market dimension

4.5.1 Electricity interconnectivity

Current interconnection level[126]

A key aspect of the integrated electricity market is the development of network connections between countries, the so-called interconnectors. At present, the Netherlands has connections with Germany, Belgium, the United Kingdom and Norway, with a total import/export capacity of 5 gigawatts (see Table 4.6).

	Capacity in megawatts			
Connection	2017	2020	2025	2030
NL-DE	2450	4250	5000	5000
NL-BE (BE-NL)	1400	1400 (2400)	3400	3400
NL-DK	0	700	700	700
NL-UK	1000	1000	1000	1000
NL-NO	700	700	700	700
Total	5550	8050	10800	12830

Table 4.6 Interconnection capacity of the Netherlands in megawatts (Source: ECN, 2017a)

The electricity markets of Belgium, France and the Netherlands have been integrated since 2008. More recently, the markets of Germany (since 2010) and the United Kingdom (2014) have also been coupled to the Dutch market. Connections with this regional market have also been made with the Scandinavian and Central European markets (TenneT, 2018). This has resulted in the contouring of a strongly integrated (North-Western) European electricity market in which the Netherlands plays a pivotal role. This integration contributes to the competition on the energy market, strengthens security of supply and makes the integration of renewable electricity easier. After all, a high degree of connectivity allows national electricity surpluses or deficits to be absorbed more easily. The Dutch manager of the high-voltage grid (TenneT) plays a crucial role in this development given that it operates high-voltage grids both in the Netherlands and in part of Germany (see Figure 4.18).

[126] With reference to overviews of existing transmission infrastructure by Transmission System Operators (TSOs).

Figure 4.18 Transmission network and interconnectors (Source: TenneT)

Expected expansion of interconnectivity[127]

Connections of electricity network with Germany and Belgium increasing

At present, the Netherlands has direct connections with Germany, Belgium, the United Kingdom and Norway. Due to envisaged extensions, these connections are set to increase from 5 to 9 gigawatts by 2021. There are no concrete expansion plans for the connections with Norway and the United Kingdom. The Cobra cable is currently being constructed between the Netherlands and Denmark, which is a connection of 700 megawatts that is expected to be commissioned in 2019. At the end of September 2018, the Doetinchem-Niederrhein connection of 1500 megawatts between the Netherlands and Germany was commissioned. Capacity between Belgium and the Netherlands is set to increase from 2 to 3.4 gigawatts in advance of 2025 through the completion of the Rilland transformer station, the placement of an additional phase shifter in Maaseik in Belgium and internal reinforcements in the Belgian grid with a view to the closure of the nuclear power plant at Doel.

Following the decision of the European Council of 23 October 2014 to increase European interconnectivity to 10% by 2020 and to 15% by 2030, the European Commission set up an expert group that published a report on 15 November 2017 on the expected European interconnection capacity required for 2030. This report cites two new methods of measuring interconnectivity, with the Netherlands exceeding its targets in both alternative measuring methods (EC, 2017a). Table 4.7 indicates the percentages of interconnectivity based on the definition used by the European Commission (EC, 2017b). The Netherlands is also able to exceed its targets based on this definition.

[127] With reference to national network development plans and regional investment plans of TSOs.

	2017	2020	2025	2030
Total capacity of interconnections (MW)	5,550	8,050	10,800	12,830
Electricity production capacity (excluding conserved units) (MWe)	34,637[1)]	30,349	35,660	36,900
Interconnectivity (%)	16.0%	26.5%	30.3%	34.8%

Table 4.7 Interconnections, capacity of electricity production and interconnectivity (Sources for capacity of electricity production: Statistics Netherlands (realization) and ECN, 2017a (projection))
[1)] Capacity in 2016 and including mothballed plants

Developments of connections in the gas network
There are currently no plans to drastically expand the gas network. However, in time, sections of the network for low-calorific gas may be made suitable for the transport of high-calorific gas, as a result of the phasing out of low-calorific gas and the possible increase of the consumption of high-calorific natural gas. In addition, the envisaged transition from low-calorific gas to high-calorific gas by industrial large-scale users may necessitate the realisation of new connections with the network for high-calorific gas.

The current Network Development Plan of the manager of the national gas transport network GTS, the Network Development Plan (NDP) 2017, sets out the maintenance and limited expansion of the gas network in the period up to 2025 (GTS, 2017a). This expansion relates to the connections abroad as a result of the projected increase in imports. Incremental Capacity Tests (ICT) are a new addition to the NDP 2017. These allow market parties to inform GTS once every two years if they require an expansion of the interconnection points capacity of the European gas network. The first ICT ran from 6 April to 1 June 2017, but did not result in an expansion (GTS, 2017b).

The plans for expansion of connections with the gas network in the long term are currently being discussed, given the phasing out in full of the extraction of natural gas from the Groningen gas field. There are various options available to absorb demand for natural gas, which have various consequences for the gas network and the connections to the network. The principal options include importing high-calorific natural gas from Norway and Russia, gas extraction from other (small) Dutch fields and transitioning to other types of gas, such as biogas and hydrogen and/or electrification.

4.5.2 Energy transmission infrastructure

Characteristics of existing transmission infrastructure[128]
Electricity transmission network
The high-voltage grid connects the ultra-high-voltage grid with the distribution networks. Power plants, energy-intensive industrial complexes, larger wind farms (35 to 500 megavolt-amperes), etc. are all connected to the high-voltage grid. The high-voltage grid chiefly consists of networks with a voltage of 50 kilovolts, 110 kilovolts or 150 kilovolts, of which the networks with the latter two levels of voltage have been managed by TenneT since 1 January 2008. The high-voltage grid consists of approximately 5,020 kilometres of overground lines and approximately 3,850 kilometres of

[128] With reference to overviews of existing transmission infrastructure by TSOs.

underground cables. The ultra-high-voltage grid transports electrical energy across larger distances within the Netherlands. The larger power plants, upwards of 500 megavolt-amperes, are connected to this grid, which also has connections to Belgium and Germany and with the United Kingdom and Norway through direct current connections. TenneT is the network manager of this grid with a voltage of 220 kilovolts or 380 kilovolts. The ultra-high-voltage grid consists of approximately 2,840 kilometres of overground lines and approximately 40 kilometres of underground cabling.

Electricity is hard to store and, as such, is not available in stock. In order to guarantee the continuous supply of electricity, supply and demand must be balanced with one another 24 hours a day and 7 days a week. TenneT uses instruments such as regulation capacity, reserve capacity and emergency capacity to compensate for unexpected imbalances in supply and demand.

Natural gas transmission network

The transport networks that are operated by Gasunie Transport Services (GTS) consist of pipes and stations. The transmission networks are classified into a high-pressure grid (HTL) and an intermediate-pressure grid (RTL) based on pressure class. The high-pressure grid is split based on gas type, into a network that transports Groningen gas (G-gas) and a network that transports high-calorific gas (see Figure 4.19).

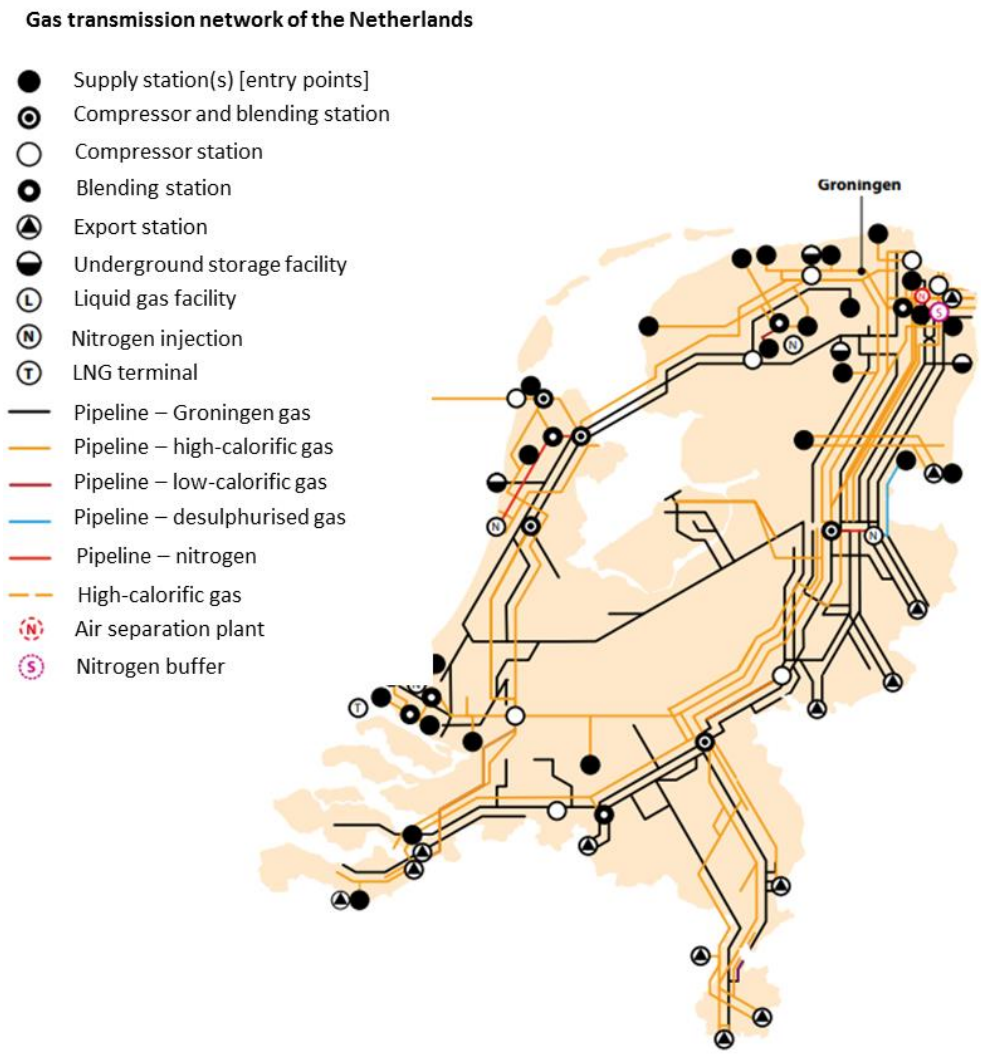

Figure 4.19 Transmission network for high-calorific gas (yellow) and Groningen gas (black) (Source: ECN, 2016b).

The two HTL networks are connected via blending stations where different combinations of high-calorific gas and nitrogen are blended and injected into the G-gas network. The HTL contains many compressor stations at which the pressure of the gas is increased to facilitate further transport. Gas is fed into the grid at entry points. These can be supply points for gas sourced from indigenous production, upstream networks, neighbouring networks, LNG terminals or points that are in connection with underground storage facilities. Gas can be supplied via the connections with Germany and Belgium and in the form of LNG on the Maasvlakte (the GATE LNG terminal). The possibility of enabling limited supply from the United Kingdom via the Bacton Balgzand Line (BBL) is currently being explored.

After transport, gas is removed from the HTL at exit points or at metering and pressure control facilities. Exit points are the transhipment points for domestic customers (the gas distribution stations), border points where gas is transferred to other networks and points that are connected to underground storage facilities. The RTL begins at a metering and pressure control facility where HTL gas is supplied; in turn, the networks of the regional network managers are largely supplied by exits on the RTL. The RTL is virtually only used for the transport of G-gas.

Expected expansion of transmission infrastructure[129]

Developments in the electricity transmission network

The Netherlands has one of the most reliable national electricity grids in the world, with a reliability percentage of 99.99% (Netbeheer Nederland, 2017). In order to supply the electricity market effectively and continue a reliable supply of energy, the capacity of the high-voltage grid is to be expanded in the years to come. The expansions relating to the 380 kV network that are ongoing or planned include the Randstad 380 kV Noordring connection, the Noord-West 380 kV connection, the Zuid-West 380 kV connection and the Doetinchem-Wesel 380 kV connection (completion by the end of 2018).

Developments in the transmission network for natural gas

GTS regularly draws up a Network Development Plan (NDP), the most recent version of which is the NDP 2017 (please see above). This NDP uses three scenarios to show that the gas transmission system in the Netherlands is robust enough to respond to the expected changes in the supply and demand of gas in the next ten years and that any necessary investments are limited. There will, however, be a greater need to convert high-calorific gas into gas that is suitable for the low-calorific consumer market, due to the decision to reduce gas extraction operations from the Groningen gas field as quickly as possible and to ultimately phase them out. For that reason, at the end of March 2018, the government decided to move forward with the construction of an additional nitrogen plant, to allow the reduction of the production from the Groningen gas field to be absorbed through the conversion of high-calorific gas to low-calorific gas. The plan is for the plant to be commissioned in the first quarter of 2022 (GTS, 2018).

4.5.3 Electricity and gas markets and energy prices

Trends of the energy markets and prices

Energy prices for final consumers

The Consumer Price Index (CPI) for energy reflects developments in prices for natural gas and electricity household consumption (see Figure 4.20). Since 2000, household energy bills have increased by an average of 4.5% per year, while inflation has been sitting at 1.8% per annum on average. The relatively large increase in energy prices for households is partly due to the steady increase in fuel prices on the world market. The energy CPI fell sharply during the crisis from late 2008 onwards, but returned to peak levels from early 2013. Since then, it has again fallen sharply. The

[129] With reference to national network development plans and regional investment plans of TSOs.

consumer price has since risen slightly due to the increase of the energy raw material in 2016 and this trend has continued in 2017 (Statistics Netherlands, 2018e).

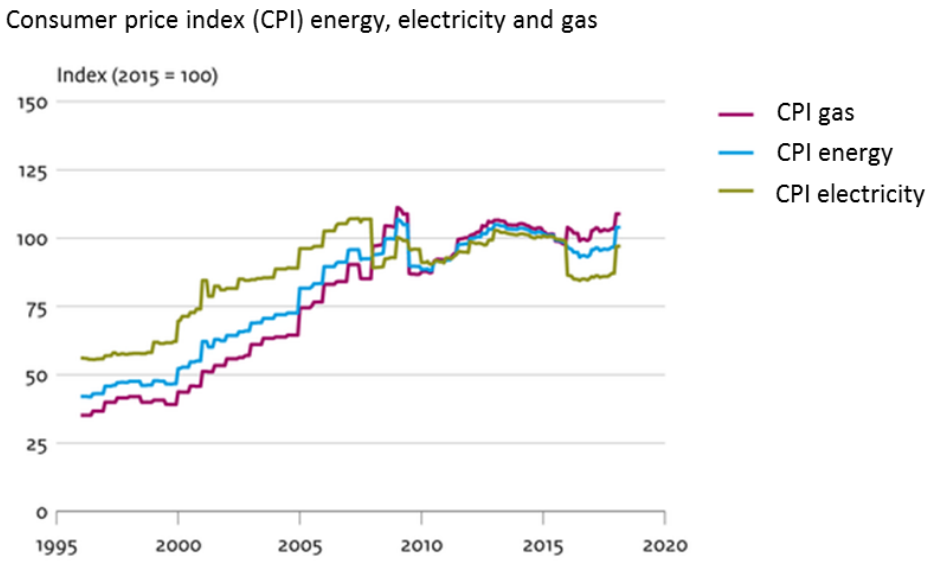

Figure 4.20 Consumer price index (CPI) for energy, electricity and gas (Source: Statistics Netherlands et al., 2018c)

Price of electricity for final consumers

The price of electricity depends on a number of factors, including the fuel prices of oil, coal and natural gas (see Figure 4.21). Another key component is the costs of the transmission systems. At the end of the 1990s, the natural gas and electricity prices for small consumers rose as a result of the Energy Tax (known as the Regulatory Energy Tax, REB, until 2004) and the Environmental Quality of Electricity Production (MEP) levy. The MEP was meant to stimulate renewable energy and was in force from 2001 to 2007. An additional energy tax was introduced as of 2013, the Surcharge for Sustainable Energy, which funds the SDE+ grant scheme. Due to the transport costs and the taxes, the effect of the fuel prices is less pronounced in the price of electricity.

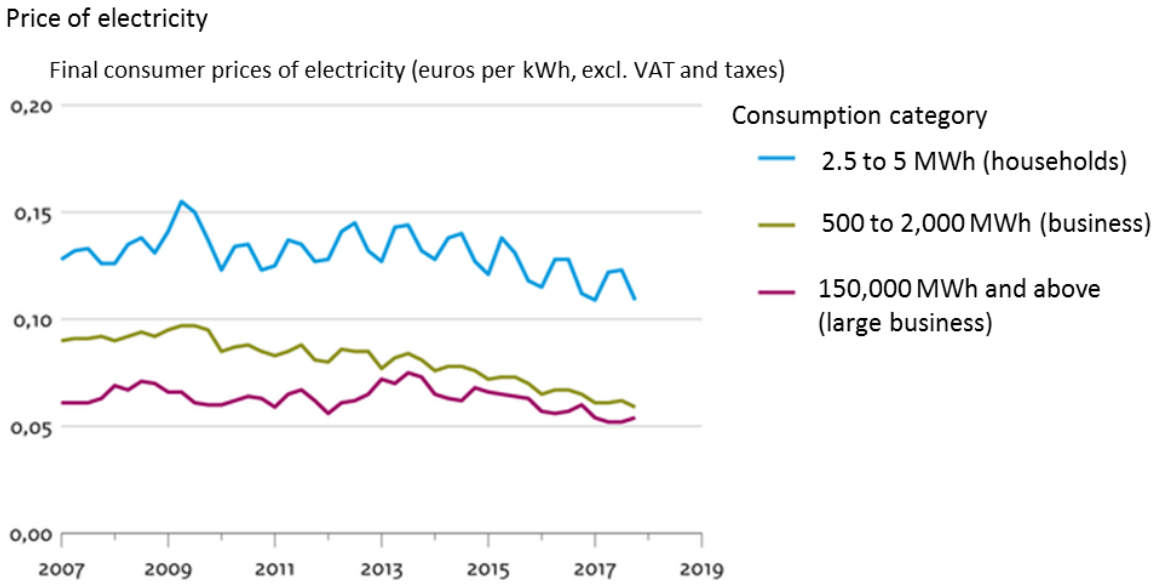

Figure 4.21 Price of electricity for final consumers (Source: Statistics Netherlands et al., 2018b)

Natural gas price for final consumers

Figure 4.22 illustrates the development of the price of natural gas from 2007 for final consumers. In general, the price of natural gas follows the price of crude oil (see Section 4.1.3). Major world events also have an effect on natural gas prices. The strong fluctuations of the price for households that take place within a year are the result of the strong demand for natural gas during the winter months.

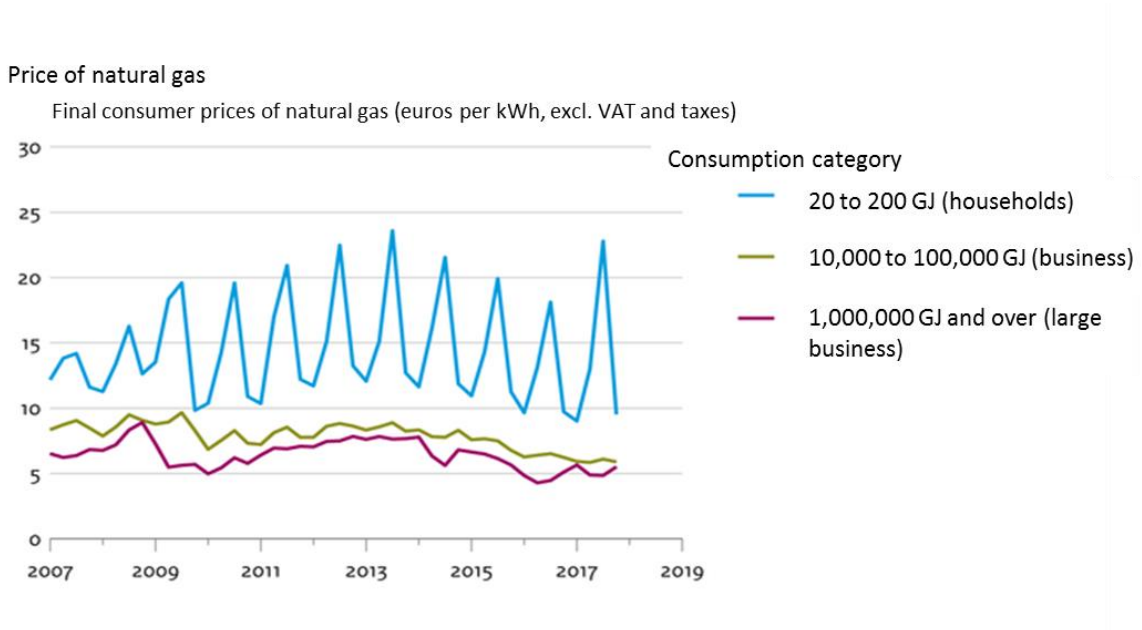

Figure 4.22 Price of natural gas for final consumers (Source: Statistics Netherlands et al., 2018b)

Projections of developments for the electricity market

The Dutch electricity market is highly integrated with the North-Western European market. As such, developments in countries around us are of critical importance to production within the Netherlands,

to imports and exports and to the price of electricity. These developments can relate to the development of generating capacity, including the share of renewable energy, and that of the electricity demand in neighbouring countries.

Figure 4.23 shows the expected wholesale price in the Netherlands. Key factors that impact the development of the wholesale prices up to now include the lower fuel prices and overcapacity in the supply and growth of the production of renewable energy in the Netherlands and Germany. The rise in the projection can be explained based on the impact of the increasing fuel prices and the decrease of the overcapacity.

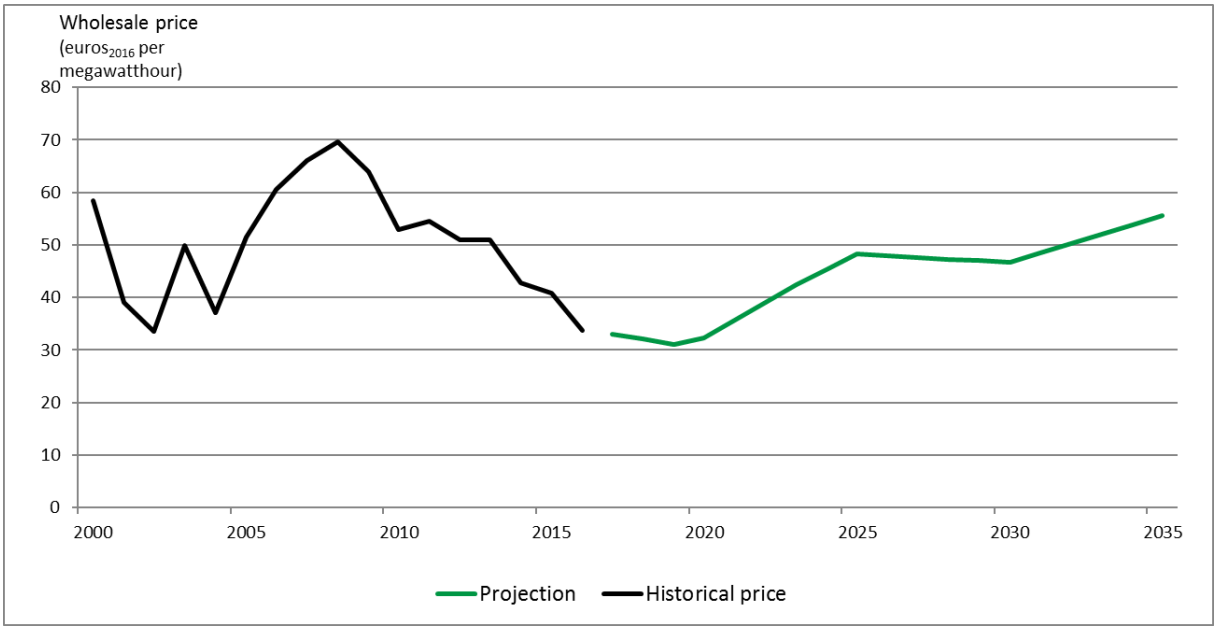

Figure 4.23 Development of the average wholesale price of electricity (Source: ECN, 2017a)

The wholesale price in the Netherlands is significantly affected by developments in other countries within the North-Western European market. The network companies of most countries expect a slight increase of the demand for electricity in the long term, due to electrification of the heating energy demand and transport. The resulting effect is expected to be greater than the reduction in the demand for electricity as a result of energy savings. The European network of high-voltage grid managers, ENTSO-E, drafts a pan-European network development plan every two years referred to as the Ten-Year Network Development Plans (TYNDPs). Based on the "Vision 4 – European green revolution" scenario from the TYNDP 2018, the same scenario that was used in the NEV 2017, the generating capacity of renewable energy will increase significantly in the countries around us. This scenario is based on both a strong European framework in relation to network management and remaining on schedule for the Energy Roadmap 2050 (ENTSO-E, 2018). Within that scenario, wind power in particular is expected to increase substantially, from roughly 75 gigawatts in 2017 to over 175 gigawatts by 2035. The capacity of lignite and coal-fired power plants is to decrease from 65 gigawatts in 2017 to below 40 gigawatts by 2035. The capacity of gas-fired plants is set to increase by 20 gigawatts to 88 gigawatts by 2035.

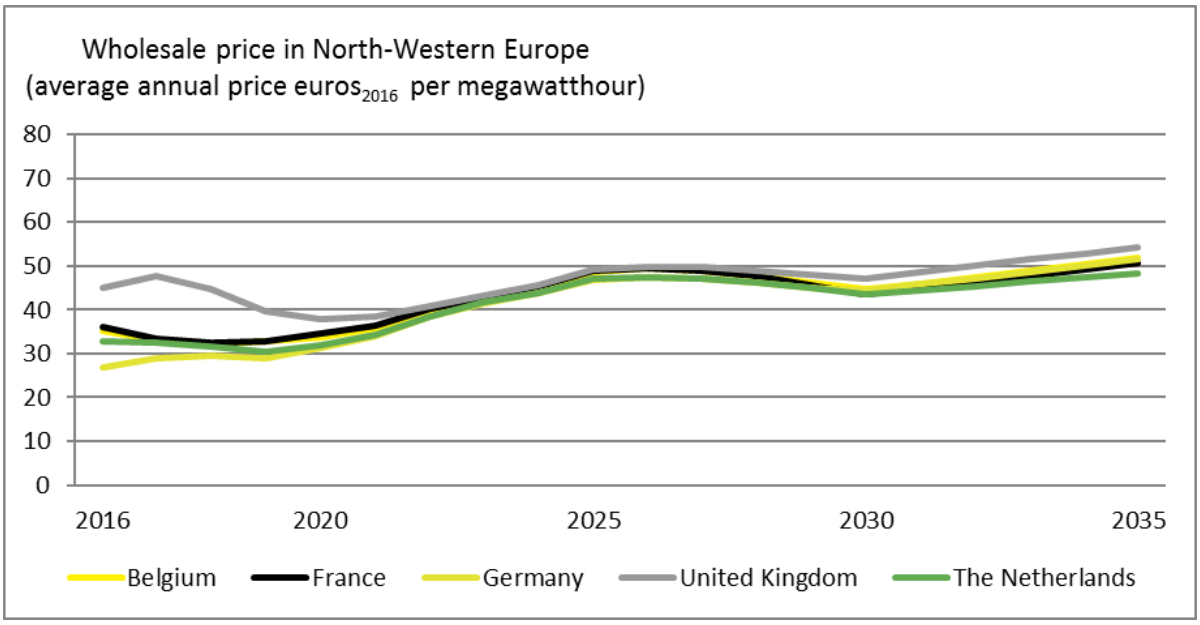

Figure 4.24 Development of the wholesale price of electricity in North-Western Europe (Source: ECN, 2017a)

The price difference between the Netherlands and Germany is expected to decrease, resulting in the prices being very close to one another beyond 2021 (see Figure 4.24). A key reason for this is the increase of interconnections and market integration. In addition, both countries are becoming increasingly similar in terms of the composition of their generation capability, given that the share of renewable energy is growing in the Netherlands and nuclear energy is being phased out in Germany. By 2035, prices in the Netherlands will be slightly below the level of Germany, though the difference will be minor. In the next few years, the price of electricity in the United Kingdom will be relatively high because the old coal-fired power plants have been decommissioned. After that, the price difference will decrease due to the increase in the capacity of gas-fired power plants and renewable energy sources. In addition, the capacity of the network connections between the United Kingdom and the rest of Europe are to be expanded significantly from 2020. Any expectations in relation the future as regards the United Kingdom will, however, be highly variable, given that they are subject to the outcome of the Brexit negotiations.

The expectations for average household energy bills are affected by developments in energy consumption, gas and electricity prices and taxes and levies (Table 4.8). The table shows that, between 2016 and 2020, the overall energy bill is to remain roughly the same, with the contributions from various items shifting within the energy bill itself. In the projection for 2020, factors such as self-generation of electricity will result in savings on energy bills and gas consumption will decrease, but the costs for the surcharge for sustainable energy and the MEP will rise.

[Euro$_{2016}$]	2000	2005	2010	2016	2017	2020	Bandwidth 2020[c]
Electricity supply[a] [kWh/year]	3,101	3,246	3,277	2,803	2,768	2,488	(2,262 – 2,714)
Variable costs	€367	€346	€263	€156	€144	€124	(93 – 191)
Fixed costs	€59	€96	€212	€227	€231	€231	
Energy tax	€158	€275	€395	€282	€278	€250	(227 – 272)
Tax reduction	€-41	€-235	€-345	€-311	€-306	€-292	
Surcharge for Sustainable Energy and MEP	€-	€63	€-	€16	€20	€64	(58 – 69)
VAT	€95	€103	€100	€78	€77	€79	(69 – 95)
Electricity bill subtotal	€638	€648	€625	€448	€445	€456	(397 – 548)
Effect on energy bill of self-generation of electricity[b]	€-0	€-1	€-2	€-36	€-44	€-73	
Effect on energy bill of electricity savings compared to 2016[b]	€-	€-	€-	€-	€1	-33	
Gas consumption [m^3/year]	1,882	1,673	1,608	1,264	1,241	1,134	(1,071 – 1,191)
Variable costs	€483	€574	€511	€336	€309	€315	(267 – 485)
Fixed costs	€65	€142	€165	€161	€183	€183	
Energy tax	€140	€303	€284	€318	€310	€284	(268 – 298)
Surcharge for Sustainable Energy	€-	€-	€-	€14	€20	€70	(66 – 73)
VAT	€120	€194	€182	€174	€172	€179	(167 – 215)
Gas bill subtotal	€809	€1,212	€1,142	€1,003	€994	€1,030	(960 – 1,238)
Effect on energy bill of gas savings compared to 2016[b]	-	-	-	€-	€-14	€-93	
Total	€1,446	€1,861	€1,767	€1,451	€1,438	€1,486	(1,440 – 1,782)

Table 4.8 Development of the average household energy bill between 2000 and 2020. Projection for adopted and proposed policies. Amounts are adjusted for inflation and expressed in euros$_{2016}$ (Source: ECN, 2017a)

Footnotes:

a. Average electricity supply is total electricity consumption of households minus self-generation through PV systems in households, divided by the number of inhabited homes.

b. This relates to the direct effect on the energy bill. Purchase or depreciation costs have not been included in these figures.

c. Bandwidth based on uncertainties in energy consumption per household and the uncertainties in energy prices.

4.6 Research, innovation and competitiveness dimension

4.6.1 Current energy innovation policy

Energy innovation through generic policies

As outlined in Chapter 3, the government uses both generic and specific policies to stimulate energy innovations. The focus and outcomes of the generic enterprise policies in the Netherlands are identified each year through the Enterprise Policy Monitor,[130] which provides an indication of the focus of expenditure along social challenges, including regarding issues relevant to the NECP, such as clean energy and climate action. Dutch businesses and knowledge institutes also make use of broad and generic European innovation instruments. Eureka and Eurostars have already been included in various figures on generic business policy. In addition, Dutch businesses also make use of Horizon 2020, EFRO/Interreg and LIFE.

Energy innovation through specific policies: Energy Top Sector

A clear thematic focus can be distinguished within the government's Top Sectors policy. The Energy Top Sector, for example, has various thematic clusters: Biobased Economy, Energy and industry, New Gas, Urban Energy (innovations for a transition to a sustainable, reliable and affordable energy system in the built environment and in infrastructure) and Offshore Wind Energy. Section 4.6.3 sets out how this has resulted in the allocation and focus of R&D expenditure to and on relevant technology domains. In addition, collaboration takes place with other Top Sectors on the energy theme.

Focus in thematic collaboration of the Netherlands in international energy programmes

The Netherlands collaborates on a number of issues related to energy innovation with other countries within the framework of the International Energy Agency (IEA) and EU programmes such as the Strategic Energy Technology Plan (SET).[131] Our nation's commitment and participation in these programmes generally aligns very well with the national focus of the Energy Top Sector.

Through the EU, the Netherlands also participates in Mission Innovation,[132] in which 22 countries and the EU work alongside one another to tackle energy innovation, with the ambition to ensure a doubling of public clean energy investments over a 5-year period. They encourage cooperation, information exchange and coordination with private investors and businesses.

Within the SET programme, the Netherlands participates in some 10 thematic programmes. The priorities of Dutch innovation policy (particularly through the Energy Top Sector) generally align very well with the priorities of the EU SET programme, including with the challenges within the international Mission Innovation project. The activities the Netherlands participates in, both as a participant and as a leader in the SET context, are also usually chosen to ensure the priorities are matched. In addition, the Netherlands takes part in all SET programmes, with the exception of Concentrated Solar Power, Ocean Energy and Batteries & e-mobility.

Electric transport receives considerable attention in the Netherlands, also as part of the implementation of the government's vision on sustainable fuels for transport. In recent years, development in the Netherlands principally focused on applications of electric transport and charging infrastructure.

[130] https://www.bedrijvenbeleidinbeeld.nl/bedrijvenbeleid/missiegedreven-topsectoren-en-innovatiebeleid/hoe-staat-nl-ervoor/maatschappelijke-uitdagingen.
[131] See the website on the SET: https://setis.ec.europa.eu/.
[132] Please visit the Mission Innovation website: http://mission-innovation.net/.

Within the occasionally broader SET programmes, the focus of the Netherlands is on comparable priorities as exist within the Top Sector or within energy transition policy. Within the SET programme on energy efficiency in industry, for example, the Netherlands' participation is mainly focused on alternative, more sustainable high-temperature processes (through the electrification of processes, new separation processes and new processes for the steel industry, such as Hisarna). Within the programme, the Netherlands additionally focuses on high-temperature heat recovery techniques and systems.

Within the TKI Urban Energy, the Netherlands focuses a great deal on smart solutions (technical, local approach, connected smart grid applications) for users, through test beds on smart grids, including through green deals on smart energy cities and smart grids. In both related SET programmes, the Netherlands also collaborates on these issues.

At present, work is ongoing on the design and shape of new energy innovation policy. The new government, which was sworn in at the end of 2017, wishes to give shape to its energy policy, including energy innovation policy, partly through a new Climate Agreement (see Chapter 3).

4.6.2 Trends in the low-carbon technology sector

Trends in the low-carbon technology sector in the Netherlands

This section paints a picture of the economic significance of the Dutch energy sector in recent years with a focus on the developments in the transition to the development and application of low-carbon technologies for energy savings and renewable energy. This section will make a distinction between energy operation and activities related to energy investments.[133] Energy operation is generally capital-intensive. Activities related to investments, by contrast, are often labour-intensive and, as such, are vital to employment potential in the energy supply.

[133] Energy operation consists of activities that relate to the extraction, production, conversion, trade, storage, transport and supply of energy (including refineries, oil and gas extraction, filling stations and production of renewable energy). In order to ensure that these activities remain at the same level or grow along with the demand of final consumers, investments are made by the operating sectors. In addition, the final consumers of energy themselves also make investments, for example in new energy-efficient industrial boilers or insulation measures. These investments of operating sectors and final consumers, in turn, lead to economic activities in other sectors, such as for construction and utilities companies, manufacturers of technology, R&D, the government, consultancy and other services, and are referred to as "activities from investments". For more information on the demarcation and definitions of energy-related activities and the distinction between conventional and sustainable, we would kindly refer to the background reports (Statistics Netherlands, 2015; Van Dril et al., 2016).

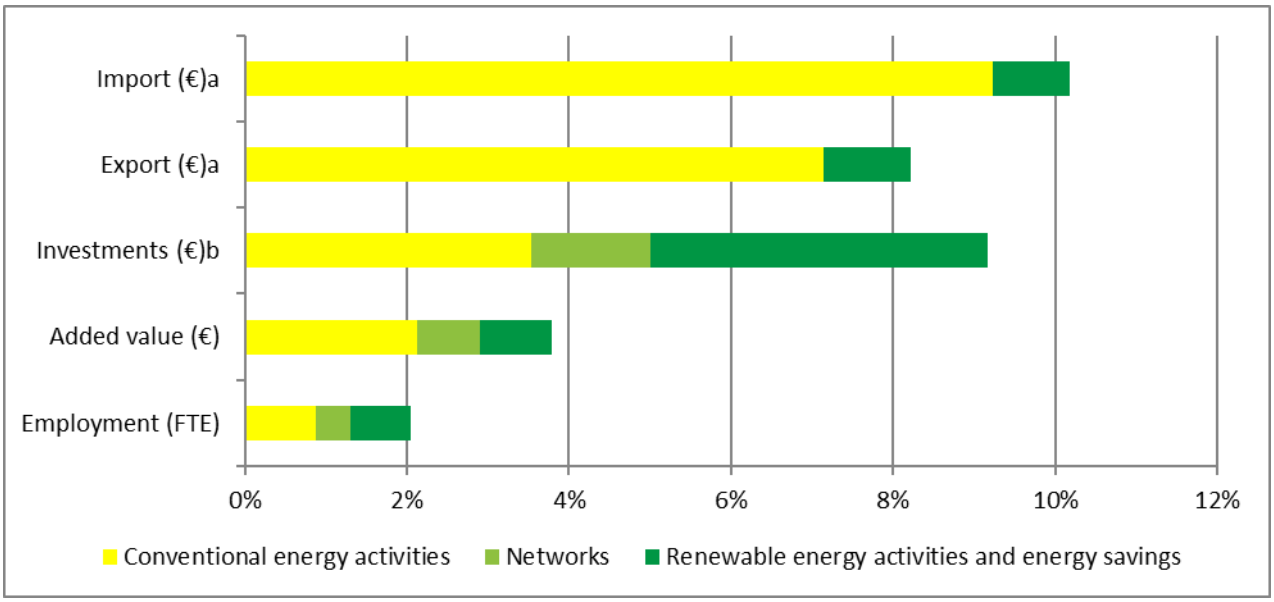

Figure 4.25 Percentage of energy-related activities in the entire Dutch economy for various economic indicators in 2017 (Source: Statistics Netherlands, 2018f)

Footnotes:

a) in 2016

b) in 2016

Figure 4.25 outlines the key economic characteristics of the energy supply by way of introduction. In 2016, the energy supply contributed 3.8% to Dutch GDP (gross domestic product). However, the added value of the energy supply has been decreasing since 2013, chiefly due to the decrease of the percentage of gas extraction, partly as a result of the production cap established for Groningen and the low price of gas.

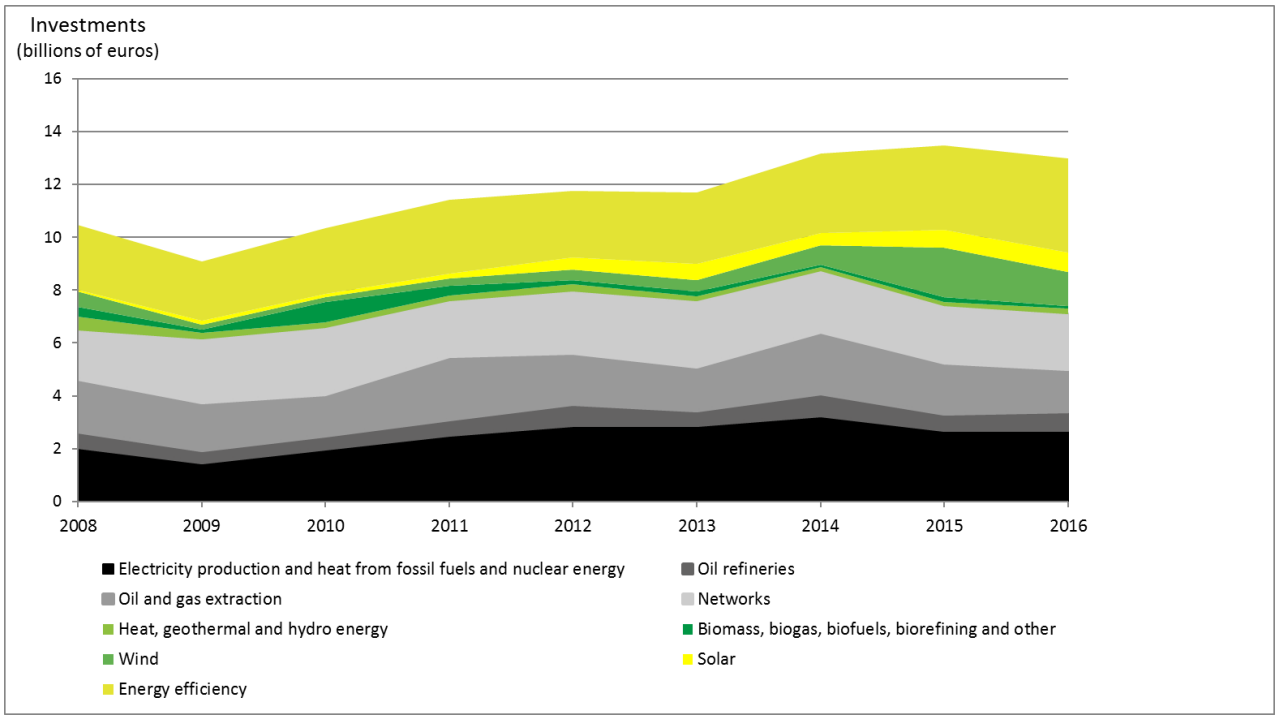

Figure 4.26 Development of energy-related investments in 2008-2016 in current prices (Source: Statistics Netherlands, 2018f)

Investments: sustainability dominates investments in energy

Between 2008 and 2016, energy-related investments steadily increased to 13 billion euros (Figure 4.26) (Statistics Netherlands, 2018f), primarily through investments in offshore wind power and, to a lesser extent, investments in biomass and solar power. Investments in conventional energy, by contrast, have decreased.

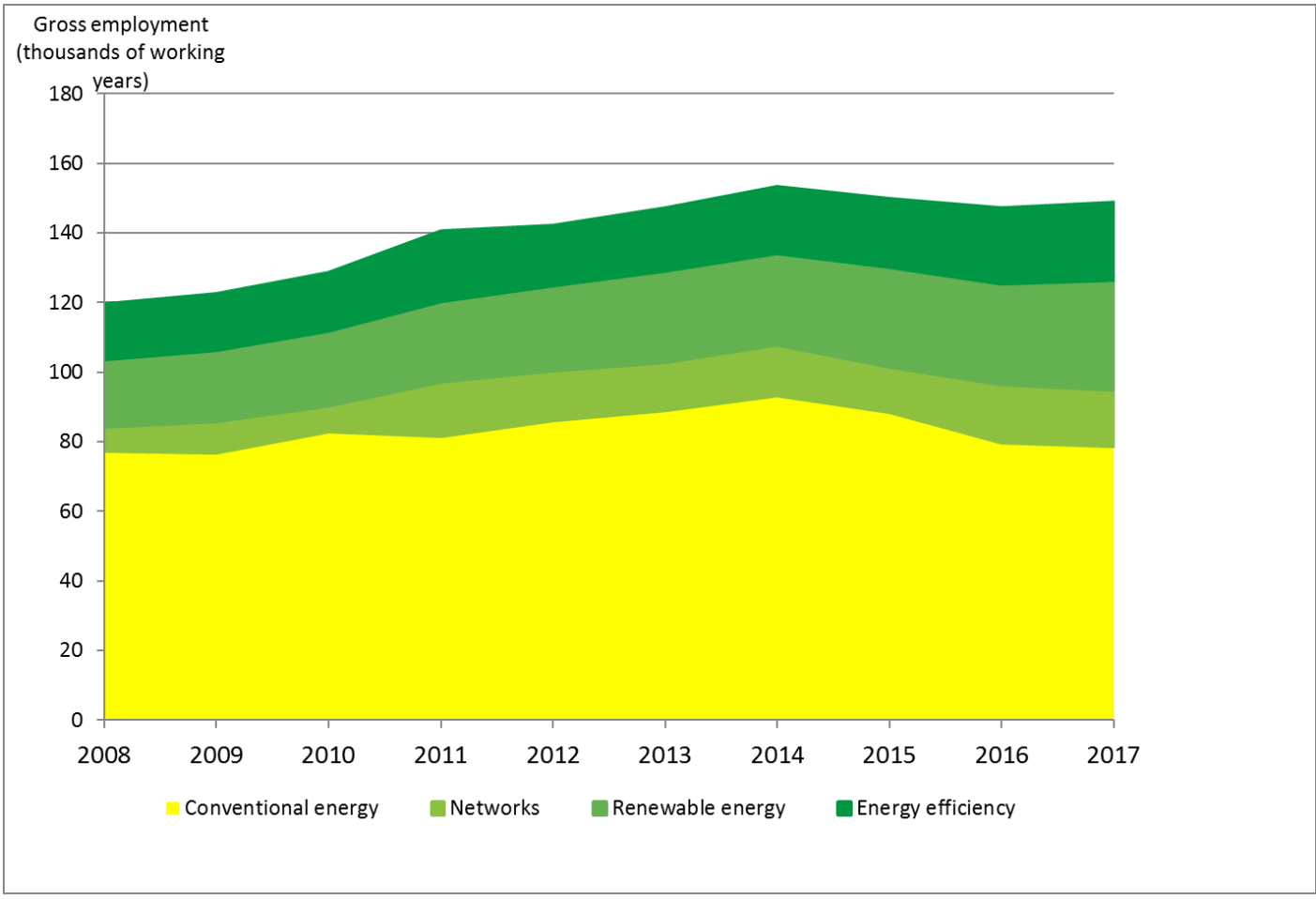

Figure 4.27 Development of energy-related gross employment in 2008-2017 (Source: Statistics Netherlands, 2018f)

Employment: similar shift toward renewable energy

Following a peak of 153,000 working years in 2014, gross employment[134] in the energy supply fell to 149,000 working years in 2017 (Figure 4.27) (Statistics Netherlands, 2018f). This is mainly the result of decreased employment in oil and gas extraction and electricity production, due to fewer investment activities in these sectors. The rise in investments in renewable energy will lead to a recovery of employment. Corresponding employment has increased from 34,000 working years in 2008 to 54,000 in 2017.

(Gross) employment in the operation of energy is relatively modest in size and is largely found in conventional energy. The number of working years in the operation of renewable energy, by contrast, has been increasing steadily for several years, up to 3,100 in 2017. Employment is increasing the most in the field of wind and solar power, whereas it remains relatively constant in the field of biofuels and biomass.

International position of the Dutch clean tech sector

As regards the position of the Dutch low-carbon technology sector, there is as yet no generally accepted ranking. The Cleantech Group and WWF, however, periodically report their ranking based on consideration of a combination of factors. In their recent report, the Netherlands came in at 15th place (Cleantech Group, 2017). According to the authors of that report, the Netherlands scores relatively high on most factors on the score index (such as the quality of the innovation ecosystem, entrepreneurial culture, private funding for start-ups, public R&D investments, etc.), but we scored less high due to the relatively low share of renewable energy in terms of energy consumption.

4.6.3 Trends in spending, research and innovation with regard to low-carbon technologies

Each year, the Netherlands Enterprise Agency (RVO) publishes the "Publicly Funded Energy Research" monitor on the instructions of the Ministry of Economic Affairs and Climate Policy (RVO, 2018b). This report is used to report to the IEA. The results are also used in the NEV. This provides insight into the expenditure of the Dutch government on energy research conducted by knowledge institutes, universities and businesses and the focus within that domain on the underlying energy themes. The public investments in energy research through fiscal instruments (the Research and Development (Promotion) Act), public funds (the Innovation Fund for SMEs) and the direct payments of the Ministry of Education, Culture and Science to universities are beyond the scope of this monitor.

Public spending on energy research fluctuated between 150 and 200 million euros per year (see Figure 4.28) (RVO, 2018b). These fluctuations over the years have had various causes. The first cause was the policy change in 2011, which initiated a shift toward top sector policy in terms of funding from 2012. Moreover, the funds from decisions in 2012 and 2015 concerning the so-called Discovery programme of the Netherlands Organisation for Scientific Research (NWO) were also still spent in the years thereafter. Furthermore, the agreements under the Energy Agreement made an additional budget available for innovation projects as of 2014.

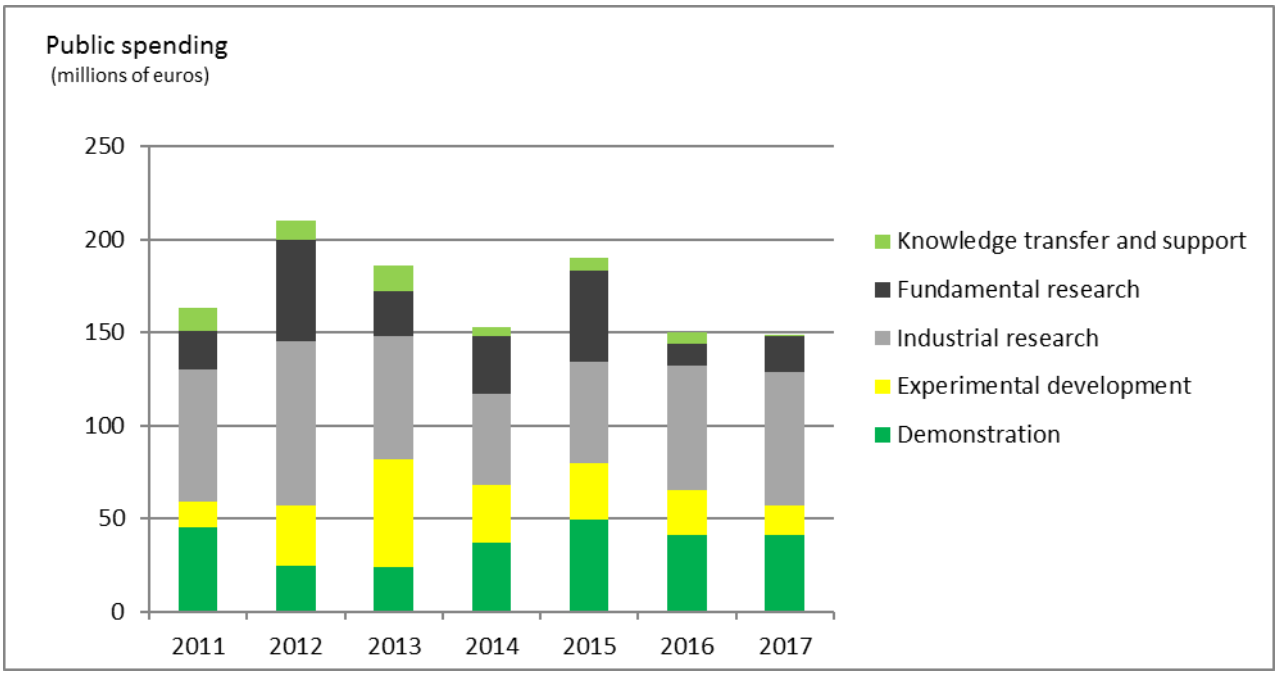

Figure 4.28 Public spending on energy research based on subsidy decisions (Source: RVO, 2018b)

Within the schemes of the central government in 2017, some 151 million euros of public funds was invested in energy research and innovation. Of this 151 million euros, 41% (61 million euros) was

invested in research into improved and cheaper production methods from renewable energy sources, 33% (50 million euros) was invested in energy savings and over 10% was invested in research into energy storage and into transmission and distribution technologies (RVO, 2018b). Investments in fundamental research fluctuated as a result of the biannual investment cycle of the NWO. The contribution to demonstration has remained the same and experimental development has decreased in recent years. Knowledge institutes and universities carried out 52% of all innovation activities – a slightly higher percentage than in previous years. The past four years, this percentage was between 45% and 50%.

Figure 4.29 shows the distribution along energy themes according to the IEA. Of investments in fossil fuels, over 95% went to research on energy storage and carbon capture and storage.

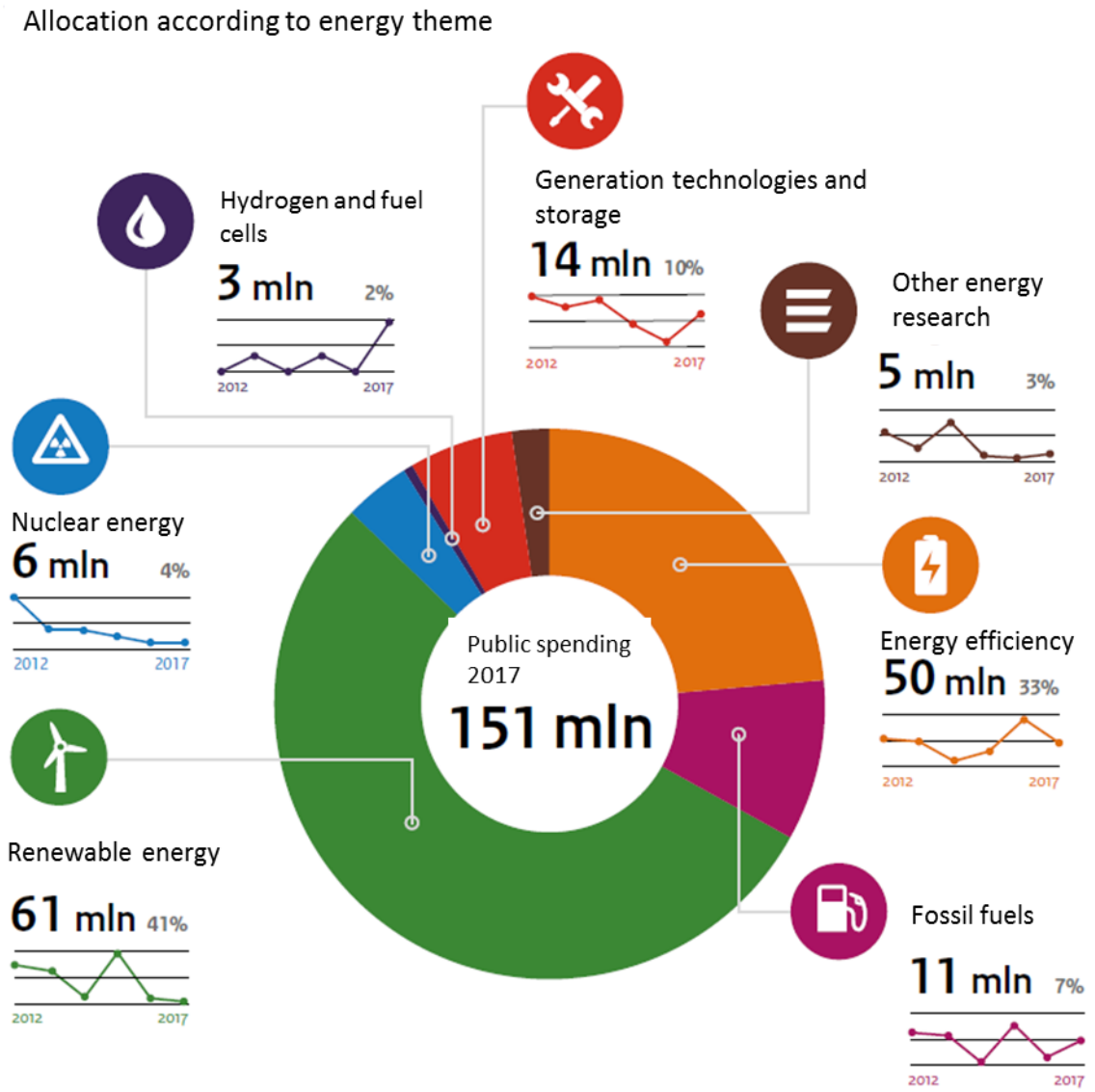

Figure 4.29 Distribution of public spending in 2017 on energy research based on subsidy decisions on themes (Source: RVO, 2018b)

Investment in energy research is chiefly a matter for the Ministry of Economic Affairs and Climate Policy. Other major contributors are the Ministry of Education, Culture and Science and the Ministry of the Interior (for the built environment). The funds are mainly spent through schemes and programmes

via intermediary organisations such as the NWO and the RVO and are primarily allocated to knowledge institutes and businesses.

The results of innovation, first and foremost, consist of factors such as further technology and product development (as well as cost decreases, etc.), strengthening of the knowledge infrastructure (including patents, knowledge networks, institutes), the competitive position of companies (including networks), improved preconditions for innovation and market development (in terms of rules, institutions and facilities). The next section will primarily examine patent applications.

Patent applications in renewable energy

Figures on the number of patent applications provide an overview of the results of efforts in the field of innovation, as described above. As of 2011, there has been a discernible downward trend in the number of patent applications in the field of renewable energy, with applications in the field of energy from wind, biomass and waste streams in particular showing a significant decline. This downward trend is not confined to the Netherlands, but is also evident in the European Union and the rest of the world, as shown by Figure 4.30. This may be a sign that the relevant technologies have matured sufficiently and that they are now primarily situated in a scaling up phase.

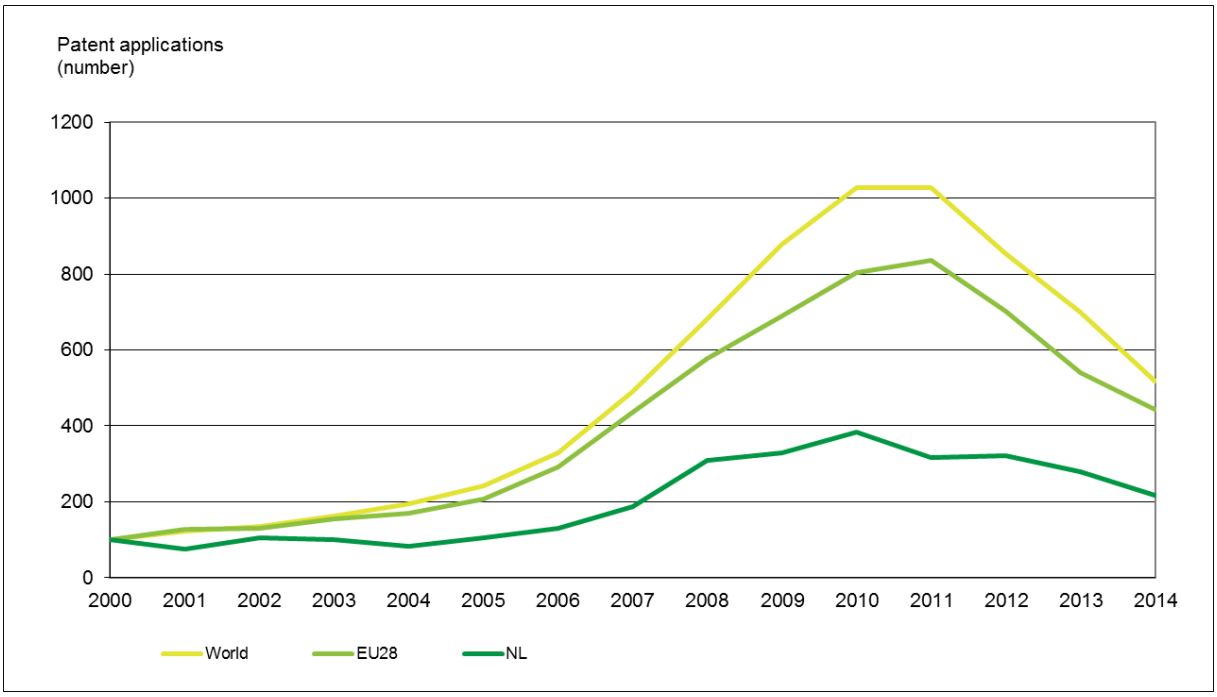

Figure 4.30 Number of patent applications in renewable energy at various levels of scale (Source: RVO, 2017)

The EU SET programme also analyses the trends in patents. It does so in a similar way on behalf of the various participating EU countries. Figure 4.31 shows the distribution of patents for the Netherlands by energy theme. This shows that the Netherlands is relatively well represented in patents with regard to the themes of smart solutions for consumers, CCUS and energy efficiency in buildings.

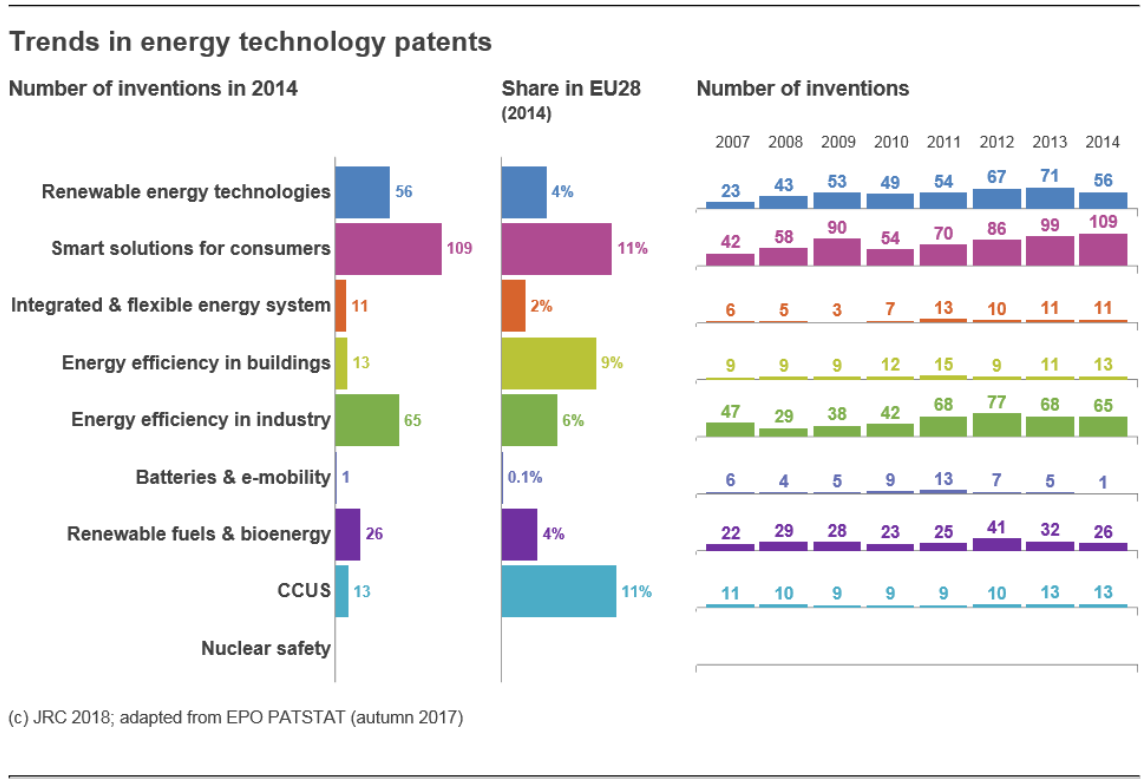

Figure 4.31 Development of the number of patents in energy technologies from Dutch applicants (Source: Pasimeni et al., 2018)

Number of researchers

As previously outlined in this section, energy-related employment as a result of investments in renewable energy is on the rise. Statistics Netherlands carried out an estimate for the NEV 2017 of the distribution of the employment for investments in renewable energy and energy savings between 2008 and 2016, both according to product profile (energy technology) and process profile (type of work). According to this study, the number of working years for researchers because of investments in renewable energy and energy savings since 2010 amounts to over 3,200 (Statistics Netherlands, 2017c). No data are available on the total number of energy-related working years of researchers across the Netherlands.

4.6.4 Structure of current energy prices and subsidies for fossil and other energy

This section will examine the various elements that currently determine the energy prices for Dutch companies. The energy prices include three key components:

- energy and energy supply costs themselves: the global market prices are discussed in Section 4.1; Prices of final consumers (consumers and businesses) are discussed in Section 4.5.3;
- grid, grid management and transport costs (outlined in greater detail below);
- taxes and levies (outlined in greater detail below).

The classification into these three components in part depends on energy consumption, applicable rate classes and energy type. This means there are significant classification differences: a rough indication for consumers is 15-24% network management, 30-40% taxes/charges and 44-51% supply costs.[135]

[135] Rough estimate based on various sources consulted in September 2018: Netbeheer Nederland, Energiemarktinformatie.nl and Essent.

Taxes and levies

The Netherlands has a differentiated system of taxes and levies that impact energy consumption. In principle, energy tax must be paid for electricity or gas supplied via the distribution network or a direct line, purchased on the exchange or obtained through other means. Consumers are also required to pay value added tax on that amount (currently 21%).

The level of the energy tax also depends on the amounts of natural gas and electricity. The rates also differ per tax type and per year. The rates are available in tables provided by the Dutch Tax and Customs Administration.[136] No energy tax is owed for the consumption of:

- electricity, self-generated through renewable energy sources;
- electricity, self-generated using an emergency unit in the event of failure of supply from the distribution network;
- self-produced landfill gas, sewage treatment gas or biogas;
- electricity, self-generated using a CHP unit.

A reduced energy tax rate applies for natural gas used for heating in the horticulture sector. Natural gas that is used as an input for the production of electricity is exempt from energy tax under certain conditions, in accordance with the Energy Taxation Directive. With regard to non-profit institutions and religious buildings, the energy tax provides for a partial refund scheme. Under the Convention of Mannheim, coastal and inland waterways are exempt from excise duty, while there is a reduced rate for other applications, such as for machinery in construction and agriculture. Under the Chicago Convention, international aviation is exempt from excise duty in respect of the use of kerosene.

In addition, there is a reduced energy tax rate of locally generated renewable electricity. If a cooperative or an owners' association should generate renewable electricity and supply it to its members, then those members would be entitled to this lower rate under certain conditions. One of the conditions is that the cooperative or owners' association should have a statement from the Dutch Tax and Custom Administration. In some cases, an energy tax refund may be obtained, including for block heating and for participation in a multi-year agreement (under certain conditions, including regarding sufficient progress).

The Netherlands does not have any subsidies for the consumption of energy from fossil fuels. Nevertheless, these exceptions to energy taxation and lower rates may actually result in higher consumption of (fossil) energy.

Surcharge for Sustainable Energy

An additional levy on energy consumption was introduced in the Surcharge for Sustainable Energy Act (ODE) on 1 January 2013. The purpose of this new levy was to cover the cash outflow related to the Sustainable Energy Production Incentive (SDE+) grant scheme.

The ODE, however, is not an earmarked levy. Due to the budgetary rules applied in the Netherlands, which prescribe a strict separation between income and expenditure, there is only an ex ante estimate of the level of ODE income required to cover the cash outflows for the sustainable energy incentive estimated in advance. During the entire budget period of a sitting government, this revenue and expenditure, determined ex ante, is not corrected in the interim.

The ODE is levied on households for 50% and for 50% on businesses. The rates rise annually in order to cover the estimated rising SDE+ budgets arising from the target to achieve a share of 14% renewable

[136] https://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/overige_belastingen/belastingen_op_milieugrondslag/tarieven_milieubelastingen/tabellen_tarieven_milieubelastingen?projectid=6750bae7-383b-4c97-bc7a-802790bd11.

energy by 2020 and to grow to a share of 16% by 2023 – in accordance with the commitments in the Energy Agreement. The rates are included in the tables of the Dutch Tax and Customs Administration. The future development of the ODE depends on what is agreed upon in the Climate Agreement.

Network management and transport costs
These are the fixed costs for the connection to the electricity, gas or heat grid. Since 1 January 2009, the transport costs for household users depended on the type of connection, also known as the capacity rate. These rates vary per network manager, per region and per connection.

Chapter 5 Impact assessment of planned policies and measures

The Netherlands' focus is on increasing the European reduction target to 55% by 2030. Meanwhile, in the Netherlands, we will be putting measures in place that prepare us for a reduction of 49% by 2030 in respect of 1990. The government wishes to agree those measures with local and regional authorities, businesses, nature and environmental organisations, trade unions and other social partners in a Climate Agreement. An indicative target has been formulated per sector platform.

Sector	Indicative allocation of the 49% reduction target (in megatonnes of carbon dioxide equivalents as of 2030)*
Industry	14.3
Mobility	7.3
Built environment	3.4
Electricity	20.2
Agriculture and land use	3.5**

(*) Including the effects of the circular economy.
(**) Including 1.5 Mt of reduction from land use that does not count toward achieving the 49% reduction.

Before the summer, the platforms completed a proposal for key points of a Climate Agreement with which they wish to achieve the 49%. Over the summer, the Netherlands Environmental Assessment Agency (PBL) and the Netherlands Bureau for Economic Policy Analysis (CPB) assessed this proposal for key points (Parliamentary Paper 32813, no. 216). These analyses show that the proposed key points put the parties on track to achieve the targeted reduction of 49% by 2030. Even so, the PBL and CBP analyses also confirm that further steps are required in order to translate the proposal into specific instruments and actions. Enabling further elaboration in each sector will require all the parties to define in greater detail what efforts they themselves will undertake and what agreements the parties commit themselves to towards each other. This is what the parties of the platforms – including the government – are committed to.

The government has asked the sector platforms to identify more clearly what additional measures are needed for a stricter European target of 55% by the end of the year. In the event a higher European target is set as a result of these efforts, we will already be prepared for this. Because the outcome of the international talks to be held in 2019 is not yet certain, the goal ultimately established for 2030 may differ from the 49% the government currently has in mind.

The negotiations within the sector platforms will have to culminate in one coherent Climate Agreement comprising five sectoral pillars. The Netherlands Environmental Assessment Agency, in cooperation with the Netherlands Bureau for Economic Policy Analysis, will then conduct calculations and assessment of the complete package of measures in this definitive proposal, including consideration of the impact of greenhouse gas emissions, cost-effectiveness, budgetary effects and the effects on costs and household incomes.

The Climate Agreement will be submitted to Parliament. Based on the results of the calculations and assessment, the government will, in consultation with the relevant parties, finalise the Climate Agreement. The Climate Agreement will form the basis of the final NECP. Chapters 4 and 5 of the final NECP will be based on the next NEV that is to be published in 2019. In addition to an updated overview of the existing policies, the next National Energy Outlook will also take into account the new policies of the government, including the measures and agreements that are to be established in the Climate Agreement.

Annex 1: Sources

Primary sources

The primary sources of this draft NECP are

- Confidence in the future, Coalition Agreement 2017 – 2021, VVD, CDA, D66 and ChristenUnie.
- Letter to Parliament on "The Government commitment to the Climate Agreement", 23 February 2018, Parliamentary Paper 32 813, no. 163;
- Letter to Parliament on the Government appraisal of the proposal for key points of a Climate Agreement, 5 October 2018, Parliamentary Paper 32 813, no. 220;
- Energy Agreement for Sustainable Growth, Social and Economic Council (SER), September 2013;
- National Energy Outlook 2017.

Other sources

Other sources used in this draft NECP, mainly for factual information, have been provided below in three categories: Parliamentary Papers, the Bulletin of Acts and Decrees, and other documents and websites.

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Parliamentary Paper 30 196, no. 559. Letter to Parliament on the National Energy Outlook 2017, 19 October 2017.

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