Ministry of Economic Affairs and Climate Policy

Draft update of the National Plan Energy and Climate

2021-2030

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Content

Part A.
National plan

1 Overview and procedure for the adoption of the plan

The draft version of the update of the Dutch Integrated Energy and Climate Plan (INEK) is available before you. The INEK, which was presented to the European Commission at the end of 2019, sets out the broad lines of climate and energy policy in the Netherlands for the years 2021-2030, including the policies resulting from European commitments.1 In 2019, the INEK was largely based on the Climate Agreement with the involvement of more than one hundred societal (public and private) parties.2 This was also the basis for the first Climate Plan, adopted3 on the basis of the Dutch Climate Law.

A lot has happened since. In early 2022, a new government took office that tightened the Dutch climate targets. The Dutch Climate Law is being brought in line with the European Climate Law so that the Netherlands is part of a climate-neutral Europe in 2050. In June 2022, the Climate Policy4 Programme updated the Climate Plan in response to this strengthened target. This revision did not yet bring the policy fully in line with the ambition to achieve at least 55 % reduction by 2030. This is why the government presented an additional policy package during the Spring decision making in April 2023.5

This draft version of the INEK update contains the new, more ambitious Dutch climate policy. The European Commission's recommendations of 2020 at INEK are reflected in this draft, and the European Commission's guidance to the Netherlands on updating national energy and climate policies has also been taken into account as far as possible. The policy section contains the new, strengthened objectives (chapter two) and the policies set out in the 2023 Climate Policy Programme and Spring Decision-making (chapter three). The analytical part of this draft update INEK describes the developments in the Netherlands with regard to the five European energy dimensions. Chapter 4 describes the current situation, based on the adopted policy as it was known as of 1 May 2022. In particular, the National Climate and Energy Outlook (KEV) of the Planning Bureau voor de Leefomgeving (PBL) of 2022 was used.6 This KEV is published annually in accordance with the Dutch Climate Law and gives insight into the target scope of the 2030 climate target and developments in renewable energy and energy saving. Chapter 5 discusses the (broader) impacts of the new, more ambitious policies as described in Chapter Three.

Note: Logically, the KEV 2022 does not contain the strengthened policy for spring decision-making in April 2023. This estimate will become available in September 2023, ahead of the publication of the new KEV. The Climate Law stipulates that the KEV is published annually. Insights from the KEV 2023 will feed into the final update of the INEK plan in 2024.

1.1 Summary

I. Political, economic, environmental, and social context of the plan

We are facing a major challenge: tackling climate change to limit global warming to 1,5° Celsius. The government is convinced that the Netherlands can meet this major challenge with Europe. We have the responsibility to contribute to the solutions, but also the knowledge and skills to do so.

The government is thus hopeful about the future of the Netherlands and Europe, about the opportunities offered by the transition. Even if the news that overwhelms us about climate change sometimes turns out to be bleak. The scientific evidence gathered by the IPCC can no longer be ignored. The climate is changing under human influence, and the process is accelerating. For those born now, by the time they are old, this will have very serious consequences. Those born today will increasingly experience extreme heat and drought, as well as extreme rainfall and floods. Sea levels will rise and the changing climate will also have a negative impact on health. In addition, people will migrate due to climate change and food and water shortages that may arise as a result.

1Parliamentary paper 32813, No 406.
2Parliamentary paper 32813, No 342.
3Parliamentary paper 32813, No 406.
4Parliamentary paper 32813, No 1049.
5Parliamentary paper 32813, No 1230.
6Parliamentary paper 32813, No 1112.

The scientific community is also happy to show that we can still counter this situation. By reducing greenhouse gas emissions together, we can keep our planet alive and habitable for future generations. It is technically possible. It is important to make societal choices and speed up implementation.

The major efforts required at national, European and global level must take place in a geopolitical highly complex context. This context, including the war in Ukraine, the related gas crisis and rising energy prices in Europe, has shown the urgency of the rapid phasing out of fossil energy over the past year, including from the point of view of security of energy supply. Mitigating the risks of strategic dependencies is key here.7

The urgency of the climate issue is also reflected in the 2022 Dutch Coalition Agreement. It was agreed that the new government would bring the Dutch Climate Law into line with the European Climate Law. In 2050, the Netherlands is part of a climate-neutral Europe. The national interim target for 2030 shall be strengthened to at least 55 % net greenhouse gas emission reduction by 2030 compared to 1990. In order to achieve this target, it has been agreed to focus the policy on a higher challenge of around 60 % by 2030. The policy was developed in the Climate Policy Programme published in June 2022 and the additional policy package agreed by the government in April 2023 ('Spring Decision-making Climate Action').

The mission of this new policy is to achieve a just, feasible and ambitious climate policy:

- *Fair:* In climate policy, the government takes account of the benefit to society, taking into account the contribution to the objectives and the (national) costs to society. The government wants the 'emitter' to pay, and that it pays for sustainability. We also look at ability to pay. For example, the government does not want only people who can pre-finance investments to benefit from public schemes. Strong shoulders are expected to be able to bear heavier burdens: increases in the burden on low and middle-income earners shall be minimised as far as possible. When designing subsidy schemes, we look not only at the greatest impact on the goals, but also at whether public support is channelled to households and entrepreneurs who need it most. Because of financial concerns, limited time or less digital skills, there is a growing group of people struggling to get involved in the transition. For example, they have no savings to make their homes more sustainable, do not know how to apply for subsidies or do not have time to make their homes more sustainable. Whether they live in a rented house which makes them dependent on the landlord for sustainability. The government wants to provide additional support to this group through subsidies and care.
- *Implementable:* With the pace we need to make, we are looking for the limits of what is feasible until 2030. Because of the need to catch up, tensions are emerging. Is the necessary infrastructure in place in good time? Are there enough skilled people to do the job? Can the Cabinet and Chambers be sufficiently speeded up with the comprehensive legislative programme? We already see that it is sometimes piking and scratching. Because of the urgency of the climate challenge, this cannot be a reason for scaling back measures and ambitions. Instead, we are working on targeted solutions that will do everything we can to accelerate policy implementation. The challenges surrounding the electricity grid are being addressed through the National Action Programme for Network Conductions (LAN). Network operators shall make investments to accelerate the expansion of the grid and to use it flexibly and optimally. The government makes it legally possible to speed up procedures, and thus lead times, for energy infrastructure projects. The government is also ready to participate in regional network companies so that they have sufficient capital to invest vigorously in expanding the electricity grid. The Government responds to the call of the parties to the Rijksregie through the Multiannual Programme for Infrastructure and Climate Action (MIEK), so that network operators can better plan and prioritise investments and focus on areas where capacity is most refurbished and expansion is the most urgent for society. With the arrival of the National Energy System Plan (NPE), we want to better anticipate future developments by planning and programming ahead. With the introduction of the National Industry Sustainability Programme, there will be a stronger responsibility for making industry more sustainable and more coherent between the various initiatives. To avoid shortages of professionals leading to delays in implementation, the government has recently launched an Action Plan on Green and Digital Jobs. We also call on employers to continue investing in reskilling and upskilling professionals.
- *Ambitious:* The Dutch contribution to a climate-neutral Europe is enshrined in the Dutch Climate Law. This also applies to the 2030 interim target of achieving at least 55 % greenhouse gas emission reductions at national level. We are pushing for around 60 % reduction, and we are committed to "overprogramming" measures. With this, the government, together with the elaboration of the Coalition Agreement as laid down in the Climate Policy Programme, expects the ambition of at least 55 % reduction to come within reach.

7Parliamentary Letter on Open Strategic Autonomy, Parliamentary Document 35982, No 9 and Parliamentary Letter Plan of Approach to Strategic Dependencies, Parliamentary Document 30821, No 181.

II. The European Energy Union

The Paris Agreement agreed to keep average global warming well below 2 °C, with a target of 1.5 rd C. The European Union, on behalf of the Member States, has made firm commitments to reduce greenhouse gas emissions by at least 55 % by 2030 compared to 1990 levels. Cooperation within the European Union creates synergies between countries in the fight against climate change and the energy transition, making them more efficient and effective.

In the European Union, major steps have been taken in recent years to translate the objectives of the Paris Agreement into European objectives and legislation. The Netherlands endorses the European climate objectives. As described in the previous section, the national strategy to achieve the long-term reduction targets is set out in the Climate Plan, which is largely based on the Climate Agreement. Given the integral nature of the Climate Agreement, it addresses the five dimensions of the Energy Union (decarbonisation, energy saving, energy security, internal energy market, and research and innovation). These are divided into five sectors, namely electricity, industry, mobility, agriculture and land use, and built environment, and in a number of cross-cutting topics, namely electrification, hydrogen, bio-raw materials, innovation, labour market and training, financing, citizen participation, spatial integration and regional energy strategy (RES).

The Russian invasion of Ukraine has further highlighted the importance of close European energy cooperation, including in the areas of security of supply and affordability of energy. EU Member States have jointly taken several measures under REPowerEU[8] to phase out Europe's dependence on Russian fossil fuels as soon as possible and to increase the security of supply of natural gas and reduce high prices for European citizens. These include agreements on the timely and adequate filling of gas deposits, the achievement of gas savings and the setting up of a mechanism for joint procurement of gas.

III. National emission reduction target

With the climate and energy paragraph in the Coalition Agreement, the Dutch government increased its climate ambition in early 2022. The 2019 Climate Agreement aimed to reduce greenhouse gas emissions by 49 % by 2030 compared to 1990 and 95 % by 2050. In the Coalition Agreement, the Netherlands increased this to at least 55 % net reduction in greenhouse gas emissions compared to 1990 and is part of a climate-neutral Europe in 2050, in line with the European Climate Law. The Coalition Agreement agreed to focus climate policy on a higher target of around 60 % reduction so that the climate law target is more likely to be achieved.
The June 2022 Climate Policy Programme, which complements the 2020 Climate Plan, developed the policy towards the higher 2030 target. Compared to 1990, the Netherlands is expected to reduce greenhouse gas emissions by 39-50 % in 2030, as projected by the PBL in the 2022 KEV, if the policy deployed is speedily and fully implemented.

In the spring decision making in April 2023, the government subsequently presented an additional package of measures with an envisaged reduction of around 22 megatons of greenhouse gas emissions by 2030 (on top of the projections in the KEV2022). With this, together with the elaboration of the Coalition Agreement as laid down in the Climate Policy Programme, the government expects the ambition of at least 55 % reduction to come within reach.

8 Parliamentary paper 22112, No 3438.

1.2 Overview of current policy situation

I Energy system and policy context

National Energy System Plan

In order to achieve the desired acceleration in the transition of the energy system, the government has decided to take stronger ownership of the development of the energy system. The government does this because the speed with which we want to build the energy system leads to many complex coordination questions. Public and private parties will need to take decisions to steer the energy transition from their own role, while addressing interdependencies and uncertainties about the development of the energy system as a whole. This implies the need for guidance from the Government to help solve these coordination problems and make balanced choices about the development direction of the system as a whole and in the long term.

The Energy System Programme has been established at national level. This programme looks at the development of the energy system from a coherent perspective – across all sectors and ongoing programmes – and focuses on the long-term, the energy system that the Netherlands intends to deliver by 2050.

With the development of the National Energy System Plan 2050 (NPE), guiding choices are made and developed for the development of the energy system. The NPE will be a recurring tool in which these choices are presented in a coherent manner. The outline of the National Energy System Plan 2050 was published in 2022. The elaborated NPE will be finalised in July 2023. The results will be taken into account in the final INEK.

Energy savings

Nor do we have to generate, pay or import energy that we do not use. Energy saving is an important pillar in a sustainable energy system. This is why the Netherlands is ambitious in energy saving. The EU has set itself the target of reducing greenhouse gas emissions by 2030 55 % compared to 1990 levels by 2020. One of the components to achieve this is the Energy Efficiency Directive (EED). The revision of the Energy Efficiency Directive as part of the Fit for 55 agreement reached a provisional agreement to reduce energy use in the EU by 11.7 % by 2030 compared to projected energy use in 2030. This also results in a national contribution with an indicative target of the Netherlands in 2030. This target value shall be quantified when the final EED text is published. This target is expected to be lower than current energy use. Therefore, in 2023, the Government is working towards setting indicative sectoral energy savings targets.

Renewable energy

Currently, the pathway on the revision of the Renewable Energy Directive (REDIII) is in its final phase. In the following, the Netherlands will go through the translation to the Dutch objective, which will be significantly increased.

For the EU's 2018 renewable energy target of 32 %, the European Commission has indicated that it considers a contribution of 26 % from the Netherlands to be reasonable. The Netherlands is ambitious and aims to achieve at least a 27 % share of renewable energy by 2030. According to the KEV 2022, the Netherlands is expected to achieve a 30.5 % share of renewable energy in 2030 (bandwidth 26,9-32,6) on the basis of the established policy as known as of 1 May 2022. As a result, the current national reference target of 27 % for 2030 is expected to be largely met. The 2022 KEV does not yet include planned policies and complementary policies in the context of the Spring 2023 decision-making process.

Energy mix

The Netherlands is stepping up the ambition for the electricity sector, with the aim of having a $_{CO2}$free electricity production in the Netherlands as early as 2035. To this end, measures shall be taken to achieve free$_{control}$capability, for example by incentivising the use of hydrogen. The government is also focusing on electricity storage by investing in battery innovations and making batteries mandatory in large-scale solar parks. This will allow solar energy to be used even if the sun does not appear and will relieve the electricity grid. It also promotes hydrogen production at sea, as well as exchanges of energy with North Sea countries, enabling long-term energy storage and exchange.

Natural gas consumption will be reduced by the continued reduction in the use of natural gas in (mainly decentralised) electricity production through cogeneration and reduced natural gas demand for heating buildings and by changing the use of natural gas in industry (e.g. electrification, biogas or hydrogen). The Parliamentary letter on security of gas supply of April 20239 states that the

9Parliamentary paper 29023, No 417.

import of Liquid Natural Gas (LNG) in the coming years is still necessary to ensure a good balance of demand. Towards 2030, the need for these import flows is expected to decrease, while existing terminals should then be prepared – gradually – for large-scale imports of renewable energy carriers (e.g. hydrogen, ammonia, derivatives).

With the Act on the Prohibition of Coal, which entered into force in January 2022, as of 2030, operators of coal-fired power stations are no longer allowed to use coal in electricity production. On the contrary, the contribution of renewable sources is expected to increase sharply in the coming years, in particular due to the growth of renewable electricity generation (see paragraph 4.2.II). In addition, the share of nuclear energy in the energy mix will also increase. This is due both to the extension of the current nuclear power plant in Borssele and to the steps needed for the construction of two new nuclear power plants.

For the time being, oil retains its dominant role as a fuel in transport and as a raw material in the chemical industry. Consumption of oil decreased slightly compared to 2019. Oil is expected to take over the place of natural gas as the main energy carrier in the energy mix in the coming years.

Energy market

Many parties are active in the Dutch energy market and are strongly connected to the rest of the world. For the supply of gas and electricity, it is on the one hand the producers and suppliers operating on the market and, on the other hand, the system operators. The Netherlands has split the energy companies, with network operators operating independently and financially sound.

The high-voltage (electricity) and high-pressure (gas) networks each have one system operator, TenneT and GTS respectively. For the distribution networks, there are several parties, each operating in a given region.

Developments in other countries with regard to energy supply in the Netherlands

Developments in our neighbourhood have a major impact on those in the Netherlands. In recent years, the Netherlands has on balance been an importer of electricity. Greenhouse gas emissions from the production of the imported electricity took place abroad. Imports and exports are expected to increase in the period up to 2050 due to the strong growth in wind and solar production capacity. The import balance is expected to increase sharply in the period up to 2030. By increasing the link with the rest of the world, fluctuations in the production of solar and wind electricity can be captured.

Demand for fossil fuels increased sharply in the course of 2021 with the decrease in COVID-19 measures compared to previous years. The Russian invasion of Ukraine has led to an unprecedented further increase in energy prices, bringing fuel prices to historically high levels in 2022. Russia has overwhelmingly wired the gas crane to the EU. The EU is committed to reducing its dependence on Russian energy as soon as possible and has adopted import boycotts on Russian coal and oil.

Demographic and economic developments

Demographic and economic developments have a major impact on energy consumption. At the end of 2022, the population was 17,8 million people (see Table 4.1). The population is expected to increase to 18,5 million people in 2030 (PBL, 2022a). Population ageing has stabilised the potential workforce in recent years. With the increase in the retirement age, the potential labour force will increase in the coming years, but slowly decline after 2030. For consumers' energy consumption, the number of households is more important than the size of the population. The average size of a household has been declining for decades and this trend continues in the future. The growth in the number of households is therefore higher than that of the population.

On average, gross domestic product (GDP, in 2016 prices) is growing by 2.2 % per year between 2 020 and 2030. More than three quarters of GDP are currently realised in the services sector. Exports continue to make an important contribution to economic growth, alongside household investment and consumption. The permanent economic damage caused by the coronavirus crisis seems to be covered (CPB, 2022a). However, there is still a lot of uncertainty surrounding trend productivity developments, for example the scale and impact of learning disadvantages and protracted coronavirus complaints on the labour market are still unknown, as are the impact of accelerated developments, such as digitalisation. In the coming years, ageing populations are holding back labour supply and thus potential economic growth (CPB, 2022a). Average GDP growth thus levelled down to 1.4 % per year between 2 030 and 2040.

II Description of current policies and measures

In line with the higher ambitions, the government presented the draft Climate Policy Programme in 2022, in addition to the Climate Plan 2021-2030 (which is in line with the 2019 INEK Plan). In April 2023, a decision was taken to strengthen this draft

policy programme and is an additional package of measures with a target of 22 megatons of greenhouse gas reduction by 2030 (on top of projections in the KEV 2022). With this, the government expects to be more likely to meet the national 2030 climate target, as well as the revised obligation to stay within the ESR and to achieve a 2030 48 % greenhouse gas reduction by 2005 compared to.

The general frameworks and the framework conditions needed to fulfil this challenge, such as adaptation of the Climate Law, spatial frameworks, just transition and labour market developments and requirements, are set out below. The following chapter also deals with the RED and EED and see, inter alia, Chapter 3 for policies in the different sectors.

Adaptation of Climate Law in line with the European Climate Law

The national climate targets are set out in the national Climate Law. The government has sent a proposal to amend the Climate Law to the Lower House, which tightens the targets for 2030 and 2050 and avoids conflict with the European Climate Law. The 95 % target is tightened up to an obligation for the Netherlands to reduce net greenhouse gas emissions to zero by 2050 (climate neutrality for the Netherlands). The 49 % reduction target by 2030 shall be replaced by a reduction target of at least 55 %. This includes land use and is without prejudice to the reduction obligations under the European Climate Law and the binding EU legal acts adopted to develop it.

The parliamentary process is ongoing at the time of writing. In addition to this first amendment to the Climate Law, a second amendment will follow. This amendment enshrines the position of the Climate Council in law and aligns the cycle of the Climate Law with the Dutch budget cycle. The government will also consider intermediate targets for 2035 and 2040 in the Climate Law. It will be part of the new European target for 2040, for which the European Commission will present a Communication by 2024. The second amendment is expected to enter into force in 2025.

Spatial frameworks: Environment Act, National Environment Vision and Main Energy Structure Programme

A CO_2neutral energy system requires more space than a fossil energy system. The Government is therefore at the forefront of drawing up a programme under the Omgevingswet, aimed at planning and making spatial reservations for national energy infrastructure. This is the Energy Main Structure Programme (PEH). In order to achieve robust choices for promising new development directions, these are balanced by, inter alia, system efficiency, practicability, broad prosperity, land take and the effects on the environment. Synergies are also sought with other spatial developments, such as economic sustainability, urbanisation or nature conservation. Based on different possible developments of the energy system by 2050, PEH looks at the space needed to solve bottlenecks in the energy system, as well as spatial impacts of certain system choices, such as a high-hydrogen energy system, or a system based on as much electrification as possible. On this basis, PEh aims to identify, inter alia, high-voltage spatial development directions, tube lines and sites for conversion and storage of national interest. It also provides an insight into how spatial impact can be taken into account in choices for the energy mix of the future.

The establishment of the PEH shall take place in close cooperation with co-public authorities, network operators and other stakeholders. The draft programme is expected in the first half of 2023.

Just transition

In climate policy, the Netherlands takes into account the utility for society, taking into account the contribution to the goals and the (national) costs to society. The government wants the ‘emitter’ to pay, and that it pays for sustainability. Ability to pay is also considered. For example, the Netherlands does not want only people who can pre-finance investments to benefit from government schemes. Strong shoulders are expected to be able to bear heavier burdens: increases in the burden on low and middle-income earners shall be minimised as far as possible. The design of subsidy schemes focuses not only on the greatest impact on the objectives, but also on whether public support is channelled to households and entrepreneurs who need it most. Because of financial concerns, limited time or less digital skills, there is a growing group of people struggling to get involved in the transition. For example, they have no savings to make their homes more sustainable, do not know how to apply for subsidies or do not have time to make their homes more sustainable. Whether they live in a rented house which makes them dependent on the landlord for sustainability. The Netherlands wants to provide additional support to this group through subsidies and care.

Social Climate Fund

The Netherlands is preparing the implementation of the Social Climate Fund (SCF) with a focus on shaping the transition towards climate neutrality in a just way, with a special focus on the sectors covered by ETS2. The Fund was set up for the period 2026-2032. During the negotiations, the Netherlands indicated that the SCF should contribute to the transition towards climate neutrality, with a focus on financing measures that would effectively mitigate the impact of price increases for less powerful

groups and structurally contribute to making the built environment and mobility more sustainable. The Netherlands is exploring how best to link the objectives, and possible targets and contributions from the Social Climate Fund, with Dutch climate and energy policies, including tackling energy poverty. That survey takes into account the consistency with the plans contained in the draft updated version of the INEK. It is expected to clarify in the second half of 2023 how the SCF can be broadly integrated into the broader Dutch climate and energy policy. Member States can claim SCF funds by submitting national Social Climate Plans (SCPs) by 30 June 2025, including a public consultation of stakeholders. The plan should consist of investments of a structural nature aimed at reducing dependence on fossil fuels, as well as possible measures aimed at mitigating short-term negative impacts through, for example, income support.

Quality employment and training opportunities

The transition to a climate-neutral society is also transforming the labour market. For example, certain functions will disappear, for example in the coal sector, but we already see that the number of new jobs needed for the transition is growing more rapidly in the short term. The number of vacancies per 1000 jobs (the vacancy rate) more than doubled in technology between 2011 and 2021, from 20 to 50 respectively. In the energy supply, the shortfall with a job vacancy rate of 55 is higher than average.10 In January 2023, more than 74.000 vacancies were open for technical occupations.11 TNO estimated that 39.000 to 72.000 jobs would be created by climate action taken by the Netherlands until 2030, compared to 6.000 to 11.000 jobs lost due to the transition such as in the oil and coal sector.12 To avoid a shortage of professionals leading to delays in the implementation of the transition, the Green and Digital Jobs Action Plan was published in early 2023. In doing so, the Netherlands is taking several steps to ensure quality employment and training for the transition. Addressing labour market constraints in technology and ICT is a shared challenge of employers, workers, education and government. This requires action on several fronts. The government focuses on four pillars:

1. Increasing inflows into beta education; Demand for technicians and ICT workers has been growing for years, but the inflow into education is not large enough to meet labour market demand. In view of the societal challenges such as the climate and digital transition, it is important to attract more young people to training and jobs in engineering and ICT.

2. Maintaining and increasing inflows into the beta technical labour market. Given the large leak of technicians and ICT, it is important to focus on their preservation. In addition to policies aimed at stimulating side-inflows from other sectors,13 matching supply and demand, and developing lifelong development (LLO), it is important to also look more broadly at the influx of specific target groups.
3. Labour productivity growth. The solution to the shortages can be found not only in helping more people to find jobs, but also by promoting labour productivity growth through (process) innovations and digitalisation.
4. Strengthen governance and reduce fragmentation. Given the social, economic and social consequences, the government sees a clear role in addressing labour market constraints. This means that the government intends to work more actively and with more focus than before on removing obstacles and removing bottlenecks that prevent the matching of supply and demand.

In addition, employers in the engineering sectors also contribute to this by means of an Aanvalsplan Techniek. A first activity resulting from the attack plan is the Techniek Inclusive pilot project, to ensure that both women and other less represented target groups feel welcome, home and safe on the technical labour market.

The technique and ECT offer opportunities for all. This is why the four pillars of the Green and Digital Jobs Action Plan and the Employers' Awareness Plan also address under-represented groups, such as women and young people with a migrant background. The government also wants to facilitate the entry of people away from the labour market into the technique to match employers' intention to attract new target groups. For example, the Cabinet has jointly initiated the launch of a coalition for greater diversity (VHTO – the Centre of Excellence for Gender Diversity in beta, Techniek and Technology) and the Platform for Talent and Techniek. The aim of this coalition is to develop a nationwide, integrated approach to increasing the proportion of women in technology, for example by improving the attractiveness of working conditions and the image and image of technology.

The European Just Transition Fund (JTF) also contributes to a just transition towards climate neutrality. The regions with the greatest transition challenges will receive additional support to counteract the negative effects of the decarbonisation of their regional economy. On the one hand, to maintain employment levels in the regions and, on the other hand, to ensure that workers

10ROA and SEO (2022) labour-market constrained technicians. Developments, statements and prospects for trade.
11Dashboard Online vacancies UWV (work.nl).
12TNO (2019) Employment Impact Assessment of Climate Action.
13Subsidy scheme for retraining in ICT and Techniek professions, see Parliamentary Document 32637, No 469.

and residents in the region have the skills to benefit from this new employment.

Procedural justice

Climate justice also means that there are fair procedures. This is why this year a government vision on involving citizens in the energy and climate transition is presented. This vision describes how residents of the Netherlands can be (better) involved in policy-making at national and local level. Preparations are also ongoing for a possible National Citizens' Forum on climate and energy policies. See also point 1.3.I. "Involvement of stakeholders, civil society and the public" of this chapter. In addition, the National Climate Platform was set up at the end of 2022 to connect practical experiences of citizens, businesses and social institutions with policies. The NRF informs public authorities about what lives in society and advises on how to achieve a more connected and just transition.

For general poverty policies and debt management, we refer to the text on energy poverty in point 3.4.IV Energy poverty.

III. Key issues of cross-border relevance

Together with ambitious EU Member States, the Netherlands has pushed for ambitious climate targets both for 2050 (EU climate neutrality) and for 2030 (increasing the 40 % target to at least 55 % reduction). These targets are now binding in the European Climate Law and translated into concrete laws and regulations in the Fit for 55 package, with the Netherlands always insisting that the measures must actually count towards the desired target of at least 55 % and that the negotiations and implementation of the regulations and directives are taken forward expeditiously. With the adoption of the revisions of the ETS Directive, and the ESR and LULUCF Regulations, this reduction is ensured at EU level.

The Netherlands continues to work together to ensure that climate and energy targets, legislation and policies are shaped in a way that is in line with climate neutrality by 2050. In addition, government consultations in the field of climate and energy take place regularly with Germany, France and Belgium, among others.

By stepping up together with our neighbours, we can avoid carbon leakage from greenhouse gas reductions and major competitive disadvantages for the Dutch economy. Regional alignment of strategies for security of supply is also important. The European CO_2standards for vehicles (cars, vans and trucks) are very important to reduce CO_2emissions from new vehicles. The Netherlands is working intensively with like-minded Member States in negotiating CO_2standards for heavy-duty vehicles to ensure strong EU standardisation. The same applies to sharp EU standards for non-road mobile machinery (e.g. excavators, cranes, ship engines). In order to implement the EU Directive on the construction of alternative fuels infrastructure (AFIR), the Netherlands, together with Germany, has set up an informal partnership involving a dozen European Member States. In addition, the Netherlands is working on the deployment of alternative fuels for mobility in Benelux. Cooperation is also ongoing with neighbouring countries to enable electric and cross-border driving. This involves standardising protocols and charging infrastructure.

Depending on the common challenges and interests of the (neighbour) countries, the coalition may vary from topic to topic. This will build on existing energy, industrial and climate partnerships (such as the Pentalateral Energy Forum and North Seas Energy Cooperation) and seek cooperation in the fields of agriculture, mobility, circular economy and built environment with like-minded countries.

IV. Administrative structure of implementing national energy and climate policies

Governance at the national level on the basis of the Climate Law

In accordance with the Climate Law, the coordinating Minister for Climate and Energy, attached to the Ministry of Economic Affairs and Climate Policy, bears the (end) responsibility for the (end) responsibility for the target range of the targets in the Climate Law and the planning and accountability cycle (Climate Plan &INEK, Climate Note).

The specialised ministers are responsible for achieving the sectoral share of the megatonnes declaration resulting from the tightening of the 2030 target in the Climate Law to 55 %. The coordinating Minister for Climate and Energy regularly (at least four times a year) discusses the progress of policy implementation. The Minister for Housing and Spatial Planning, attached to the Ministry of the Interior and Kingdom Relations, is responsible for the Sector Declaration on Buildings Environment; the Minister for Infrastructure and Water Management for the Mobility Sector Declaration; the Minister for Economic Affairs and Climate Policy for the Industrial Sector Declaration; the Minister for Agriculture, Nature and Food Quality for the Agriculture and Land Use Sector Declaration. The Minister for Climate and Energy is responsible for the electricity sector and energy policy.

The Planning Bureau for the Environment (PBL) is an independent assessor in the fields of living, environment, climate and energy. Every year, the PBL publishes the Climate and Energy Outlook (KEV). The KEV, which is the successor to the former National Energy Outlook (NEV), provides an overview of realised emissions and an estimate of greenhouse gas emissions in the Netherlands broken down by sectors. The Climate and Energy Outlook also provides an insight into the developments and measures affecting emissions of greenhouse gases. The KEV shall be sent to both chambers of the States-General by 1 November each year.

The Climate Law requires the government to periodically account for the achievement of the objectives set out in the law. At the same time as the KEV, the Cabinet sends the Climate Note to both Houses of the States-General. The Climate Note includes:
A. the overall picture of the implementation of climate policy as set out in the Climate Plan; B. a presentation by ministry of the main aspects of climate policy implementation; C. a presentation of the impact of climate policy on departmental budgets;
d. the financial impact on households, businesses and public authorities of significant developments in climate policy that deviate from the climate plan;
e. how climate and energy monitoring is involved in the next revision or review of the progress of the climate plan; and
f. where relevant, the progress report on the implementation of the climate plan.

The Council of State advises annually on the Climate Note and 5-yearly on the Climate Plan.

The national assurance cycle in accordance with the Climate Law has been aligned with the INEK cycle. The current Climate Plan will also be updated in 2024.

Inter-administrative cooperation

Among other things, co-governments have an important role to play in the energy transition through their mandate and responsibility in environmental policy. The central government and co-authorities need each other to achieve results. This has been the subject of administrative agreements between the Government, IPO and VNG, following the elaboration of the Coalition Agreement in the Climate Policy Programme, cooperation by sector (through national programmes), and overarching arrangements such as the availability of sufficient means of implementation.

In order to keep track of the progress of the agreements, an Administrative Consultation on Climate and Energy (BOE) is organised at least four times a year under the chairmanship of the Minister for Climate and Energy.

Regional Energy Strategies (RES)

In the 30 energy regions in the Netherlands, governments, residents, businesses, grid operators, energy cooperatives and civil society organisations work together on the Regional Energy Strategies: the RES.

In many cases, the region is the right scale to link the challenge of the energy transition with other challenges in the physical environment, thus balancing interests. The matching of electricity and heat supply and demand, as well as the spatial weighting of renewable energy and heat generation, cannot be addressed by a single level of government. The RES provides a tool for municipalities, provinces and water authorities to work together at a regional level to carry out integrated trade-offs on the generation of renewable electricity, the heat transition in the built environment and the related storage and infrastructure. This is done together with network operators, companies and social stakeholders. The focus is on achieving the generation of at least 35 terawatt hours of renewable energy on land by 2030 and developing a Regional Structure of Warmte. The RES have been given priority directions in line with the balancing principles set out in the draft National Environment Vision. The first offer made by the RES regions brings together 55 terawatt hours.

The RES is established by the municipal councils, county states and the general authorities of the water boards. Representatives and daily managers are often taken into account from the start of the RES process. The way in which this has been done varies from region to region.

The implementation of the RES is supported by the Interadministrative National Programme RES (NP RES).
The NP RES has five clients: the Ministry of the Interior and Kingdom Relations, the Ministry of Economic Affairs and Climate Policy, the Interprovincial Consultations, the Association of Dutch Municipalities and the Union of Water Boards. The NP RES provides a platform for learning and matching, and supports the regions in the target range and developing a solid and socially owned process to this end. In this light, stakeholders such as network operators and the participation ecoalition are also actively involved.

The RES regions continue to implement the RES 1.0. A progress paper is prepared every two years by the RES regions, outlining the state of play in their respective RES regions. In addition, some of the regions are re-calibrated RES 2.0 on the basis of insights from implementation, innovations and moving towards the target in 2030 and beyond.

Mobility: MIRT

The Multiannual Programme for Infrastructure and Transport (MIRT) contains the national projects and national programmes, which work on the accessibility, safety and spatial planning of the Netherlands. The projects and programmes are (mainly) financed by the Mobility Fund (MF) and the Delta Fund (DF). Every year, there is administrative consultation between the central government and local authorities (provinces, municipalities, transport regions, water boards) in each of the five MIRT regions (north-west, south-west, south, east and north) and for the freight transport corridors programme, in which investment decisions are taken on the basis of jointly identified indications.

Scientific Climate Council

An independent Scientific Advisory Board has been established to advise the Cabinet on climate policy. It has been operational since April 2023. The WKR has a multidisciplinary composition and consists of a maximum of 10 members, including a president. The Advisory Council is an independent, scientific advisory board that is requested and unsolicited to provide government and parliament with scientific knowledge on the climate policy to be pursued.

1.3 stakeholder consultation and involvement

1. Involvement of interested parties, civil society and the public

Citizen engagement and citizens' forum

The climate challenge and changes in energy supply needed to do so have a major impact on the living environment, daily life and wallet of Dutch people. By giving citizens space for their own initiative and involving them in government initiatives, their concerns, wishes, experiences and preferences can be better taken into account at all stages of policy-making. This is already happening in many places. Together with co-governments, civil society organisations and citizens, the KabinetsVision Citizen engagement in the energy transition was published on 17 May 2023.14 The vision sets out ten principles, three priorities and first lines of action to properly organise citizen engagement around the energy challenge. In the coming period, the government will work with other parties to even better involve residents of the Netherlands and residents of larger energy projects in the energy transition and give them more scope to think about and do.

One of the ways in which citizens are involved at national level is the possible establishment of a national citizens' forum on climate policy. Within this Citizens' Forum, a belief group of citizens, who is as representative and diverse as possible, debriefed on a topic. At the end of the process, the Citizens' Forum prepares an opinion to the Cabinet. Good cooperation between Parliament and the Cabinet is essential for the establishment and follow-up of a citizens' forum. The government is in discussion with the House of Representatives on the organisation of a citizens' forum, in order to ensure that the opinions are properly followed up by politics. The House of Representatives and the Cabinet are expected to agree on the Citizens' Forum before the summer of 2023.

In August 2023, the new public campaign "Set the button" will enter a new phase. This campaign integrates Dutch society into the climate and energy transition at three levels. We explain what governments, businesses and citizens can do.

2. The 'why' and 'how'. We tell us what is happening and why we need to act. This is an important element in the public campaign as it should be possible for stakeholders to fall back on it. In addition to explaining why we are implementing this transition, we also tell us how we will do so. How does the landscape change, what people will make of it in their immediate environment.
3. At domain level, we are looking at how the transition is taking shape. We travel differently, live differently, use energy, consume and eat differently. This is done in close cooperation with other departments. Their public campaigns are linked to the national campaign.
4. Offering concrete prospects for action. In this, the government cooperates with the other departments, regions, municipalities and other relevant stakeholders. What explains what citizens, civil society organisations/institutions and businesses can do concretely to contribute to the climate and energy transition.

The National Climate Week takes place annually. We want to encourage behavioural change by making the movement from society towards a sustainable Netherlands fully visible and inspiring Dutch people to take additional steps. We do this by highlighting sustainable initiatives by citizens, civil society organisations/institutions and businesses and public authorities. We opt for a local approach involving climate mayors (citizens involved) and climate supporters (relevant institutions such as businesses, associations and foundations) with a strong role to play in facilitating municipalities. The message is that we can get it together together.

National Climate Platform

A National Climate Platform (NFP) has been set up to strengthen the ambitious public climate and energy transition plans with insights from the world of life of citizens and entrepreneurs in particular (SMEs), thus promoting the desired acceleration. The Platform aims to increase ownership and involvement in climate policy, in particular among those groups that are more difficult to reach. The added value of the NRF lies in systematically identifying, analysing and placing on the agenda the opportunities and bottlenecks that citizens and entrepreneurs experience in the day-to-day practice of the climate and energy transition. The platform reports on those opportunities and bottlenecks to the Minister for Climate and Energy three times a year.

This platform is under independent chairmanship and is a follow-up to the governance of the Climate Agreement that has expired

14Cabinet Vision for Citizens' Engagement in the Energy Transition, Parliamentary Paper 32813, No 1231.

with the new cabinet. The NRF is positioned as an independent platform for 4 years.

Participation in RES

In the regions, public authorities are working with grid operators and social stakeholders on regionally owned choices for the generation of renewable electricity, the heat transition in the built environment and the related storage and energy infrastructure. These choices are and are translated into areas, projects and their implementation and implementation.

An RES 1.0 has been established in each region. This was preceded by a Start Paper which also sets out the objective and manner of democratic and spatial assurance. The process has resulted in an offer per region where concrete search areas can be suitable for energy from solar, wind, soil or water, taking into account spatial quality and public acceptance.

Process participation in the RES leads to more quality-informed choices and decisions and is important for successful implementation. By region, municipalities, water boards and counties provide adequate and timely information to citizens and establish local facilities to enable citizens to participate more effectively in the implementation of the RES. It is up to the region to determine what kind of facilitation is needed.

In implementing the RES, regional authorities are bound by the agreements on project participation in renewable energy generation as set out in the Climate Agreement.

In many regions, 50 % local ownership is being developed. Regions are involved in different ways: from drafting guidelines for developers to setting up a regional public development company.

Energy System Outlook Expert Team

The Independent Expert Team Energy System (ETES) 2050 has been mandated by the Cabinet to develop an outlook that serves as one of the building blocks in the rationale of the National Energy System Plan.15

ETES worked on this outlook from April 2022 to April 2023. The team had a broad composition representing, among other things, broad energy system expertise, including economic, governance and transition, and socio-social knowledge, as well as specific expertise in areas such as electricity, heat, industry and mobility. This broad composition reflects the multitude of technical, social and steering issues involved in the energy transition.

The Energy System Expert Team proposes that the design of the energy system should be based on three design principles: fair, robust and sustainable (explained in box x below). In addition, the expert team issues the following 8 key messages:

1. **Use other design principles.** According to the ETES 2050, electricity should be already$_{\text{carbon-neutral}}$by 2035, and the new energy system as a whole should be ready between 2040 and 2045. For this transition, according to the experts, it is important for the government to adopt different design principles. In recent decades, principles such as security of supply and affordability have been at the centre. These are still relevant, but not sufficient. The expert team therefore proposes a new set of design principles: **fair, robust and sustainable**. They shall mean the following:

Just so that energy is affordable for all. With a fair distribution of the benefits and burdens of the energy transition between income groups and generations, between businesses and citizens, between urban and rural areas and between the Netherlands and the rest of the world. It also means involving everyone, striking a balance between all interests and striving for recovery.
Robust by ensuring sufficient energy infrastructure that is resilient to unexpected events and that can be used in a smart way. Energy demand and supply must match well at all times of the day. Good regulation of distribution, storage and conversion should be partly local, partly (inter) national.
Sustainable society today is emitting more greenhouse gases than the planet can. This also applies to the use of raw materials and freshwater and the decline in biodiversity. The earth cannot continue to supply infinite. Therefore, the energy transition must go hand in hand with improving biodiversity and a circular economy. Consumption in the Netherlands should also take into account effects elsewhere in the world.

15Decision establishing the Energy System Expert Team 2050.

2. In the Outlook, the expert team focuses on three main components of the energy system: electricity, carbon and local energy systems. In their analysis, the experts conclude that electricity will become the main component of Dutch energy use. **Hydrogen has a limited role** in the 2050 energy system (at least 10-15 %), but is indispensable for industry.
3. In the electricity chain, the expert team provides a small role for nuclear energy and wonders whether the financing of nuclear power plants with public money is well designed.
4. The experts also foresee that in 2050 almost all districts will be energy neutral or even energy positive and thus often self-sufficient. Much still needs to be done. Speed can be achieved by combining energy policy with social and green challenges in the spatial planning of cities, villages and rural areas. For equity**, it is important to prioritise the improvement of poorly insulated community-owned housing**.
5. In addition, decentralised heat systems have an important role to play (10-15 % final demand).
6. Finally, according to the experts, sustainable carbon will remain an important and scarce raw material in industry after fossil energy has been eliminated. According to the experts, the economy will also be different in 2050, as Dutch consumption patterns change and the Netherlands has other comparative advantages. According to the experts, industrial policy should be seen primarily in a European perspective.
7. Due to scarcity of carbon, it is not possible and necessary to regulate everything within the Dutch borders. **Energy saving and circularity are indispensable in any development path, and certainly for a successful industrial transition**.
8. Strengthen the Pentalateral Forum for commitments and alignment in (north-west) European context for the security of supply of electricity and hydrogen.

National Energy Consultation

Achieving climate neutrality by 2050 requires a change in our energy system. However, this transition to a new energy system constantly entails new choices and dilemmas. With the aim of aligning decision-making in the energy transition as closely as possible with the preferences of the Dutch people, the Dutch government organised a national consultation. In the context of the 2023 Energy Consultation, all Dutch people are given the opportunity to advise the Cabinet and express their views. A survey asks participants to choose from ten values that can be taken into account in the energy transition. This raises questions such as the degree of dependence on foreign energy supply and the preservation of our living environment. In addition, it specifically enquires about the main elements related to the development of new nuclear power plants. Participants have expanded the possibility to motivate and qualify their choices. The results of this consultation will feed into policy formulation for our energy system in 2050.

In parallel to the Citizens' Energy Consultation, the National Plan Energy System (NPE) took place at the beginning of this year. This participatory process has used the Participative Value Evaluations (PWE), a specific method to involve citizens in complex issues. The PWE method requires participants to balance ten different values and actions. The main conclusions of this consultation are briefly summarised below. The NPE is currently preparing a response to the results obtained as a result of the citizens' Energy Consultation.

- Security of supply is very important for participants. This is particularly evident from the fact that the average participant in the target "The Netherlands should be as much as possible dependent on the rest of the world/Europe for its energy" awards most points. This high prioritisation is consistent for almost all groups of participants (e.g. age and political preferences).
- Maintaining the status quo is less important for the participants in the Energy Consultation. Three goals related to maintaining the status quo score relatively low in the Energy Consultation.
- The energy transition should not cost too much, and powerful people pay the most for the transition. Fairness and affordability (also for less affluent people) are two important public interests for the energy transition.
- Another high priority objective is citizen engagement: citizens should be involved as much as possible in choices about the design of the energy system of the future. Furthermore, the attitude of residents to various forms of participation has been sought. This leads to the following insights:
  - In general, people are enthusiastic about participation, the majority indicates that they are likely to come to a degree of participation (or to an active or passive form).
  - Where participants need to come physically, such as a meeting or a citizens' forum, the municipal level is preferable to the national level.
  - The passive methods (survey and referendum) receive a stronger enthusiasm than the active methods with high time investment (meeting and citizens' forum).
  - Citizens who are more likely to participate are generally much enthusiastic about citizens' participation.

II. Consultation and coordination with other Member States

The Dutch energy and climate policy is regularly shared with other Member States through various consultation fora. Among others, the Netherlands participates in the Pentalateral Energy Forum, the North Seas Energy Cooperation (NSEC), the Green Growth Group and the Climate Change Committee Working Group on Climate Change. In addition, the Netherlands cooperates with other climate-ambitious EU Member States and regular government consultations in the field of climate energy with Germany, France and Belgium. The INEK is aligned through the Pentalateral Energy Forum and the North Sea Energy Cooperation (NSEC). The Pentalateral Energy Forum was co-launched by the Netherlands in 2005 with Benelux, France and Germany as members, and then Austria and Switzerland. Benelux rotates the Secretariat and the Presidency. Ministers provide political guidance on the Penta-countries' regional cooperation, focusing on market coupling, security of supply and improving flexibility services.
Ministers meet every two years. The Penta-region is the largest European market and participating EU countries see a role for the Pentalateral Energy Forum in the coordination of the Integrated National Energy and Climate Plans. To this end, a political declaration was signed in the margins of the Energy Council in February 2019. With this declaration, the countries express that the Pentalateral Forum will focus on enhanced regional cooperation in the framework of the Integrated National Energy and Climate Plans.

With the Netherlands and the European Commission, Belgium, Luxembourg, Germany, France, Denmark, Ireland, Sweden and Norway have signed the North Sea Declaration for offshore wind energy development and offshore grid improvements, including interconnectedness. A MoU was signed with the United Kingdom at the end of 2022 to enable technical cooperation between NSEC countries and the UK after Brexit, in line with the agreements of the Trade and Cooperation Agreement. These countries will be involved in the elaboration of a package of concrete actions to achieve additional CO_2reductions, as additional efforts should also be in line with the other ambitions set together with these countries. This would also make it possible to exploit synergies, such as joint interconnection and interconnection projects with offshore wind farms. The North Seas Energy Corporation's agreements are summarised below (section1.4.II).

The Green Growth Group (GGG) consists of 16 EU Member States (BEL, DEN, DUI, EST, FIN, FRA, IER, ITA, LUX, NL, OOS, POR, Slov, SPA, ZWE and UK) plus Norway working together to strengthen the EU's climate ambition.

In the Climate Change Committee (under the Climate Change Committee), EU Member States and the Commission are working together on the implementation of the EU Climate Adaptation Strategy.

In addition, bilateral consultations are also held with neighbouring countries. This includes topics such as the phase-out of (low calorific) natural gas, the phase-out of coal, greenhouse gas reduction measures, knowledge sharing and cooperation on hydrogen and CCS and the impact of capacity market mechanisms.

The Ministry of EZK intends to organise a neighbouring country consultation after 30 June 2023 and before the final INEK update. During this consultation, we will inform colleagues from other Member States about the Dutch Climate Policy Programme which forms the basis of the Dutch INEK.

III. Iterative process with the European Commission

Consultation with the European Commission takes place in the regular INEK Technical Working Groups, the NECP online platform and the Council Working Groups on Energy and Climate. In addition, bilateral consultations with staff from DG ENER and DG CLIMA will take place towards the final INEK update.

1.4 regional cooperation in drawing up the plan

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

In June 2018, Belgium, together with the Benelux Secretariat, organised a dialogue meeting in the Pentalateral context (Netherlands, Belgium, Luxembourg, Germany, France, Austria and Switzerland) to discuss how we will draw up our INEKs together and where to coordinate them. This resulted in a political declaration signed at the Energy Council in February 2019. With this declaration, the countries express that the Pentalateral Forum will focus on enhanced regional cooperation under INEKS. In 2023, Penta Ministers again decided to include a joint paragraph in the new concept of INEKs. The English text of this declaration is included under 1.4.II. This joint paragraph will guide Penta's work in the period 2023-2030.

A joint North Sea paragraph has been agreed with the North Seas Energy Cooperation (NSEC) countries. This English text is also included under 1.4.II.

II. Explanation of how regional cooperation is considered in the plan

Common PENTA Chapter FOR NECPs

Pentalateral Energy Forum – The platform for regional energy cooperation

The Pentalateral Energy Forum (Penta) is a voluntary regional cooperation 2005 between Belgium, France, Germany, Luxembourg, the Netherlands and, in 2011, Austria, counting for more than 40 % of EU population and covering more than 50 % of the electricity generation in the EU. Switzerland joined as a permanent observer in 2011 and contributors Actively to the technical work and decision shaping. In close cooperation with the European Commission (on invitation), the Pentalateral Energy Forum enhances the cooperation between all relevant parties in order to contribute to a resilient, decarbonised and efficient electricity system that is based on integrated and well-functioning markets. As the electricity sector plays a crucial role in the decarbonisation of our societies as a whole by 2050 the latest, Penta countries aim to further increase the share of renewable energies and to fully decarbonise their electricity system as one as possible and ideally by 2035.

The cooperation is led by the Ministers responsible for energy policy, who measures on a regulatory basis. The follow-up of the activities is ensured by the Penta Coordinators under the direction of the respective Directors General of the Penta countries. The work programme is carried out by Ministries, Transmission System Operators (TSOs), Distribution system operators (DSOs), regulatory authorities (NRAS) and market parties who measures on a regulatory basis in currently four thematic support groups. In order for each Support Group to deliver on its goal, the exchange between and within Support Groups is very likely and overseen at the Penta Coordinators' level. The Support Groups also liaise with other international fora, such as for example the North Seas Energy Cooperation.

As the transition to a decarbonised energy system gathers pace, countries that are increasingly dependent and regional cooperation becomes incremenly important to address the challenges that arise. The Pentalateral Energy Forum is well placed to address what challenges, working for examination on security of supply, market integration, energy efficiency and decarbonisation. About the past two decades, Penta countries have evolved from a purely national policy perspective on energy markets to the adoption of a regional approach. As a result, Penta countries are ideally placed to contribute to the next phase of the energy transition.

Security of supply

Security of supply has been at the core of the Pentalateral Energy Forum in its establishment. Rather since, countries have been closely cooperating to foster security of supply and to prevent, prepare and manage electricity crises in a spirit of solidarity and trust. Notable milestones were achieved through various regional adequacy assessments, common crisis exercises, and a common framework under the EU Regulation 2019/941 on risk preparedness in the electricity sector.

Today, the work on security of supply is organised within a dedicated Support Group, structured by two main workstreams: resource adequacy assessments on the one hand, and risk preparedness on the other. Future work is planned for both of these workstreams as well as for the interface between them.

Resource adequacy assessments

Concerning resource adequacy assessments, Penta countries will work in concert with European studies performed by ENTSO-E (European Resource Adequacy Assessment, Seasonal Outlooks) to increase alignment and accessibility for Penta countries. Based on the extensive expertise and knowledge in the field, complementary sensitivity analyses could be achieved by Penta TSOs with a particular focus on the Penta region and considering regional specificities and cross-border interdependencies. Topics worth further regional investigation include:

- The articulation between the national energy system planning, the implementation of the TEN-E regulation and the fast evolution of the European energy system;
- The role of demand-side response and other flexibility resources for system adequacy;
- Methodological Improvements in Resource Adequacy Assessments;
- The need for increasing grid capacities and for the option of the existing grid;
- Analysis of critical situations and possible Countermeasures.

Risk preparedness

Concerning risk preparedness, the objective is to foster the regional cooperation in the Penta region with a view to preventing, preparing for and managing electricity crises in a spirit of solidarity and transparency and fully respecting the requirements of a competitive internal market for electricity and the operational security procedures of the TSOs. The Penta countries will look for efficiency between all competent entities involved in a crisis management and between European, regional and national levels. As such, work will focus on the implementation of the memorandum of understanding on risk preparedness in the electricity sector signed on 1 December 2021, and specifically on:

- Analysis and assessment of regional measures, including necessary technical, legal and financial arrangements for their implementation;
- Organisation of regional exercises;
- Revision of relevant regional electricity crisis scenarios for the Penta region in close alignment with ENTSO-E and the Commission concerning applicable methodologies
- Should an electricity crisis occur within Penta, application of the agreed framework.

Interface between resource adequacy assessments and risk preparedness

Complementary to the above, Penta countries will also work at the interface between resource adequacy assessments and risk preparedness. A first step has been carried out through the Penta study Methodological improvements of Resource Adequacy Assessment where the differences and transhipments have been investigated. Penta will work towards bridging existing gaps between long-term analysis and short term operational planning, technical and political decision-making, as well as between countries. Specifically, Penta intends to assess in the further development of analytical tools and procedures for information exchange and decision-making, closely involving Ministries, TSOs, NRAS, as well as ACER, ENTSO-E, EU DSO and the Regional Security Centers located within the Penta region (i.e. Coreso and TSCNet).

Market integration

The Pentalateral Energy Forum has two decades of experience on market integration questions. During that period, Penta has witnessed and drives large changes to the policy landscape, with notable milestones being the introduction of flow-based market coupling first within the Penta region, and now in a larger-scale part of continental Europe.

Promoting future proof market design

In recent years, the work on market integration within Penta has spread in terms of focus and in terms of topics tasks up. Penta ministers have firmly placed hydrogen on national and European agendas as a key element affected for system and market integration. The newly created SG4 is Actively contributing to development of an integrated EU hydrogen market.

The Pentalateral Energy Forum also claims to contribute to the integration of renewable energies and the development of a decarbonised future electricity system, where integrated markets play a crucial role. Most recently this was done through two studies “Vision 2050” and “Flexibility”. These studies have been conducted in the context of the Support Group 3 (SG3) on the future electricity system, and will serve as a basis for future work within Penta.

The Vision 2050 report compares national scenarios for decarbonisation, and proposals for building blocks for a common political vision on the future electricity system. This building blocks outline necessary elements for a future electricity

system to develop in an efficient way. Penta countries will continue work on the Vision 2050 through drafting a political declaration that containers a shared vision on the future integrated energy system.

To further achieve such a future electricity system, Penta countries recognising the need for a future – proof market design, and will Actively exchange on improving and implementing electricity market regulation, also highlighting areas where further work is needed. Penta countries will, based on their past experience, work together in elevating the welfare gains associated with taking an integrated and market based approach towards policy questions that may materialise. They will continue to organise technical changes and projects that contribute to the actual implementation of energy policies in the Penta regions.

Flexibility

The Flexibility report provided additional insight into the current and future state of flexibility in the region. It Outlines the needs and sources of flexibility in 2030/40/50, drives by the integration of renewables, and shows that cooperation can leverage significant synergies between countries, reducing overall flexibility needs. The report also providing important recommendations on how to promote flexibility across the region and potential measures how to improve the flexibility of market participants. Therefore, Penta countries will:

- Exchange on harmonisation of non-standard products such as grid services (e.g. redispatch and topological remedial actions).
- Exchange on how to facilitate the contribution of flexible behaviour by market participants to balance the energy system via wholesale markets and to operate the electricity grids in a safe and stable person.
- Follow up development of technical requirements for additional power demand (e.g. heat pumps and other sources) to ensure interoperability to achieve that additional power demand will be flexible.
- Work together in implementing the provisions on flexibility in upcoming EU legislation such as the electricity market reform, and the network code on demand side response. Wherever possible, Penta countries will aim to address the flexibility needs of the region when designing national policy.

Energy efficiency

The Pentalateral Energy Forum recognising the importance of increasing energy efficiency as a way to reduce dependence on fossil fuels, and to reduce the scale of the challenge of the energy transition. In this regard, Penta Sees both the value in saving energy, and in flexibility of power demand. Penta countries exchanged on implementation of the electricity demand reduction obligation that was mandated by EU legislation in the winter of 2022/2023.

Penta countries will continue to work together through Exchanging on the implementation of the revised Energy Efficiency Directive, and will exchange on best practices with regard to energy savings.

Decarbonisation

As described above, and based on the previous work on the Vision 2050, Penta countries continuous working towards a common political vision on a decarbonised electricity system, which should be renewed as soon as possible and ideally by 2035. Penta countries will work together to further scale up renewable energies and to keep awareness of the import of flexibility in moving towards a fully decarbonised electricity system without losing security of supply. Penta countries full knowledge and strive for better regional cooperation with the objective to exploit synergies and leverage efficiency gains. Penta countries will explore the added value of additional regional cooperation on renewable integration, grid planning, connecting the offshore to the onshore (in cooperation with the North Seas Energy Cooperation) and in addressing other questions with cross-border impact that may arise in the transition towards a decarbonised electricity system.

Hydrogen

In 2020, a dedicated Support Group on hydrogen was created with the goal to advance the work and close cooperation of Penta in the field of hydrogen. SG4 focus on the regulatory and market developments in view of hydrogen unemployment in the Penta-countries in relation to the national, European and international framework. Based on the political declaration on the role of hydrogen to decarbonise the energy system in Europe signed in 2020 and on recent developments, including REPowerEU and IEA's report entitled 'A 10-Point Plan to Reduce the European Union's Reliance on Russian Natural Gas', the Penta-countries exchange information and defined common positions on the future market design for the developments in the view of hydrocarbons. In particular, SG4 will continue working on development of hydrogen certification, emerging hydrogen infrastructure in the Penta region and steps needing to develop cross-border interconnections as well as monitor the progress of the implementation of the Hydrogen strategies of the Penta-countries

aiming at the development of regulation, supporting mechanisms, investments, supply- demand developments, trade, major others.

Common NSEC Chapter FOR NECPs

North Seas Energy Cooperation – Regional offshore renewable energy cooperation

The Netherlands is part of the wider North Seas region, which has a large renewable energy potential.
The absorption of offshore wind energy play an incremental importing role in Reaching Europe's energy and climate goals. The EU Offshore Strategy has set the ambitious goal of 300 GW of offshore wind and 40 GW of ocean energy installed capacity by 2050. On 19th January 2023 the North Seas Energy Cooperation (NSEC) facilitated the development of the non-binding agreement on objectives for offshore renewable energy generation in 2050 with intermediate steps in 2040 and 2030 for priority offshore grid corridor Northern Seas offshore grids under the TEN-E Regulation. Targets for the NSOG priority offshore grid corridor constitute 60.3 GW in 2030, between 134,9 and 158 GW in 2040, and between 171,6 and 218 GW in 2050. This means a significant change of scale for the offshore sector, renewable energy efficiency and strategic integrated offshore development. High energy prices, e.g. in 2022, and geopolitical events causing the European energy system have undercut the imperative of accelerating the deployment of domestic renewable energy generation capacities and transmission networks regionally offshore as quickly as possible, thereby significantly improving energy security.

The Netherlands works cooperating with the other NSEC countries on identifying, analysing and realising capacities for concrete cooperation projects. NSEC is a voluntary, bottom-up, market-oriented, regional cooperation initiative established in 2016, which series to:

- Create synergies;
- Avoidance of Incompatibilities between national policies;
- Share knowledge on international best practices;
- Foster joint strategies where possible and beneficial.

Ministers responsible for energy regulatory measures in the NSEC format. In 2023, NSEC nationals of Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway, and Sweden with the participation of the European Commission. On December 18th 2022, NSEC energy ministers and the EU Commissioner for energy signed a Memorandum of Understanding on offshore renewable energy cooperation with the United Kingdom. The establishment of this MoU was provided by the Trade and Cooperation Agreement between the European Union and the United Kingdom of 30 December 2020, builds on NSEC, and is distinct yet complementary to the NSEC framework.

For the offshore wind sector, it is vital to offer a predictable and stable long-term operating environment to facilitate long-term investments and further cost reductions. To this end, existing barriers must be removed and attractive investment conditions should be created. NSEC members working together to make an important contribution to achieving these objectives through a regulatory exchange of expertise focused on several topics within the four NSEC Support Groups (SGS):

- SG1: development of hybrid and joint projects;
- SG2: Permitting, maritime spatial planning and environmental considerations;
- SG3: financing and support frameworks;
- SG4: long term grid and infrastructure planning.

In order for each support group to deliver on its goal, the exchange between and within support groups, is very likely and overseen at the NSEC coordinators level. Examples of this are on ports with SG1 and SG4, maritime spatial planning and grid planning with SG2 and SG4, and how Non-price criteria can strengthen innovation on key challenges for an accelerated, Cost-efficient and responsible discharge of offshore wind with SG1, SG3 and SG4. Finally, the support groups also liaise closely with other international fora, such as the Pentalateral Energy Forum and the Clean Industrial Forum in relation to onshore grid planning, market arrangements and stakeholder engagement.

Development of hybrid and joint projects

NSH's SG1 serves as a platform to collaborate on concepts for potential offshore wind projects and a coordinated

electricity infrastructure, including transmission infrastructure. The group has increased its activity as NSEC countries have started more joint and hybrid projects in the North Seas in order to facilitate technical and budgetary discussions and sharing of best practices as well as the projects progress.
Besides joint projects on offshore wind, which will be connected and supported by different countries, the support group also works on possible “hybrid” solutions that use cross-border options to connect offshore wind farms to more than one electricity market and create synergies between countries, as well as the correspondence EU and national market arrangements.

Therefore, the members of SG1 develop opportunities for collaboration on hybrid projects as well as on possible legal, regulatory and commercial barriers. SG1 will continue to work on the barriers and steps for hybrid and joint projects, which can be addressed on the national and regional level. Furthermore, the collaboration will continue to function as a forum to reflect on how to work on issues with legislative processes at the EU and national level.

Permitting, maritime spatial planning and environmental considerations

In order to address our energy and climate targets within the EU, there is a need to accelerate planning and Permitting procedures at EU and national level, and at the same time better Understand the possible ecological limits of large scale wind development in the North Seas and the impacts on other users of the sea. SG2 made an inventory of spatial Tensions of 2030 offshore wind farm developments on a regional sea scale. Next steps are set to better define the ecological Tensions and potential threats for development and defined spatial strategies to avoid or mitigate such threats. To increase knowledge and support the absorption of offshore wind in the North Seas, the North Seas countries will continue to cooperate closely on maritime spatial planning, environmental research, cumulative impact assessment of wind farms between responsible authorities for energy, maritime spatial planning and environment.

Financing and support frameworks

Offshore tenders are a central top for financing and support frameworks. NSEC members coordinate the offshore tenders by means of sharing information concerning the national tender specifications as a part of SG3. In the working group, the countries also exchange best practices concerning tender design, zero-subsidy support, design elements to foster system and sector integration as well as as grid connection regimes. To achieve the ambitious goals, joint projects are also reaching more and more important.

For this reason, the group also addressing financing opportunities for joint cross-border offshore projects, including through EU financing instruments such as the Connecting Europe Facility and the Union Renewable Energy Financing Mechanism. Finally, Power Purchase Agreements (PPAS) play an incremental importing role in the financing of offshore projects. The countries will address the issues, barriers and solutions for a wider up of PPAS. Further, the group exchanges on the decommissioning, lifetime extension and repowering of wind farms. The aim of the changes is to jointly develop and discuss ideas for the medium term future of the offshore energy system in terms of installed capacity, e.g. through the coordinated tender modules.

Delivery 2050: long-term grid and infrastructure planning

NSECs SG4 works with ENTSO-E to provide and coordinate input on the Offshore Network Development Plan for the Northern Seas offshore grids under the EU TEN-E regulation. Furthermore, SG4 claims to Broaden the discussion on long-term grid planning to include the early development and update of green offshore hydrogen production and transport, and its potential role in an incremental connected North Seas energy system. Green hydrogen will be imported into decarbonising our energy system. Power-to-X, and specialised hydrogen, will play a key role in providing flexibility where and when it is need. Hydrogen demand is expected to be significant, especially after 2030n due to both its potential as a recoverable energy carrier and, as a fuel and raw material for hard-to-electrify activities. Several NSEC countries have fixed targets for onshore and offshore green hydrogen production targets. In SG4, NSEC countries will exchange first experiences with hydrogen in correlation to offshore wind, and exchange knowledge on transport infrastructure, RES development and offshore power-to-X production. They will work together to provide insights on offshore hydrogen production, to discuss the roll-out of electrolysis, and to increase the synergies between the long-term offshore grid and hydrogen network planning. In all aspects of medium and long-term infrastructure planning, SG4 underlines the significance of broad engagement on this planning process with member states and relevant stakeholders, including industry and NGOs, to Anticipate and tackle supply-chain bottlenecks (e.g., ports’ development and availability) in the rollout and acceleration of delivering our North Seas energy system. This closely relates to the import of safeguarding the security of offshore and underwater critical infrastructure, and the supply of critical raw materials, through innovation and

enhanced circularity.

2 national objectives and targets

2.1 Decarbonisation dimension

1. GHG emissions and removals

i. Greenhouse gas emission reduction target, ESR and LULUCF

National targets consist of targets set by the government for the Netherlands and targets that are a national translation of European policies.

National Climate Law targets

The national climate targets are set out in the Climate Law. The government is working on a proposal for the first amendment of the Climate Law, which strengthens the 2030 and 2050 targets and avoids conflict with the European Climate Law:

1 The target of 95 % reduction by 2050 will be tightened up to an obligation for the Netherlands to reduce net greenhouse gas emissions to zero by 2050.
2 The 49 % reduction target by 2030 is replaced by a target of at least 55 % reduction, includes land use and is without prejudice to the reduction obligations under the European Climate Law and the binding EU legal acts adopted to develop it.

The parliamentary process is ongoing. In addition to this first amendment to the Climate Law, a second amendment will follow. This amendment enshrines the position of the Climate Council in law and aligns the cycle of the Climate Law with the Dutch budget cycle. The government will also consider intermediate targets for 2035 and 2040 in the Climate Law. It will be part of the new European target for 2040 proposed by the European Commission in 2024. The second amendment is expected to enter into force in 2025.

Indicative votes by sector in 2030

In view of the achievement of the 55 % target by 2030, an acceleration of emission reductions is needed. In order to achieve with sufficient certainty the tightened target of at least 55 % reduction by 2030, the government intends to focus on about 60 % emission reductions when drawing up climate policy, so that even in the case of shortfalls the 55 % is not at stake.

The table below gives an overview of the target emission reductions in 2030, i.e.v IBO Klimaat,16 including indicative residual emissions by sector. With Prinsjesdag this autumn, calculations from the PBL – in anticipation of the annual climate and energy survey – show the range of emission reduction in 2030. The reduction through cross-sectoral measures has not yet been allocated to the individual sectors. This is considered in the Climate Note 2023.

Further sectoral policy implementation and specific instruments are described in Chapter 3.

16

Parliamentary paper 32813, No 1230.

Table 2.1 Estimated emissions in 2030 based on current IBO Climate policy and reduction by sector by additional measures (in megaton $CO_{2\ equivalents}$).

Sector	Emissions target in 2030 based on IBO Climate (including Policy and Programme Climate Action June 2022)	Additional measures (in April package)	2030 elections
Electricity *	17	4,0	13
Industry + CE *	34,8	5,2	29,6
Mobility * *	25,0	4,0	21,0
Farming	20,5	4 * * *	17,9 * * *
Use of land	2,5	1,4	1,8 * * *
Built Environment	14,6	3,2	13,2
Overshooting sector	—		— 3,2
Sum of sectors	114,4		93
Total national estimate * * * * (IBO baseline path)	113	**Approx. 22**	91
Additional global reduction		***Approx. 2,5***	

3 The size of the residual emissions is determined by the balance of positive and negative emissions.

** * mobility: this excludes international aviation, maritime and international inland waterway transport.*

*3 * * the indicative residual agricultural mission has been reinforced by an additional 1 megatonnes reduction in greenhouse horticulture compared to the Climate Policy Programme.*

The indicative statement has not been corrected for the additional livestock and arable farming policy, as this does not change the NPLG (5 megatonnes) mission set out in the Coalition Agreement. For land use, the government maintains the residual objective of the Climate Policy Programme.

*4 * * * PBL and IBO Climate have taken into account inter-sectoral interactions in the estimates. As a result, the sum of emissions figures by sector is slightly higher for the projected emissions than is shown in this table as a national total.*

National obligations arising from European policies

Under the Fit for 55 policy package, the ESR and LULUCF regulations have been revised. Both regulations entered into force definitively. The new obligations under the ESR and LULUCF are as follows:

Table 2.2 National targets under ESR/LULUCF

Obligations	Redistribution to national purpose
Cumulative issuance budget for ESR sectors in the period 2021 to 2030	Approx. 839 megatons of CO_2equivalents
LULUCF (net emissions budget in 2030)	4,5 megaton $CO_{2\ equivalents}$

N.B.: the final carbon budgets under the ESR have not yet been established (pending implementing legislation and subject to mid-term review), an estimate is given above.

With the additional package decided by the government in April, the government expects to meet the ESA obligation. The new official estimate of the PBL incorporating this additional package will be available in September, ahead of the publication of the new KEV. This will make it clear whether the ESR objective is within reach. This will be taken into account in the final update of INEK (2024).

Land-use, land-use change and forestry (LULUCF)

The revision of the European Land Use, Land Use Change and Forestry (LULUCF) Regulation entered into force on 11 May 2023. The joint target for the EU in 2030 was increased from 225 megatonnes of net carbon storage to at least 310 megatonnes of net carbon storage in the review, to be achieved by capturing more carbon from land use than that emitted by land use. This also adjusts the net carbon storage targets for 2030 at Member State level. For the Netherlands, this target has been adjusted to a maximum of 4,5 megatons of net carbon emissions in 2030. The revised regulation will cover the period 2026-2030, using a four-

year budget for the years 2026-2029 and a binding target for the year 2030. If a Member State exceeds the four-year budget, the deficit shall be multiplied by a factor of 1,08 to the national target for 2030.

ii. Other national objectives and targets, including sectoral objectives and climate change adaptation National Climate Adaptation Strategy

In 2021, the European Commission published a new EU strategy on adaptation to climate change. This strategy, part of the EU Green Deal,[17] implements the Regulation for a European Climate Law[18] that requires the EU to be a climate-resilient society by 2050, adapted to the inevitable impacts of climate change.

This objective is in line with national climate change adaptation policies. Both the[19] 2016 National Adaptation Strategy (NAS) and the Delta programme[20] aim to achieve climate-resilient and water-resilient spatial planning in the Netherlands by 2050. It focuses on the resilience of our society, the economy, ecology, the water system and our security. Within these programmes, various tools have been developed to make knowledge of climate change accessible and to stimulate adaptation, such as the Climate Impact Atlas and the Climate Damage Estimate. Investments in the climate proofing of the Netherlands are being made from various departments and local and regional authorities, in conjunction with other challenges.

The new EU strategy aims to address climate change adaptation smarter, faster and systemically. This requires coordination between the different policy areas where the effects of climate change are felt. The integrated approach to adaptation and mitigation through natural processes and ecosystems, known as nature-based solutions, plays an important role. The Commission will support Member States in their implementation, including by identifying the financial benefits and developing financial products under InvestEU that stimulate nature-based solutions applications.

The new EU Strategy will feed into the development of the new National Adaptation Strategy, in addition to the results of the evaluation of[21] the NAS, the upcoming KNMI climate scenarios (expected in autumn 2023) and the PBL's analysis of impacts and risks associated with climate change (expected in 2025). The new National Strategy is expected in 2026.

Clean Air Accord

The Clean Air Agreement was launched on 13 January 2020. This concerns mainly the reduction of NOx and particulate matter emissions. The Government is working with local and regional authorities to continuously improve air quality in order to achieve health benefits for all in the Netherlands. The implementation also involves citizens and businesses. The Clean Air Accord sets a downward trend of emissions to air across all sectors to achieve 50 % health benefits by 2030 from emissions from Dutch sources compared to 2016. This is moving towards the 2005 WHO advice values in 2030.

National Circular Economy Programme

The Netherlands wants to be fully circular by 2050. In a circular economy, raw materials and products are being used in a resource-efficient and smart way. We use fewer raw materials because we use products longer. Raw materials used will be used again for new products. We also choose raw materials that are always replenished. In this way, the value of raw materials, materials and products is maintained for as long as possible, resulting in almost no waste. The impact is that with the use of raw materials in production and consumption, we do not emit CO_2, do not cause pollution, improve biodiversity and improve the security of supply of raw materials. The environmental impact of the use of raw materials in a circular economy, i.e. of all Dutch production and consumption, should be reduced to the earth's carrying capacity by 2050. The Kingdom of Spain is working to give concrete expression to the planetary boundaries and the resulting 'safe operating space' for the use of raw materials by the Netherlands. At European level, the Netherlands is taking steps to further operationalise this.

In order to achieve the objective, more guiding and coercive measures are needed. The National Programme Circular Economy 2023-2030 (NPCE) includes a mix of normative, price-setting and incentive measures. Where the policy was more focused on the back of the chain, it is now more at the front of the chain. Consider circular design and lifetime extension of the user phase. Circularity targets for priority product chains have also been developed in the NPCE.

The NPCE will focus on further developing the ambitious climate target for the circular economy. Indeed, by steering and

17 Parliamentary paper 35377, No 1.
18 Parliamentary paper 22112, No 2860.
19 https://klimaatadaptatienederland.nl/overheden/nas/.
20 https://www.deltaprogramma.nl/.
21 Parliamentary paper 31793, No 233.

facilitating (international) sustainable circular chains, circular economy policies contribute to the climate challenge.

Based on the results of the biennial Integrated Circular Economy Report (ICER) of the Environmental Planning Bureau, the package of measures in the NPCE can be adapted and expanded.

International transport sectors

Emissions from international aviation and shipping, linked to the so-called international fuel bunkers, do not count towards national emission totals. Therefore, in national climate policy, as summarised in Table 2.1, these are not counted under mobility. The government is exploring the possibility and desirability of counting these sectors towards the national 2050 climate target. These sectors do count towards the goals of the Paris Agreement. For maritime and inland waterway transport, the government is working towards climate neutrality by 2050. For aviation, several national climate targets have been set out in the Aviation Note 2020-2050, starting with CO_2emissions in 2030 at most equal to 2005. This concerns the total emissions of departing flights from the Netherlands and the reduction must take place entirely within the sector.

Renewable energy

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

The trajectory on the Renewable Energy Directive is currently in its final phase. In trilogues, agreement was reached on increasing the European target to 42.5 % renewable energy. The Netherlands has been working at European level to increase the European targets for renewable energy (32 %) and energy savings as part of REPowerEU. The Netherlands places the reduction of greenhouse gas emissions at the heart of climate and energy policy. Renewable energy and energy savings are important to achieve the CO_2reduction targets. At this point in time, the RED III trajectory has not yet been completed. Once the trajectory is completed, the exact indicative national contribution for the Netherlands will be elaborated.

Current goals and progress

According to the KEV 2022, the Netherlands is expected to achieve a 30.5 % share of renewable energy in 2030 (bandwidth 26,9-32,6) on the basis of established policies as known as of 1 May 2022. This largely achieves the current 27 % national reference target based on RED II (European target of 32 %) for 2030 based on established policies.

In 2020, the share of renewable energy in the Netherlands was 11.5 %, with a statistical transfer reaching the binding target of 14 %. In 2021, there was also a shortfall in the reference target and the (domestic) share of renewable energy reached 13.0 % (CBS, 2023).22 The Netherlands is expected to reach around the level of the 2020 reference target in 2022, but the reference point of the indicative trajectory for 2023 (16.3 %) is currently out of reach. This reference point is expected to be reached around 2023. With the agreements in the Coalition Agreement (2022), the government is striving to significantly increase the share of renewable energy through the additional rollout of, inter alia, offshore wind, solar on roof and scale-up of innovative technologies such as hydrogen and green gas. It is committed to a significant increase in the share of renewable energy, so that in the coming years the share of renewable energy is well on track with the indicative path agreed at European level towards the 27 % target for 2030. The contribution to the raised EU renewable energy target is specified in the final INEK update.

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

1. Electricity and renewable energy

The Netherlands is working hard to make electricity production more sustainable. In recent years, particular emphasis has been placed on increasing the share of solar and offshore wind energy. For a description of the routes by mode, see section 2.II.iii below.

Green gas

Through the Groen Gas Programme, the government aims to scale up the production of green gas in the Netherlands to at least 2 billion cube (bcm) in 2030. The programme does not yet include ambitions for 2050, but it does explicitly examine the role that green gas can play in the energy and raw materials system by 2050. In order to achieve the ambitions for 2030, the programme is working on several measures, including business case, spatial integration and resource availability.

The Government is currently working on a blending obligation that will oblige energy suppliers to supply a growing amount of green gas administratively to end users in the built environment. This share will reach 1,6 bcm in 2030. This obligation should

22Refers to a more detailed provisional figure.

ensure a long-term stable business case for green gas producers and corresponding investments in production capacity. In order to stimulate large-scale demonstration of gasification projects, a subsidy scheme for this technology is being developed. For this purpose, EUR 300 million have been allocated in the Multiannual Programme of the Climate Fund for 2024, and a further EUR 300 million has been earmarked in the Multiannual Programme for 2025.

In order to speed up the deployment of installations, network operators are looking at overcoming infeed capacity bottlenecks, for example in relation to gas quality requirements or *reverse flow* investments. An amendment to the Ministerial Order on Gas Quality is under preparation for a number of already identified bottlenecks. In addition, the co-authorities are exploring ways of speeding up permitting and spatial integration. Finally, fermentation is included as a sustainable agricultural technique aimed at reducing methane and nitrogen emissions in the agricultural sustainability plans. It also looks at ensuring sustainability and achieving the right policy and legal frameworks for the release of bio-raw materials and the marketing of residual streams from the fermentation process.

2. Heating and cooling

The Government has commissioned an investigation into whether the Netherlands can meet the binding heat target of 1.1 % proposed by the Commission. The Netherlands has indicated that it also wishes to use waste heat for the share of heat/cool. A top-up of 0.2 % points will then apply, so that the target to be achieved becomes 1.3 % point. The trajectory of the revised REDIII is not yet finalised. The above study shows that the Netherlands can achieve the intended purpose of the RED III, which is still under development: 1.34 % point on the basis of the planned policy.23 The target emission reduction could lead to an additional 73 petajoule renewable heat through the blending obligation for green gas, the stimulation of hybrid heat pumps and renewable heat in greenhouse horticulture and 113 petajoule reduction of final energy consumption for heat through post-insulation and savings in industry and agriculture. Once the REDIII has been completed, the Netherlands will proceed to a national target.
The built environment accounts for the largest share of national final energy consumption compared to other sectors, with 37 % as a sector. The final energy consumption of the built environment decreased since 2010 mainly due to improved insulation and more efficient space heating installations. The growing stock of buildings does not make savings in part. The decrease in final consumption has stagnated for a number of years.

The share of renewable heat in final heat consumption increases year on year and is 10.4 % in 2021. Among households, biofeedstock accounts for the largest share of renewable heat, but this share is decreasing each year. In the services sector, the share of bioraw materials is much smaller. The number of dwellings connected to a heat network in 2020 is around 430.000. Heat grids are required to report on their sustainability, in 2021 the renewable share of energy is 38.5 %.

The National Programme to Support the Local Heat Transition (NPLW) supports municipalities in their regional authority in the local heat transition and in accelerating and scaling up the heat transition. Within the programme, 57 municipalities in 66 testbeds are learning how to design and scale up the neighbourhood approach, under the motto ‘learning by doing’. The NPLW Knowledge and Learning Programme distributes the lessons through knowledge meetings and products such as the participation guide and the heat transition roadmap. The NPLW has thus built over the last four years a large learning network of municipalities, stakeholders and knowledge institutions, working together towards a natural gas free built environment.

The NPLW Monitor 2021 shows that more and more test gardens are under way: homes are insulated and natural gas is replaced by renewable heat with (hybrid) heat pumps or a heat grid. Almost half of the test-beds are now in the implementation phase. The number of natural gas liberated dwellings increased from 642 at the end of 2020 and 1.197 in mid-2021 to 1.805 dwellings and 8 non-residential buildings in May 2022. In addition, 500 dwellings are now 13 non-residential buildings that are natural gas free of charge. These figures are updated twice a year on the dashboard of the NPLW website.

The heat pump grew by 37 % in 2021. These were mainly air-to-air heat pumps, also known as the air conditioning. In 2021, more than 1,7 million installations were installed. This has increased by almost 25 % since 2020.24 In the light of the delegated act on renewable cold, it is currently being examined how the share of renewable cooling can be monitored and counted.

3. Built environment

In terms of area measures, the policy on sources and infrastructure for heating and cooling is set out in programme line 4 of the

23Parliamentary paper 22112, No 3521.
24 Monitor Enhancing the Sustainability of Building Environment 2022, see www.rvo.nl/nieuws/monitor-verduurzaming-gebouwde-omgeving-2022.

Acceleration of Sustainability Programme for Building Environment.

Heating

Natural gas is partially replaced by green gas, reducing CO_2emissions and encouraging the development of renewable sources and energy carriers. In addition, the tools and conditions for new infrastructure (heat networks) are being put in place. The following shall be carried out:

- In order to remove bottlenecks in the sustainability of heat networks in the built environment, work is under way on the Collective Heat Supply Act, which encourages the construction of new heat networks through a parcel system and the phased introduction of cost-based tariff regulation, as well as a sustainability standard. This law also imposes an obligation to have a majority public interest in the heat infrastructure, thereby creating transitional law for the existing situations. Policies are currently being developed to stimulate the build-up of public realism. In 2023, it is also a subsidy instrument to eliminate the unprofitable top of heat networks. It will also be opened in subsequent years, with the unprofitable peak becoming increasingly limited by the phased introduction of cost-based tariffs. In the short term, is with NieuweWArmteNU! (National Growth Fund) found funding for 12 flywheel projects and six innovation projects. In addition, sustainable heat sources need flanking policies to further scale up and reduce costs. In this way, the vision of the heat system, its development and the heat source strategy are implemented.

- In the Coalition Agreement, a green gas blending obligation equal to 20 % of gas consumption in the built environment in 2030, or 1,6 billion cubic metres (bcm) of green gas, was agreed. With the Green Gas Programme, the Government aims to increase national production of green gas to at least 2 bcm by 2030. This is a strong challenge in view of the current production of 0,2 bcm but is appropriate to the climate ambition of this government. Hydrogen can also be used as an energy carrier in the built environment, although its availability and affordability are still very uncertain. The Government therefore expects that large-scale use of hydrogen in the built environment will not take place before 2030. In order to ensure that hydrogen is also deployable with sufficient availability and affordability, knowledge is currently being developed on its application in the built environment and its framework conditions. To this end, the Government is implementing a strategic research agenda and demonstration projects together with others.

Cooling

There are two tracks:

- **Discouraging active and energy-intensive cooling**. In new buildings, standardisation (so called TO Juli) is already controlled for sufficient cooling. To fill the cooling demand in the existing construction, there are several choices that building owners can make. From the point of view of energy demand, the Netherlands prefers passive cooling, such as shading, good ventilation and green in the environment, but active cooling such as air conditioners is also increasingly used. The Netherlands discourages and discourages this active and energy-intensive cooling. The website www.koelebuurt.nl gathers publications for residents and other stakeholders. The Improvement House.nl website provides tips for residents and building owners to keep their home cool.
- **Develop a knowledge agenda on cooling**. The demand for cooling in the built environment will increase in the coming years.

In order to increase the impact of cooling on the energy system, a study has been carried out which forms the basis of the knowledge agenda on cooling.25 Knowledge and information are currently being sought on the main findings. The main findings are in turn: — We know too little about the cooling behaviour of residents and measures they take to prevent heating of their homes.

- The link between the existing models dealing with different aspects is missing.
- Many of the model components have not yet been sufficiently validated with measurement data.
- For the reasons set out above, too little is known about the effectiveness of measures and possible policy instruments.
- The level of knowledge on the impacts of overheating in existing buildings is also moderately developed in other countries within the EU.

In the short term, it is also recommended to start work on the first knowledge question: “Quantifying current and future housing cooling needs and demand”. This development gives an initial indication of the scale of the problem and the urgency to address it.

Regarding building measures for heating and cooling, point 3.2.I sets out the policy.

4. Farming

There are many different sectors of farming in agriculture. Climate policy in agriculture is tailored to address the different source

knowledge agenda – new cold demanddwellings.

emissions. A large part of the emissions from agriculture, with the exception of the glasshouse horticulture sector, are attributable to biological processes in the animal and caused by tillage. A limited part, 0,6 megatons, is attributable to heating or cooling of storage areas of the primary products, such as fruit, vegetables, meat and dairy products.

CO_2emissions in 2021 amounted to 7,8 megatons (Emission registration, 2023). Most of the emissions of $CO_2$from agriculture come from greenhouse horticulture (of which around 0,1 megatons within the ETS). The 2030 final target is set at 4,3 megatons.26 This target is ambitious and 1,0 to 0,5 megatons more sharply compared to previous agreements such as the Coalition Agreement. The Energy Transition Convenant Glastuinbouw 2022-2030 sets out the measures

[25] www.rijksoverheid.nl/onderwerpen/duurzaam-bouwen-en-verbouwen/documenten/rapporten/2022/10/11/ and the parties' commitment to achieving the desired goal.27 On the one hand, an additional commitment to incentives such as subsidies, infrastructure, area-based approach through the Greenports, the Kas as an Energy Source for R &D, demo and knowledge exchange programme and, on the other hand, incentivising measures such as further pricing of CO_2emissions by adjusting energy taxation, creating and implementing an improved CO_2sector system and requiring energy-saving measures that can be recovered within 5 years.

5. Transport

People want to travel safely, quickly and easily from door-to-door. Businesses want their goods to reach their destination quickly and reliably. This does not change, but the way it does. Our transport accounts for a quarter of CO_2emissions. The aim is to have all new cars and vans zero-emission by 2030. These include hydrogen and battery electric vehicles. These vehicles do not emit greenhouse gases while driving, clean our air and reduce noise pollution.

In the future, the government sees a role for hydrogen as an energy carrier for heavy-duty vehicles, such as trucks and buses, and to replace diesel trains and aviation. Towards CO_2reduction, innovative biofuels will reduce emissions for the existing fleet (including logistics). Many biofuels are already produced from waste and residues. The increase in biofuels should mainly be derived from sustainable biogenic residues (including cascading). This is in line with the government's objective of using bioraw materials as high as possible and in developing the circular economy. For the use of renewable (biological and synthetic) fuels in aviation, the government has separate targets: 14 % in 2030 and 100 % in 2050.

iii. Estimated trajectories for each renewable energy technology

The government is strongly committed to increasing the share of renewable energy in the energy mix between 2020 and 2030. The indicative trajectory of the Dutch contribution to the EU renewable energy target between 2021 and 2030 is non-linear due to the nature of large-scale renewable energy projects delivered in shock.

Speeding up and simplifying licensing procedures

The energy transition needs to be faster. This is done by using all possible means. The Government is accelerating the energy transition from a clear idea with a long term perspective and by taking greater control over the implementation of projects. This is done in different ways through a broad accelerator package. Where the energy transition calls for stronger legislation or the removal of barriers, opportunities are being sought. It has been explored what legal adjustments are possible to speed up procedures, and thus lead times, for energy infrastructure projects by:

- The national coordination scheme (RCR) and provincial coordination scheme (in the Omgevingswet the project procedure) apply to more projects. For example, for hydrogen infrastructure projects, electrolysers and the Delta Rhine Corridor (the bundle of multiple pipelines between the port of Rotterdam, Limburgse Chemelot and the German Rhine country, with a possible branch to the port of Antwerp). In many cases, the application of the RCR results in time savings in the procedures and therefore leads to faster implementation of the project.
- Shortening the project process, including by moving over (steps in) the exploratory phase and maximising the deadline. This may apply to designated projects for sustainable energy infrastructure at national scale (in particular MIEK projects) with little impact on the physical environment or where there is little choice. This has the potential to avoid a half year delay for the projects concerned.
- The exemption of certain smaller construction works: this acceleration option specifically targets smaller construction activities of regional network operators, such as small transformer stations with little impact on the environment. These construction

26Parliamentary paper 32813, No 1230.
27Memorandum of Understanding on Energy Transition Glastuinbouw 2022-2030, Parliamentary Document 32627, No 43.

activities often do not (just) fit within the current category of unlicensed buildings of up to 15 square metres and a height of 3 metres. In the coming years, many additional transformers will be needed. These are important for the functioning of the network and for further electrification of industry. A possible extension of the standards of these constructions that can be built without a permit will make network extensions more timely and allow companies to switch more quickly to sustainable production. In addition, the licensing of smaller construction works relieves the licensing authority of municipalities, so that this capacity can be used for complex building permits, for example for industrial companies.

- Changes to the objection and appeal procedure which are largely included in the reports of the University of Groningen. The reports also provide a lot of guidance for administrative administration, which already exists under the Algemene wet bestuursrecht (General Administrative Law Act).
- Other legal options such as improvements in the coordination procedure and possible adaptation of the procedure for establishing acquiescence obligations. These acceleration proposals include both sufficient capacity of the judiciary and the implications for the organisation of the judiciary.

Achieving acceleration in and in permit pathways and spatial integration is needed. The exploration shows that existing laws and regulations offer opportunities that can be used more frequently and in a more targeted way, and that the greatest time savings can be achieved here and not in legislative and regulatory adjustments.

- Improve licensing, supervision and enforcement (VTH) through the Interadministrative Programme on Strengthening VTH-System (IBP);
- Strategic preparation of the permit process;
- Smarter establishment of processes and procedures;
- Increasing capacity and knowledge;
- Guidance for non-application RCR procedure;
- Decision model for municipalities and provinces helping them to make choices to get land available for the construction of large-scale energy infrastructure.

Further feasibility studies are being carried out and the type of projects for which acceleration measures can be used will be identified. This can be broader than the energy transition, such as the proposals in the objection and appeal phase that are also seen for housing construction.

Other options, such as the possibility of a maximum time limit for the competent authority for the entire permitting process for sustainable energy infrastructure projects, are being explored with interested parties.

The planned implementation of the Omgevingswet in early 2024 provides the basis for measures such as streamlining environmental and permitting procedures and one-stop shops and setting up digitalised procedures. This law merges most of the existing individual environmental permits (except in particular nature legislation and the EIA) into a single environmental permit. This permit may be granted for projects at national, provincial and municipal level.

A key element of the Omgevingswet is the Digital System Omgevingswet (DSO). This online platform for environmental permits identifies licence applicants by answering a few questions to the appropriate competent authority and sets out the requirements (in terms of content and form) for a successful permit application. The platform shall contact competent authorities with the applicant for authorisation. This DSO thus acts as a digital procedure for the Omgevingswet and acts as a national one-stop shop for environmental permits.

Electricity

Renewable onshore electricity – (solar and wind)

The declaration of 35 terawatt hours for solar and land-based wind (together ‘renewable on land’) in 2030 was laid down in the 2019 Climate Agreement. In this context, it is up to the regions to identify new areas for wind and/or solar energy in regional energy strategies. The RES monitor 202228 shows that the current electricity generation for renewable generation is around 22,8 terawatt-hours (9,4 terawatt-hour large-scale zon-PV and 13,4 terawatt-hour wind energy on land). Together with the projects in the pipeline and the ambition for new projects, the Monitor estimates that the target of 35 terawatt hours will be achieved.

There are schemes such as SDE + +, ISDE, SCE to apply for grants for wind and zon-PV projects. In addition, further policy was

28 www.pbl.nl/publicaties/monitor-res-2022.

announced in May 2022 to further increase the construction of zon-PV power generation.29 Among other things, standards for solar on roof have been announced and will be in line with the current EPBD guidelines. The House of Representatives has approved the Act to phase out the solar panels netting scheme. The Senate still has to vote on this.

The rental sector is also looking into the possibility of using additional funds for zon-PV in order to catch up with the purchasing sector.

Approach to offshore wind energy

The Wind Energy in Sea 2030 Roadmap sets out the ambition to increase offshore wind capacity from 3 gigawatts in 2022 to around 11,5 gigawatts installed in 2030.30 In 2022, the Netherlands doubled this ambition for offshore wind energy to a planned capacity of around 21 gigawatts by 2030.31 This doubling is in line with the European Commission's call on Member States to accelerate the development of renewable energy.32

The Wind Energy in Sea 2030 Complementary Roadmap sets out the wind energy areas in which these wind farms will be realised and how this deployment takes place over time.33 The following diagram shows this schedule:

Extent	Wind energy area, lot (s)	Tender lots	Wind farm expectedto be used	Status
0,75	*Borssele*, Lots I and II	Realised in 2016	2020	Realised
0,75	*Borssele*, lots III, IV and V	Realised in 2016	2020	Realised
0,76	*Hollandse Kust (South)*, Lots I and II	Realised in 2017	(2022-2023)	Under construction
0,76	*Hollandse Kust (South)*, Lots III and IV	Realised in 2019	(2022-2023)	Under construction
0,75	*Hollandse Kust (north)*, lot V	Realised in 2020	(2023)	Under construction
ca. 0,7	*Hollandse Kust (west)*, Lot VI	Realised in 2022	(2025-2026)	Planned
ca. 0,7	*Hollandse Kust (west)*, lot VII		(2025-2026)	Planned
ca. 1,0	*Ijmuiden Ver*, lot III	Fourth quarter 2023	(2028)	Planned
ca. 1,0	*Ijmuiden Ver*, lot IV		(2028)	Planned
ca. 1,0	*Ijmuiden Ver*, Lot I		(2029)	Planned
ca. 1,0	*Ijmuiden Ver*, Lot II		(2029)	Planned
ca. 1,0	*IJmuiden Ver (north)*, lot V		(2029)	Planned
ca. 1,0	*IJmuiden Ver (north)*, lot VI	Second quarter 2025	(2029)	Planned
ca. 2,0	*Lower Wine (Dairy)*, Lot I	2026 *	(2030)	Planned
ca. 2,0	*Lower Wine (North)*, Lot II		(2030)	Planned
ca. 2,0	*Lower Wine (North)*, Lot II		(2031)	Planned
ca. 0,7	*Hollandse Kust (North)*, Lot VIII	2026/2027 * *	tbc * *	Planned
ca. 0,7	*North of the Wadden Islands*, Lot I	2026/2027 *	(2031)	Planned
ca. 2,0	*Doordewind*, Lots I	2027 *	(2031)	Planned
ca. 2,0	*Doordewind*, Lots II	2027 *	(2031)	Planned

• *The tender dates for these wind energy areas are indicative. A final decision on the planning is expected in 2024, based on the results of the research programme for the connection of Wind in the Sea – Eemshaven (PAWOZ – Eemshaven) for the* north of the Wadden Islands *and Doordewind, and the landing survey for Lower Wine* III.

** * the tender date for this wind energy area is indicative. Pending clarification of Tata Steel's plans for improving the sustainability of energy supply and the production process, further decisions will be taken on this matter. Decisions on the landing of the relevant part of the net at sea will be linked to this.*

In 2020 and 2022, permits were granted for the construction and operation of three new wind farms, with a total installed capacity

29Parliamentary paper 32813, No 1046.
30Parliamentary paper 33561, No 42.
31Parliamentary paper 32813, No 974.
32European Commission; REPowerEU: joint European Action for more affordable, secure and sustainable energy, COM (2022) 108 final; Communication from the European Commission: 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality, COM (2021) 550 final.
33Parliamentary paper 33561, No 53.

of approximately 2,2 gigawatts.34 All three wind farms were authorised without subsidy, the last two wind farms having also paid a financial offer for obtaining the permits. Permitting procedures for wind farms are currently also driven to reduce the negative impact and strengthen the positive impact on the North Sea Nature, as well as to integrate into the energy system, for example through the production of renewable hydrogen or other forms of flexible demand.

In the coming years, the partial revision of the North Sea Programme will identify new wind energy areas for the possible realisation of offshore wind energy after 2031.

In the preparatory steps for the further deployment of offshore wind energy beyond 2030, the government takes into account some 50 gigawatts of installed power in 2040 and around 70 gigawatts in 2050. This depends, however, on whether it is spatially adaptable at sea and on land and in line with demand developments. In addition to electricity, hydrogen is expected to be produced in the North Sea. The electrolysis site plays a role in reducing expected grid congestion when landing around 21 gigawatts of offshore wind energy by 2030. Offshore electrolysis is expected to play a key role in unlocking off-shore wind farms sites for offshore wind energy production. This is also interesting from the lower land take at sea, compared to electricity cables, and lower transport costs through hydrogen lines. The HEROW Knowledge Platform and the Ministry of Economic Affairs are working on two demonstration projects of electrolysis at sea. These are planned before 2030 (100 megawatts) and around 2030 (500 megawatts). The offshore wind landing connection programme (VAWOZ) 2031-2040 (rvo.nl) also takes into account the landing of both electrons and molecules.35

As the wind energy areas will mainly be further off the coast after 2030, the government will use a hub based approach when deploying offshore wind energy after 2030. This means that for these larger areas, the form (electrons or molecules) in which the energy generated can best be brought to land will be considered in full. To this end, the 2050 North Sea Energy Infrastructure Plan will be drawn up with a strategic picture of where the government expects energy hubs and what infrastructure is needed for this purpose. This development for offshore wind energy after 2030 is conditional on it being adaptable to the North Sea, taking into account other interests such as shipping, nature and fisheries.

Offshore solar energy

The Netherlands has decided to install a gigawatt peak of sunshine at sea shortly after 2030 3. The Government is now examining the possibilities for this. The draft regulation for the licensing of the IJmuiden Ver lot Beta wind area includes an incentive to achieve up to 100 megawatts of the offshore sun. On the basis of the consultation of this concept, it is decided whether this will also be included in the final arrangement. These offshore solar parks will be realised within offshore wind farms. The first offshore solar energy pilot (approx. 1 megawatt peak) is currently taking place. Research on the ecological impacts of offshore solar energy is needed to establish definitive targets and to determine whether scaling up is desirable after 2030.

Ocean Energy

The potential of ocean energy technologies is too low to make a substantial contribution to the national energy transition. For this reason, the Netherlands has no objectives in the field of ocean energy. There are opportunities for Dutch companies abroad, where the potential is higher. Where possible, the policy aims to support these parties in their foreign ambitions.

Hydrogen

The Climate Agreement agreed that the electrolysis capacity in the Netherlands would be 500 megawatts in 2025 and between 2030 3 and 4 gigawatts in, in line with the additional growth in the share of renewable electricity. On this basis, the National Hydrogen Programme was launched in early 2022. This public-private programme focuses on unlocking the supply of renewable hydrogen, developing the necessary infrastructure and working with various sectoral programmes, and facilitating ongoing initiatives and projects. From

this programme shall also promote synergies between infrastructure and the use of both low-carbon and renewable hydrogen. The plans and actions for the coming years are described in a Hydrogen Roadmap.36

Given the excellent starting position of the Netherlands for the production, import and deployment of renewable hydrogen and the high existing demand for hydrogen, the Netherlands could become dominant in this area. Offshore wind energy will play a crucial role in Dutch hydrogen production. Producing renewable hydrogen, according to the EU criteria set out in the Renewable Energy

34Hollandse Kust (north), lot V and Hollandse Kust (west) lots VI and VII.
35Parliamentary paper 33561, No 54.
36 www.nationaalwaterstofprogramma.nl/over+ons/routekaart+waterstof/default.aspx.

Directive, requires a large amount of additional, unsubsidised renewable electricity.

All Dutch industrial clusters have indicated in their Cluster Energy Strategy (CES) that renewable and low-carbon hydrogen will play an important role in their sustainability strategies. From Europe, binding targets for the use of renewable hydrogen in industry and mobility are imposed on Member States. At the end of 2022, the government tightened the targets for hydrogen production in the Netherlands, while the new target is 8 gigawatts of electrolyser capacity by 2032. With the use of the refinery route, the subsidies made available for domestic production through IPCEI, the scale-up scheme and SDE + +, that supply is not yet sufficiently achieved. This is why additional tools will be used. Within the Energy Main Structure Programme, consideration is being given to the maximum contribution of hydrogen production to the energy system, through spatial control of large-scale electrolysis near electric landing and near the hydrogen transport network.

As of 2022, the development of this Dutch hydrogen transport network by Gasunie subsidiary Hynet Services is under way. Existing natural gas pipelines will be used for more than 80 % of this network. The most concrete demand for transport capacity is initially expected in the four coastal industrial clusters. Powered by renewable electricity produced mainly at sea, electrolysers in the coastal industrial clusters produce renewable hydrogen. Hydrogen imported into these port clusters is also entering the country. The first phase of the development of the transport network connects these four industrial clusters and creates interconnection capacity with neighbouring countries. For this purpose, the procedures for spatial integration using the National Coordination Scheme (RCR) have already started. In the second phase of development, demand is served from other parts of the country, including the fifth Chemelot industrial cluster in Limburg. The timing of the construction of the transport network depends on the demand of the companies. With growing production and demand for hydrogen, storage is also needed to ensure flexibility and security of supply. The production of hydrogen via electrolysis – linked to renewable electricity – is seasonal and weather dependent. Therefore, large-scale hydrogen storage is needed to absorb peaks and falls in this production profile – but also in the demand profile. In the meantime, procedures for hydrogen storage in salt cavernes in Groningen by Gasunie subsidiary Hystock have been launched. The possibility of hydrogen storage in empty gas fields is still being explored. This creates a nationwide hydrogen network, with sufficient storage capacity and interconnection with neighbouring countries. Regional distribution networks will also be part of this, so that renewable hydrogen can eventually be supplied to the entire industry, Dutch mobility and (parts of) the built environment. Hydrogen may also play a role in $CO_{2\ free}$, controllable power in the electricity sector. In addition, the agricultural sector, including glasshouse horticulture, is also looking at possible uses of hydrogen.

In addition, the government is working to stimulate innovative hydrogen projects and a human capital agenda, for example within the Greensvermogen NL programme and the TKI New Gas. Finally, work is underway on the conditions for the international hydrogen market, for example on the same rules (standardisation), quality criteria and safety standards for hydrogen transport, storage and use, and on hydrogen certification. This is done jointly with neighbouring countries, the European Union and countries outside Europe. It also encourages the construction of import terminals and seeks cooperation with several countries through bilateral Memoranda of Understanding (MoUs) aimed at creating corridors between exporting countries and north-west Europe. Through participation in the German H2Global initiative, an auction mechanism also supports the purchase of hydrogen to be imported.

At present, there is no specific consumer policy for hydrogen, although Book 6 of the Civil Code applies. The Civil Code, Book 6, deals with contract law. There are currently few consumers connected to hydrogen.

Revision of the EU Gas Directive

At the Energy Council on 28 March, a general approach was reached on the hydrogen and natural gas decarbonisation package. This revision of the EU Gas Directive and Regulation (1) focuses on hydrogen infrastructure and markets; (2) access to existing (nature) gas infrastructure and markets for renewable and low-carbon gases and security of supply; (3) network planning and (4) end-user protection and participation. Among other things, the package facilitates the rapid development of the European hydrogen market by providing legal frameworks for (cross-border) transport, storage and import/export infrastructure. Clarity on these rules is important for the development of concrete investment decisions. This is why the Netherlands has called on the Presidency to maintain momentum and to start negotiations with the European Commission and the European Parliament swiftly (trilogue phase). After the entry into force of the package, Member States will have 2 years to implement the Directive in their national legislation.

iv. Estimated trajectories for bioenergy demand and for the supply of bio soil substances, including the impact of forest biofeedstock on the LULUCF sink

The Netherlands sees an important role to play in using sustainable bioraw materials to achieve a climate-neutral and circular

society by 2050. Bioraw materials are seen as indispensable for ending dependence on (imported) primary fossil raw materials and mineral minerals, for example in chemicals, construction and the production of fuels for aviation and shipping. In doing so, the Netherlands also looks at the risks and concerns associated with the use of biocommodities, including air quality, deforestation, and biodiversity loss.

To address these concerns, the Netherlands has developed an integrated sustainability framework for bioraw materials. Sustainability criteria focus on the application of all types of bioraw materials, including circular economy materials (e.g. construction materials and raw materials for the chemical industry) and use for energy generation. These are biocommodity flows and applications that are encouraged or regulated by public authorities. For the time being, the sustainability criteria do not apply to the use of bioraw materials for fibres (paper and textiles) and to feed and food production, including transport. With the regulation, sustainability criteria will apply to all uses of biocommodity flows incentivised or regulated under climate and circular economy policies. Subsidised bioraw materials for energy applications have been subject to strict criteria for a long time, including through the Renewable Energy Directive (RED) and the Conformity Assessment Regulation on solid bioraw materials for energy applications. Therefore, the envisaged sustainability criteria from the biofeedstock sustainability framework are largely based on the RED and the conformity assessment scheme.

In addition, the sustainability framework sets out an overarching commitment to the use of bioraw materials for different high-grade and low-grade applications. This concerns the use of bioraw materials as an energy source and as a raw material. The guiding principle is that sustainable bioresources are only used when it fits into the final image or in the transition to it. Where sustainable alternatives become available in the short term, this will ultimately lead to a reduction of the subsidy on the use of bioraw materials for those uses. For example, this is already happening with the use of bio-raw materials for low temperature heat, which has not been subsidised since 2022.

Finally, work is underway to increase the availability of sustainable bioraw materials from the Netherlands, in conjunction with the promotion of new income models for the agricultural sector. This means that production and the deployment of biotic (residual) flows (regional) should give agriculture a perspective. The multiple neglect of sustainably produced bioraw materials and the high quality commitment based on the cascading principle are important principles. For public authorities, clear demand for bioraw materials from the use sectors is important for the proper development of the availability of bioraw materials. At the same time, the potential of bioraw materials in the Netherlands is too limited to meet Dutch demand in 2030 and 2050. In addition to increasing the availability of bioraw materials in the Netherlands, import of sustainable bioraw materials will therefore remain necessary.

v. Other national trajectories and objectives, including in the long term or by sector

Gas extraction Groningen

In the gas year 2021/2022, the maximum gas extraction rate was 4,5 billion Nm^3. From October 2022, the Groningenveld is on the pilot flame for the safety of the residents of Groningen. This means that a minimum amount of gas is extracted in the gas year 2022-2023: 2,8 billion m^3. From the 11 production sites remaining as of 1 October 2022, a number of which has been reduced to five as of 1 April 2023. The Government remains committed to closing the Groningen Field definitively by 2023 or by 2024 at the latest.

2.2 Dimension energy efficiency

I. The Energy Efficiency Directive (EED)

The Energy Efficiency Directive (EED) is an EU directive from 2012 with the aim of reducing energy use in the European Union. The current version of the Directive dates back to 2018. As part of the European Commission's Fit For 55 package, the EED has been revised. This was agreed during the political trilogues on 29 March 2023.

The main objective: indicative national contribution for reduction of total energy use in 2030

Current goals and progress

The current EED was revised in 2018. The headline target (Article 3) has been set at a 32.5 % reduction in total energy use in 2030 compared to the planned energy use in 2030 based on the 2007 EU Reference Scenario. Member States shall set indicative national targets for primary and final energy use37 to contribute to the collective EU target. The Netherlands aims to achieve a primary energy use of 1.950 petajoules in 2030, which translates into a final energy use of 1.837 petajoules. The KEV 2022 shows that the primary consumption target in the estimate is not met with established and planned policies. The expected primary energy use is 2.219-2.261 [bandwidth: 2.064-2.420] petajoule. Final energy use is estimated at 1.850 petajoules in 2030.

Fit For 55 EED recast

The European Commission's original proposal of July 2021 proposes to adjust the main objective of the EED (former Article 3) to a 9 % reduction by 2030 compared to the planned energy use in 2030 based on the 2020 EU Reference Scenario.38 Due to the war in Ukraine, the European Commission called in REPowerEU to further increase this reduction rate to 13 %. In March 2023, a political agreement was reached on the EED recast and the final reduction rate was set at 11.7 % reduction. This target is binding at EU level for final energy use and indicative for primary energy use. At national level, both targets are indicative. The exact indicative national contribution for the Netherlands is still being worked out. This contribution shall be determined on the basis of a prescribed formula in the EED recast, from which Member States may derogate from it. The Commission committed to update the EU Reference Scenario 2020 with the latest Eurostat data by November 2023, so the final national targets are not yet known.

Table 2.3 Comparison of targets, forecasts and current energy use (in petajoule)

	Energy use 2019	KeV 2022 forecast for 2030	EED (current) targets for 2030
Primary energy use	2.668	2.061-2.416	1.950
Final energy use	2.011	1.729-1.974	1.837

The sub-objectives: national energy savings obligation, public institutions savings obligation and public institutions renovation obligation

Current goals and progress

Article 5 of the current EED (2018) requires Member States to renovate 3 % of buildings owned and occupied by central government with a floor area above 250^{m} 2 per year in order to meet the minimum energy performance requirements set out in Article 4 of Directive 2010/31/EU.

Article 7 (EED 2018) requires Member States to achieve energy savings for final consumers of 0.8 % per year between 2021 and 2030. This obligation is cumulative, meaning that savings are added over the years. As a result, a measure contributes more to the achievement of the objective when it is applied earlier. The Netherlands has a savings target of 924 petajoule, cumulationffor the period 2021 to 2030. Only savings attributable to national policies are included. The KEV 2022 estimate for energy savings with adopted and planned policies is unlikely to be sufficient to achieve the target. The expected energy savings range is 721-939

The37 targets focus on energy consumption and exclude non-energy consumption, use of energy carriers as raw material in production processes. Final energy consumption is the energy consumption of end users in the built environment, industry, agriculture, mobility and aviation. Primary energy consumption is final energy consumption plus own consumption and conversion losses in the energy sector, such as electricity production and refineries.

38This is therefore a new reference scenario, in which the expected energy consumption has been revised downwards. 9 % reduction in this scenario corresponds to 36-39 % reduction compared to the 2007 baseline.

petajoule.

Fit For 55 EED recast

The EED recast gives the public sector an exemplary role, both at national and local level. Article 5 of the EED recast is a new target and requires Member States to reduce the energy use of public institutions (central, regional and local authorities) by 1.9 % annually. This target is indicative in the first two years and then becomes binding. This will be quantified as soon as the EED texts are finally published.

Article 6 requires Member States to renovate 3 % of the building surface of public institutions into NZEB annually in accordance with Article 9 of Directive 2010/31/EU. This applies to buildings owned by public institutions (central, regional and local authorities). The obligation concerns buildings owned and occupied by public institutions with a useful surface area greater than 250 m^2. The Directive allows an alternative approach to be pursued in order to realise the same energy savings. The implementation of the Netherlands will be determined as soon as the EED texts are finally published. This will be phased in with a savings obligation of 1.3 % per year in 2024 and 2025, 1.5 % per year in 2026 and 2027, and 1.9 % per year in 2028, 2029 and 2030. Finally, Article 8 also requires Member States to achieve a share of energy savings for vulnerable consumers or households affected by energy poverty. The quantification of the national cumulative target and the share of energy poverty will take place once the EED texts are finally published.

Finally, Article 8 requires Member States to save on average 1.49 % of final energy use per year between 2024 and 2030 through policy measures.

II. The indicative milestones for 2030, 2040 and 2050, the nationally determined measurable progress indicators and their contributions to the European Union's energy efficiency targets

The built environment accounts for over 30 % of total energy consumption in the Netherlands. In line with the Netherlands' broader energy and climate policy, the sustainability of the built environment is driven primarily by CO_2reduction. This means that $CO_{2\ emission}$ceilings have been chosen as indicative milestones for making the built environment more sustainable and progress will be measured by emissions of megaton $CO_{2\ equivalents}$. For 2030, following the spring decision making, the Netherlands has a new target for the built environment of 13,2 megatons of CO_2equivalents in 2030. Therefore, in order to achieve the long-term energy and climate targets, it is essential to make the national building stock more sustainable in the run-up to 2050, therefore each sector has a target of zero CO_2emissions. No intermediate target has yet been defined for 2040.

III. Other energy efficiency objectives

The Energy Performance of Buildings Directive (EPBD)

The revision of the Energy Performance of Buildings Directive (EPBD) aims to accelerate the renovation rate of buildings and reduce greenhouse gas emissions in the built environment. The EPBD proposal allows Member States to phase out fossil fuel installations in buildings through standardisation. The Commission proposes an effort obligation to phase out fossil fuels completely by 2040 when heating and cooling buildings. For existing buildings, the Commission proposes minimum energy performance requirements and harmonisation of the energy labelling system. For non-residential buildings and buildings of public institutions, there is an obligation to make the 15 % of buildings with the worst energy performance by 2027 more sustainable and to make a successive part of the stock of buildings with the worst energy performance by 2030 sustainable. For dwellings, by 2030, the 15 % of homes with the worst energy performance will need to be preserved, and a subsequent part of the 2033 stock. For new buildings, the Commission proposes that they should be fully zero-emission by 2030, including requirements for ventilation, fire safety, accessibility and circular material use.

The policy programme to accelerate the sustainability of the built environment is being developed in the context of the European context: the Green Deal and the Fit-for-55 package, in particular the EPBD, are relevant. Measures in the PVGO are in line with the reflections and proposals in the EPBD, for example on standardisation of non-residential buildings and the rental sector. However, the EPBD recast has not yet been completed at the time of writing this text.
Therefore, this INEK does not yet contain information on the EPBD recast, for example the new definition for nearly zero-energy buildings and requiring the minimum energy performance for buildings.

Emergency Regulations reduce gas and electricity consumption

In order to increase the security of gas supply, the European Union adopted the Emergency Ordinance 2022/1369 in August 2022.

For the time being, all European Member States should, on a voluntary basis, save 15 % of gas compared to the average over the past five years. The measurement obligation under this Regulation initially ran from August 2022 to March 2023. However, it has recently been extended until August 2024. In the period up to January, the EU has saved a large 19 % of gas,[39] The highest savings were achieved in Finland (-57 %) and the lowest in Malta (+ 12 %). The Netherlands saved 30 % of gas. The largest savings have been achieved in industry, closely followed by households.39

About one third of the savings are due to the mild winter. Some of the savings are likely to be caused by high energy bills, which have reduced the gas consumption of businesses and citizens. Through the campaign Zet, the central government has also provided tips to households and companies to save energy. Following several discussions with industry and co-authorities, many measures have been implemented which seem to bear fruit. Figures from the Statistics Netherlands show that the Dutch industry produced more in the period under review. The savings are therefore likely to be achieved not only by stopping processes and switching energy carriers, but also because of efficiency measures.

Since gas is also used to produce electricity, the European Union has also agreed to reduce electricity consumption. Between November 2022 and March 2023, Member States were expected to save 10 % of electricity compared to the average consumption in the same month over the last five years. During peak hours, when electricity is most expensive and gas is widely used, there was a mandatory reduction of 5 % compared to the average use during peak hours over the last five years. The extension of this emergency regulation has not yet been discussed. The Netherlands saved 7.8 % during peak hours, well above the target. By allowing electrification to be counted, the Netherlands achieved 9.8 % savings on a monthly basis. This emergency regulation uses the same tools as for gas saving.

[39] https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230221-1.

2.3 Dimension energy security

I. Increasing the diversification of energy sources and supplies from third countries, increasing the flexibility of the national energy system and addressing the disruption or shortage of supply of an energy source

Natural gas

Following Russia's invasion of Ukraine, the Netherlands decided in early 2022 to work towards independence from Russian fossil energy imports as soon as possible. It is positive that, thanks to the measures taken, the Netherlands is now no longer directly dependent on Russian fossil energy. At the same time, the government stresses that energy policy continues to pay full attention to

39Gas consumption in the Netherlands in 2022 lowest in 50 years (cbs.nl).

security of supply, including gas.

On the supply side of gas, this involves diversifying imports – primarily by increasing LNG import capacity and accelerating domestic production from small gas fields in the North Sea. The diversification policy is discussed in more detail in section 2.3.II below.

On the demand side, the energy transition is accelerating wherever possible and the Netherlands is focusing on gas savings. In this way too, the tightness of the market is reduced and dependence on imports is reduced. The Netherlands consumed on average 30 % less gas in 2022 than in previous years. The largest savings have been achieved in industry, followed by households. The Dutch saving of natural gas is explained in Chapter 2.2.I.

In the interests of security of gas supply, the Netherlands has also set the target of having at least 90 % of gas storage charges filled on average by the beginning of winter 2023-2024.

This goes beyond what is necessary under the obligations arising from Regulation (EU) 2022/1032 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 as regards gas storage, which results in a filling rate of 73 % to be achieved by 1 November 2023.

In order to reach the 90 % filling rate, the Dutch government has taken a series of filling measures. In the medium term, the Netherlands is developing a vision for the deployment of gas storage facilities.

In the Netherlands, a large proportion of protected customers are households. In order to prevent protected customers from being deprived of natural gas during a period of extreme cold due to a shortage of generation and transmission capacity, the network operator of the national gas transmission network Gasunie Transport Services (GTS) has the legal responsibility to reserve volume and capacity to supply protected customers in case of extreme cold. CTS is thus responsible for the peak supply to protected users in cases where the temperature is in the range of -9 °C to -17 °C. The transport infrastructure takes into account a temperature of -17 °C so that TSG is able to transport the necessary volumes in these cases.

IEA, GTS and the European Commission, among others, warned that there is a chance of gas shortages occurring in the coming winter (2023-2024). If there were to be shortages that could not be absorbed by the market, savings and sustainability, there is the Gas Protection and Recovery Plan (hereinafter: BHG) implementing the emergency plan to be drawn up periodically under the Gas Security of Supply Regulation. The BHG contains a series of measures that minimise the social and economic impact of a shortage and aim at safeguarding the security of gas supply to protected customers, including households.

Cyber resilience in the energy sector

In the energy sector, natural gas is still a relevant part of the Dutch energy supply for the coming years. In particular, (decreasing) national gas production (“small fields”, offshore), pipeline imports, the availability of underground gas storage facilities and LNG imports (via terminals) are important processes to ensure security of supply of natural gas to companies, power plants and households. Geopolitical developments have contributed to increasing their importance.

In order to effectively increase the cyber resilience of the gas sector and the mentioned gas storage and LNG facilities, the Netherlands issued instructions from operators of essential services in the gas sector as of 1 January 2023.[41] As a result of the designation, the designated group of providers is subject to a cybersecurity notification and duty of care on the basis of the Act on security of network and information systems (WGNI). The National Digital Infrastructure Inspectorate monitors these companies on behalf of the Minister for Climate and Energy. In addition, operators of essential services are entitled to receive support from the National Cyber Security Centre (NCSC). This includes, for example, receiving cybersecurity threat information from the NCSC.

For a future-proof approach, the Netherlands works to implement the European Cybersecurity Directive, Network- and Information Security 2 Directive (NIS2), which will enter into force in the Netherlands in October 2024. The NIS2 contributes to a higher level of cybersecurity of companies and organisations, including through greater harmonisation of Member States' cyber legislation. The gas sector is one of the essential sectors covered by the scope of this Directive. Gas sector entities will be subject to incident reporting in accordance with the Directive, have to implement security measures (duty of care), be supported by a Computer Security Incident Response Team (CSIRT) with advice and assistance, and will be proactively monitored for compliance with the obligations. In addition to the generic NIS2 Directive, other sector-specific cybersecurity delegated acts are under development. Currently, this is the Network Code on Sector-specific Rules for Cybersecurity Aspects of Cross-border Electricity Flows (Netcode) that monitors additional cyber measures in the electricity sector. The electricity sector network code is expected to enter into force in the third or fourth quarter of 2023. Other sector-specific network codes, for example for the gas sector, may be added by the Commission in the future.

In the NIS2 package, the government is also working on the implementation of the Critical Entities Resilience Directive (CER). The Critical Entities Resilience Directive (CER) is similar to the existing Network and Information Systems Security Act but covers the physical threat domain such as terrorist attacks and sabotage. Unlike the NIS2, the Ministry of EZK designates the critical entities covered by the Critical Entities Resilience (CER) Directive. For designated vital parties, this entails a duty of care (obligation to take measures to ensure resilience) and a reporting obligation for incidents that significantly disrupt or potentially significantly disrupt the provision of essential services.

The current Network and Information Systems Security Act, and the future CER and NIS2 apply not only to natural gas, but also to electricity, oil, hydrogen and heat.

Oil

Oil is already diversified in itself as a product. The origin of oil processed in the Netherlands can be traced back to different sources. The oil market is a global market that is not regulated. Security of supply of oil depends in particular on the stability of net exporting countries and unhindered transit on the major oil routes on Earth. The sanctions on imports of Russian crude oil and petroleum products as a result of the war in Ukraine are leading to a major change and displacement in trade flows. Since the entry into force of the last sanctions in February 2023, the world market has been able to redirect international oil flows. European parties have found new suppliers of oil and oil products. The Netherlands is closely monitoring the situation on the oil market in order to be able to intervene in a timely manner if there is a risk of shortage or shortage. Despite its sustainability, oil will remain an important part of the energy mix and commodity market in the coming years. The market exists in the interplay of supply and demand in which both the energy use of oil and its use as a feeder fuel compete. A supply disruption almost directly leads to market turmoil and rapid price increases, leading to a major economic impact. In order to avoid negative economic consequences, EU Member States and the International Energy Agency (IEA) maintain strategic oil and oil product stocks, which can be mobilised through collective action by Member States to prevent scarcity/shortage and reduce oil market rest. Both the industry and the government (through the Central Board for the Promotion of Petroleum Products, COVA) are obliged to hold strategic stocks of oil, gasoline, kerosene and diesel in accordance with the 2012 Petroleum Products Stocks Act. Any undertaking placing more than 100 kilotonnes of eligible petroleum products on the Dutch market per calendar year is obliged to keep 12 % of surplus quantities as compulsory stocks. Cova has the responsibility to complement this up to the total mandatory stock of 90 days of net imports.

The mere possession of these stocks also makes the weapon of an oil embargo – as in the 70s – much less effective. In this way, stocks already contribute to stabilisation.

The Dutch oil value chain is important due to, inter alia, the important import and export function of petroleum products. As a

[41] EZK designation of operators scheme.

result, the Netherlands is deeply embedded in the international supply of petroleum products, which is a major economic interest for the Netherlands. Within the Netherlands, many sectors also depend on these oil or oil products such as the chemical industry, shipping, aviation, road transport and households.

The Netherlands has different processes within the oil value chain, namely production, refining, storage and distribution. A number of providers of these processes (pipeline transport, refining and oil storage) are so important that major negative economic, physical or socio-social consequences arise when these processes come to a halt due to, inter alia, cyber-attacks. Indeed, information technology (IT) and operational technology (OT) are needed to keep these processes running and to ensure the provision of oil services. This makes good security of these network and information systems very important.

In order to increase the cyber resilience of the oil supply, the Netherlands issued instructions from operators of essential services in the oil sector as of 1 January 2023.[42] As a result of the designation, the designated group of providers is subject to a cybersecurity notification and duty of care on the basis of the Act on security of network and information systems (WGNI). The National Digital Infrastructure Inspectorate monitors these companies on behalf of the Minister for Climate and Energy. In addition, operators of essential services are entitled to receive support from the National Cyber Security Centre (NCSC). This includes, for example, receiving cybersecurity threat information from the NCSC.

Electricity

As a result of the decarbonisation of the energy system and the growth of energy from renewable sources, the share of weather-dependent electricity production is increasing. In order to continue to ensure the security of electricity supply, the energy system will need to become more flexible. This can be achieved by developing more demand response, storing electricity, making the controllable capacity of CO_2free and also contributing significantly to interconnection. The security of electricity supply continues to be monitored in a quantitative manner by TenneT TSO. Reliable electricity supply is, in addition to affordable and sustainable, an important objective of Dutch policy. The competitive electricity market contributes to this, including through the system of programme responsibility and the imbalance market. With the further increase in the share of intermittent sources, the demand for flexibility in the market will increase even more. In addition to imports and exports, gas plants in the Netherlands still play an important role for flexibility, which will have to become free under the pressure of the EU ETS CO_2in order to continue to provide flexibility in a market-based manner. The Netherlands does not have separate targets for increasing flexibility in the system. Flexibility in the form of demand response, storage or adjustable capacity is intertwined in the electricity market and traded through the different markets without the exact identification of flexibility.

Hydrogen

A robust climate neutral energy system and a sustainable industry require both sufficient domestic CO_2free hydrogen production and a diversified import portfolio. The development of various low-carbon hydrogen sources in addition to renewable hydrogen, such as (rest) gas with CO_2capture and storage (CCS) or through gasification of residual waste, are important to ensure sufficient supply for rapid emission reduction from users. In addition, imports will be required. The global hydrogen market still needs to be developed and has many uncertainties. Building it requires an active foreign policy on the part of the government to ensure timely, sustainable, safe and large-scale imports. The Netherlands will focus on building relationships with a wide range of countries and regions, diversifying different hydrogen carriers and encouraging sufficient import infrastructure, such as import terminals and access to the backbone. In addition, the Netherlands also stimulates the market through financial instruments such as participation in H2Global.

Hydrogen is then an obvious CO_2free fuel in the case of flexible CO_2– free generation of electricity. It provides for inflexible electricity demand not covered by solar and wind electricity generation. Dutch natural gas-fired power plants offer a good starting position

[42] EZK designation of operators scheme.

for conversion from natural gas to hydrogen. Given the currently limited availability of hydrogen and the expected increasing demand from industry and mobility, the actual large-scale deployment of hydrogen in power plants is likely to take place only after 2030. Industry and mobility require renewable hydrogen to meet EU targets. There are also several initiatives in the field of low-carbon hydrogen, which could potentially already be disposed of in the electricity sector that is not subject to EU targets. Power plants should either have access to hydrogen infrastructure.

II. Increasing the diversification of energy sources and suppliers from third countries

Natural gas

In order to avoid shortages, despite demand reduction, it is crucial to safeguard and increase a diverse supply of natural gas.

The geopolitical situation has fundamentally changed gas flows in the north-west European market, of which the Netherlands is part. Where the transport first took place primarily from east to west, transport in the opposite direction is now mainly needed. Gas entering through pipelines from Norway, Belgium and the United Kingdom as well as via LNG terminals is placed on the Dutch market and partly transported further within north-west Europe.

Given the limited potential for pipeline gas port diversification, significant expansion of LNG import capacity has been pursued in the Netherlands for the benefit of the whole north-west European gas market.

In 2022 LNG import capacity in the Netherlands doubled from 12 to 24 bcm per year. This doubling has been achieved through the realisation of the temporary Eems Energy Terminal (EET) in the Eemshaven and the extension of Gate terminal in Rotterdam. Further enlargements are planned at both the EET and GATE. In addition, several feasibility studies of market participants on LNG import capacity are ongoing.43

In addition to expanding the 'sec' LNG import capacity, it is important to attract more LNG to the EU. To increase the security of sufficient gas supply to Europe, the Netherlands is working with the European Commission on an action plan. This action plan will be set up in regional groupings. The Netherlands participates in the north-west European group, together with Germany, Belgium, Denmark, France, Ireland, Luxenburg and Sweden. One of the actions now underway is to maximise gas imports from Norway to north-west Europe. In addition, the Netherlands supports the joint procurement of gas through the Energy Platform for the North-West European market. Furthermore, bilateral energy diplomacy is44 an important part of the Dutch strategy, alongside joint efforts at EU level. In order to strengthen the security of energy supply of the Netherlands and the EU, efforts will be made to strengthen relations with public and private parties in gas and, in particular, future hydrogen producing countries. This also strengthens the Dutch position as an important landing point for gas and hydrogen.

Electricity

For electricity there are no targets for increasing the diversification of energy sources and suppliers from third countries. However, the Netherlands has interconnection with the United Kingdom and Norway. In addition, the Netherlands is investigating the construction of two new nuclear power plants. The decarbonisation and expansion of the share of renewable energy generation targets lead to further diversification of generation techniques in the electricity market. See Chapters 2.1.I and 2.1.II to this effect.

III. Reducing dependence on energy imports from third countries

Biofuels

The Netherlands is committed to using sustainable biofuels at European level and intends to increase the production of so-called advanced sustainable biofuels in the Netherlands.

Natural gas extraction

Dutch gas extraction from the small fields on land and at sea will make an important contribution to security of supply in the coming years. Speeding up gas extraction in the North Sea can make an important contribution to reducing import dependency in addition to energy saving and scaling up renewable energy production.

Dutch gas production from small fields has been decreasing for 20 years due to natural depletion and limited replenishment of new findings. In order to smooth this decline in production from the Dutch small fields at sea, the government presented in July

43Parliamentary paper 29023, No 417.
44Parliamentary document 29023, No 431 and Parliamentary document 32813, No 1143.

2022 an acceleration plan for gas extraction in the North Sea. Overall, an acceleration of gas extraction from the North Sea could lead to additional production of 2 to 4 bcm per year over a period of 10 years on top of the current production of 9 bcm, which is expected to gradually decline in the coming decades. For extraction on land from the small fields: a total of around 35 bcm is forecast to be extracted from the small fields on land until 2047.45

Minimum gas is still extracted from the Groningenveld. The remaining sites produce only at pilot flame level (minimum flow). The Government remains committed to closing the Groningen Field definitively by 2023 or by 2024 at the latest.

Oil

Oil imports from third countries will continue to be necessary, as the Netherlands is insufficiently pumping up crude oil. However, as a result of the war in Ukraine, there is a ban on the import of Russian crude oil and petroleum products by ship, in line with European sanctions. As described in Chapter 2.3.I, the oil market is an unregulated global market with a large diversification of sources in itself. As long as the market can function, the market determines the price and allocation of the available oil worldwide. Despite the reduction of greenhouse gases and the sustainability of the energy mix, oil and its refined products are expected to remain an important part of the energy and raw materials mix for the time being. Therefore, as a member of the EU and the IEA, the Netherlands takes the security of oil supply and the stability of the oil market particularly seriously. If called for by the EU or IEAs, the Netherlands will use part of its strategic oil stocks in a collective action with a view to ensuring the stability of the oil market, as was done in March and April 2022. The Netherlands is already prepared for this and can use this measure immediately on demand.

Electricity

Finally, the Netherlands has no specific policy to reduce electricity imports from third countries. For the time being, the Netherlands has developed for 40 years as a net importer of electricity as an exporter of electricity.

IV. Increasing the flexibility of the national energy system, in particular through the deployment of domestic energy sources, demand response and energy storage

Natural gas

The use of the national gas sources is described in section III above. The Netherlands currently owns some 14 billion m³ of storage capacity (working volume) to cover seasonal fluctuations and peaks in gas demand. The government has set the target of having at least 90 % of gas storage capacity charged at the beginning of winter 2023-2024. In order to achieve this, the Dutch authorities have taken a series of measures to complement this. In the medium term, the Netherlands is developing a vision for the deployment of gas storage facilities.

Electricity

The market organisation of the electricity market is now governed by the Electricity Act 1998, as well as the underlying regulations and technical codes of the Authority for Consumers and Markets (ACM). In the context of “flexibility”, it is important that the vast majority of connections now have a remotely readable measuring device. For large connections (> 3X80A, mainly businesses), this is over 90 %, for small connections (mainly households) it is around 85 %. The regulatory framework already allows for “flexibility” in the electricity system in different ways, for example through congestion management, aggregation and demand response services (especially companies), supply contracts based on flexible tariffs and the possibility for “multiple suppliers to connect” (MLOEA). Furthermore, the regulatory framework allows everyone to use the electricity system, subject to specific conditions, for example by deploying battery storage or introducing solar production by households.

The Bill for the new Energy Act (which is intended to replace the Electricity Act 1998 and Gas Act) aims to further strengthen this regulatory framework and is also in line with Directive 2019/944. Key elements for increasing flexibility in the electricity system are:

- Complete the transition to digital measurement systems (remotely readable where possible);
- Commitment to “free” data sharing through a revised data management and data exchange system;
- Optimise existing regulation to become “active” in the market (better integration of the energy community, aggregation, demand response, etc.);
- Create additional space for the use of data from additional measurement points “behind” the connection (sub-metering);
- Scope for system operators and ACM to develop specific transport methods and conditions, which can mitigate the effects of

45Geological Service Netherlands, Delfstoffen and Geothermal in the Netherlands, Annual Report 2021.

transport scarcity. This could include, for example, non-firm transport contracts.

There is a huge increase in the demand to connect batteries to the electricity grid. With the rapid increase in installed wind and solar power, a growing share of electricity production comes from domestic energy sources. No fixed prices for producers are foreseen.

In 2023, a temporary price cap for small consumers for gas, electricity and heat was occasionally introduced, as the energy market was in a precarious situation with high prices and high volatility during that period. In order to provide timely support and security to households, the price cap intervened in the energy bill. The mechanism in place with volume limits of 1 200 m^3 of gas and 2900 kilowatt hours of electricity per household leaves a full marginal price incentive for part of households, which still means – albeit in a more limited way – market forces and an incentive to make them more sustainable.

2.4 internal energy market dimension

I. Electricity interconnectivity

The European Council agreed on an indicative interconnection target of at least 15 % for 2030. The Netherlands has a much higher interconnection rate than 15 %. With an average electricity consumption of less than 14 gigawatts in 2020, interconnection capacity was 9,1 gigawatt.[46] The Netherlands has interconnection with Belgium, Germany, Denmark, Norway and the United Kingdom. Interconnection capacity continues to grow to 9,8 gigawatts in 2025 and 10,8 gigawatts in 2030.[47]

The Netherlands has no specific quantitative target in terms of interconnection. Any plans for new interconnectors will consider the welfare effects (including effects on the security of electricity supply) and projected costs for each interconnector.

II. Energy transmission infrastructure

In order to accommodate the growth in the number of renewable generation plants (both on land and at sea), it is necessary to create sufficient capacity on the electricity grid of regional and national grid operators in a timely manner. Timely and comprehensive spatial planning, including energy infrastructure from the start, is more important than ever. The transport, conversion and storage of electricity, natural gas, biogas, hydrogen, CO_2 and heat will also need to be coordinated in order to minimise spatial impact and the overall investment needed.

In December 2022, the Government, together with interested parties,48 launched the National Action Programme for Network Conductions, in which it collaborates in more than 50 actions contributing to increasing capacity on the network. In addition, as indicated above, the government is implementing infrastructure projects of national interest through the MIEK regime. For the regional scale, this is done in the Netherlands using the provincial MIEKs (PMIEKs, see for more information on the MIEK, point 3.1.I under the Electricity Sector). Furthermore, the first integrated Energy Infrastructure Forecast 2030-2050 has been delivered by regional and national grid operators; work is now underway on the second edition to be delivered at the end of 2023.49 Investment plans shall be drawn up setting out the investments needed to meet the need for transport capacity. It will also look at how congestion management, including new opportunities such as the deployment of flexibility, energy storage and demand and supply management, can make the most of available space on the grid at the lowest societal cost. In addition, consideration will be given to how the costs of energy infrastructure can be taken into account and, where appropriate, proposals for adaptation will be made.

Work is also underway to increase grid capacity in the Netherlands. For example, a new 380-kV connection is currently being built in the north-west of the Netherlands (North West project 380 kV), because the sea above the Eemshaven is an important production site and the Eemshaven has also become an important connection point in the international electricity network. In addition, the South West 380 kV project aims to resolve existing bottlenecks in this part of the country so that the offshore offshore wind farms can be connected to the national network. In September 2022, the responsible ministers made the necessary changes to the allocation through a Rijksine Application Plan. Work is also underway to upgrade existing 220 kV high-voltage connections (“make better use” programme) and has started the planning procedure for four new 380 kV high-voltage connections and two are still under preparation. Similarly, both the central government and local and regional authorities are working hard on the planning of the necessary new 220/380 kv high-voltage stations or the extension of existing 150/220 high voltage stations.

[46] Electricity interconnection capacity, 2015-2021 | Compendium for the Environment (clo.nl).
[47] Monitoring of supply assurance 2022_12JAN2023.pdf (tennet drupal.s3.eu-central-1.amazonaws.com).

For the connection of offshore wind farms, TenneT uses a concept based on standard platforms, which for nearby coastal wind farms can connect 700 megawatts per platform to wind energy. Five of these platforms have now been delivered; two to four will follow. TenneT uses standard platforms of 2.000 megawatts to connect the wind farms further to the sea. The commissioning of eight of these platforms is foreseen for the period 2028-2031.

48National action programme for network congestion, Parliamentary Document 29023, No 385.
49 www.netbeheernederland.nl/dossiers/toekomstscenarios-64.

The Dutch gas transmission and distribution infrastructure is mature and robust, but the infrastructure is being expanded. This is done, inter alia, through the construction of a new large-scale nitrogen plant capable of converting 5 to 7 billion m³ of high calorific gas into low-calorific gas on an annual basis. This installation at Zuidbroek is expected to be fully operational as of October 2023. The gas storage Gijkerk is currently being converted to store low-calorific gas instead of high-calorific gas. In addition, there is a further expansion of LNG import capacity in the coming years, in addition to what has already been achieved in 2022 (see explanation in section 2.3.II), and the Bacton-Balgzand (BBL) pipeline from the UK to the Netherlands (and v.v.) will be adapted in 2023 to increase import capacity (in the summer period).

The government has also announced work on the deployment of alternative refuelling and charging infrastructure under the recently revised European Alternative Tank and Charging Infrastructure Regulation (AFIR). For charging infrastructure, this is done within the National Agenda for Loading Infrastructure. The agenda provides an overview of the necessary charging infrastructure and sets out the frameworks within which its deployment should take place. Within the framework of the AFIR, the same is done for the deployment of hydrogen filling points and shore-side electricity connection.

111. Market integration

i. Increasing the flexibility of the system

Due to a further increase in intermittent sources in the electricity system, the Netherlands considers that more flexibility in the system is necessary. Through the legislative agenda for the coming years, the Netherlands sets up the market organisation in such a way that flexibility (including for small consumers) can be further opened up and small consumers have better access to the market and rewarded in line with market conditions. In the Netherlands, around 88.5 %50 of retail connections now have smart meters and this rate will increase further in the coming years. Using a slide to the smart meter, a smart meter enables consumers to better respond to prices in real time. Dynamic price contracts and demand response agreements allow all final customers to react directly to price fluctuations in the market. There is already a lot of flexibility in the system, such as large consumers who are flexible and responsive to real time prices by switching up, up to or off, and parties with storage assets offering in the different markets. Where necessary, barriers to storage will be removed.

Independence of network operation ensures that fair competition in supply and wholesale markets is possible and the reliability of systems is enhanced. For the degree of affordability, it is good to have competition between different providers in the energy market.

In addition, the system of 'programme responsibility' or balance sheet responsibility regulates that suppliers and customers themselves balance supply and demand on the electricity market. They have an economic incentive to achieve agreed deliveries and reductions.

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

In general terms, the Dutch government pursues electricity market frameworks that promote fair competition between market players and thus do not discriminate against any party. This includes parties offering renewable energy, demand response and storage, including through aggregation. This will also be regulated by law with the Energy Act.

iii. Consumer participation in the energy system, self-generation and new technologies, including smart meters. There are no specific targets, except for the target of having 2020 80 % of Dutch small consumers equipped with smart meters by 2020. This objective has been achieved (see also 2.4.III.i). In general terms, the Netherlands aims to ensure that consumers can benefit as much as possible from competition in the energy market, make informed choices and receive fair compensation for returned electricity. No separate national targets have been set for this purpose.

Furthermore, in a competitive Dutch market, consumers choose from a multitude of different types of providers. Suppliers offer different types of contracts, e.g. contracts for the supply of 100 % renewable energy, supply of 100 % renewable electricity of Dutch origin, etc. The Dutch retail market was in May 2022 57 with licensed suppliers that often offer multiple propositions. The Netherlands normally also has a relatively high percentage of annual switchers (2021 27 % in 2009).

In addition, an increasing number of consumers generate electricity through solar panels. The netting scheme allows them to offset inputs and decreases. The government plans to phase out the netting scheme over the period 2025-2030. For electricity that

50State of play October 2022.

cannot be offset, consumers shall receive reasonable compensation from the energy supplier. Offsetting is no longer possible from 2031 onwards. Even with the planned phasing out of the netting scheme, it remains very interesting for consumers to invest in solar panels, the payback period is not expected to exceed 7 years until 2030.

iv. Ensuring the adequacy of the electricity system, as well as for the flexibility of the energy system in the field of renewable energy production

The Netherlands assumes that a well-functioning electricity market gives market participants the right incentives to invest in generation capacity where and when it is needed, i.e. an 'energy only market'. In addition, the Netherlands has a large number of interconnectors with neighbouring countries, which can also meet Dutch electricity demand and increase exports.

Reliability, in addition to affordability and sustainability, is an important objective of the Dutch policy. The competitive electricity market contributes to this, including through the system of programme responsibility and the imbalance market. The promotion of renewable electricity may have an impact on the level ofsecurity of supply. Energy supply is becoming more dependent on weather conditions. With the increase in the share of intermittent sources, demand for flexibility in the market will increase. The Netherlands already has a lot of flexibility to deal with the loss of supply or demand in a market-based manner. The Netherlands does not have separate targets for increasing flexibility in the system.

The necessary flexibility can come from interconnection, demand side response (including dynamic tariffs), storage and controllable generation. The analysis and mapping of options shows that with developments in the energy system there is a potential for sufficient options to meet short-term flexibility demand. The long-term flexibility requires a mix of the different sources of flexibility, including controllable power. This adjustable capacity will have to be increasingly free of $CO_2$from 2030. Several options are potentially possible for this: Co_2free hydrogen, renewable sources such as bio-raw materials and green gas, nuclear power and fossil fuel use that$_{captures\ CO\ 2}$.

For the Netherlands, nuclear energy is one of the options for the future energy mix. Several studies for 2050 show that nuclear energy can be a cost-effective option and that a positive business case in the long term could be one of the options. Given the lead times, additional nuclear energy in the Netherlands for 2030 does not seem likely. In particular, with regard to small modular reactors (SMRs), developments are progressing rapidly and market introduction abroad will be possible from 2030 onwards. The use of bioraw materials is considered within a broader sustainability framework, which is discussed in more detail in Sections 2.1.I.iv and 3.1.3.

While the electricity market is sufficiently equipped to provide the necessary flexibility, it is important to continue to monitor the development of flexibility, including adjustable power. To this end, TenneT's annual generation adequacy monitoring is increasingly aligned with the ENTSO-E annual European Resource Adequacy Assessment and the Electricity Regulation.

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

No specific objectives have been set for this purpose. The Dutch government pursues electricity market frameworks that promote fair competition between market players and thus do not discriminate against any party, including those offering renewable energy, demand response and storage, including through aggregation.
The regulator monitors developments in the retail consumer market on a regular basis. The Dutch retail market is highly competitive with normally relatively high switch rates (27 % in 2021). The Dutch retail competitiveness and consumer protection policy is described in section 3.4.III.iv.

2.5 research, innovation and competitiveness dimension

I. Public and, where available, private research and innovation funding

The Dutch approach to research, innovation and competitiveness is partly the same as that reported in the INEK for the period 2021-2030. On the one hand, we use generic innovation tools to foster innovation and strengthen the competitiveness of the Netherlands. On the other hand, we dedicate targeted tools specifically to accelerate the climate and energy transition. This is done through top sector policies.

The biggest change in recent years compared to the previous reporting is the introduction of the National Growth Fund. With the National Growth Fund, the Netherlands provides between EUR 2021 and 2025 20 billion for targeted investments for structural and sustainable economic growth. The National Growth Fund focuses on the two areas of "Knowledge Development" and "Research, Development and Innovation".

The innovation policy specific to the 'Energy Energy Sustainability' mission is supported through a toolbox of grant instruments (DEI +, HER +, MOOI, TSE Industrie R &D). Approximately EUR 200 million per year is available for this purpose. The National Growth Fund has so far mobilised EUR 1,1 billion for energy topics in programmes that will run over the next decade.

Under heading II below, the innovation policy for Energy and Climate is first explained. The generic approach and the National Growth Fund are then explained under heading III.

II. Promoting clean energy technologies, long-term deployment of low-carbon technologies and related carbon transport and storage infrastructure

Innovation objectives – Energy and climate

The specific innovation policy focuses on some nine so-called "top sectors". These are clusters of businesses and knowledge institutions, where entrepreneurs, researchers and public authorities work together to develop an international competitivestrategy, earning capacity and innovation. The most relevant sector for climate and energy is the top energy sector. The top energy sector explicitly focuses on the innovation needed to achieve the climate targets. The top sector has therefore been set up through the Renewable Electricity, Enhancing the Building Environment and Industry Sustainability Missions. An overview of the missions and multiannual mission-driven innovation programmes is provided in Figure 2.1. In these missions we also establish the links with the SET Plan and globally with the IEA and the technology cooperation linkages as well as Mission Innovation.

Figure 2.1 overview of missions and multiannual mission-driven innovation programmes

Missions	A A full $CO_{2\ free}$ electricity system in 2050	B A CO_2 free built environment in 2050	C In 2050, industrial raw materials, products and processes are net climate neutral and 80 % circular	D Zero-emission mobility for people and goods by 2050	E In 2050, the system of agriculture and nature is net climate neutral
With intermediate targets	In 2030: • at least 35 TWh of electricity generated on land from wind and solar energy > 15 kW shall be generated annually; • at least 49 TWh of electricity shall be generated from offshore wind.	In 2030: • 200.000 existing dwellings/year are moving away from natural gas; • 1,5 million houses and 15 % of u-building and social property are natural gas free; • at least 20 % of local energyconsumption (including EV) within the built environment is generated sustainably.	In 2030: • consumption of primary raw materials is reduced by 50 %; • greenhouse gas emissions from production process- and waste sector have been reduced to 36 Mton CO_2 equivalent; • the sustainability of the industrial heat system has been increased to 300 °C; • electrification and CO/CO_2 reuse have been implemented; • CSS shall be deployed in a cost-effective manner; • is sustainable hydrogen production on the path to implementation; • biofeedstocks are considered to be standard.	In 2030: • there are 1,9 million electric transport vehicles; • 1/3 of energy consumption in mobility is renewable; • reduce business (car) kilometres by 8 billion; • at least the 32 largest municipalities have zero emission zones for urban logistics.	In 2030: • an additional reduction of at least 1 Mton has been achieved Co_2eq methane, 1 Mton CO_2eq reduction of energy consumption greenhouse horticulture and 1,5 Mton CO_2eq reduction due to smarter land use.
MMIPS Multiannual mission-driven Innovation-Program and sub-programmes	1 **Renewable electricity at sea** • Cost reduction and optimisation • Integration of offshore energy into the energy system • Integration into the environment (ecology and co-use)	3 **Acceleration of energy renovations in the built environment** • Enthusiasm of building owners and users for energy renovation (MVI) • Robotisation, digitalisation and integration of installation technology in building elements • Energy concepts (incl. chain optimisation)	6 **Closure of industrial loops** • Circular Raw Materials and Products • Biobased raw materials and products • Design and embedding of new circular chains • CCS deployment and social acceptance	9 **Innovative propulsion and use of sustainable energy carriers for mobility** • Zero Emission propulsion technology and vehicles • Energy distribution for electric vehicles • Distribution of hydrogen and other energy carriers for fuel cell vehicles • Innovative renewable fuels • Fuel-efficient vehicles	11 **Climate neutral food and non-food production** • Reduction of methane emissions from rumen and intestinal fermentation • Reduction of emissions from shed and manure storage • Carbon sequestration and reduction of emissions from agricultural soils and fertilisation • Reduction of peatland emissions
	2 **Renewable electricity generation on land and in the built environment** • Reduction of generation costs • New applications, optimally integrated • Acceleration with social enthusiasm • Integral sustainability • Energy system integration	4 **Sustainable heat (and cold) in the built environment (including greenhouse horticulture)** • Pacific, compact, smart, cost-efficient heat pumps • Delivery, ventilation and tap water systems • Smart compact thermal battery • Smart low/mid-temperature heat grids • Large-scale thermal storage • Geothermal	7 **Co_2-free industrial heat system** • Heat reuse, upgrading and storage • Deep and ultra industrial geothermal • Application of climate-neutral fuels • System concepts for heat and cold • Maximising process efficiency	10 **Efficient transport movements for people and goods** • Knowing what people are moving • Co_2reduction due to new mobility concepts for passenger transport • Co_2reduction through innovations in logistics • Transition supporting knowledge and tools	12 **Optimised land and water for CO_2 sequestration and use** • Seaweed distribution, cultivation and post-harvest • Double photosynthesis • Protein for human consumption • Climate-agile nature • Climate-friendly choice when purchasing products • Healthy food choice • Use reduction to zero emission
		5 **Balancing the new energy system in the built environment** • Local system optimisation • Control algorithms for saving, energy optimisation and sector coupling • Data architecture and trading systems • Flexibility and electricity storage	8 **Electrification and radically renewed processes** • Production of hydrogen, molecules and innovative renewable fuels • Electrical appliances and electrically driven processes • Flexibilisation and digitalisation • Radically renewed processes • Societal implications of industrial electrification		

13
A robust and socially empowered energy system

- Joint fact-based decision and design, including business models
- Spatial adaptation
- Infrastructure design, flexibility, market mechanisms and digitalisation
- Power-to-Molecules
- Large-scale energy storage, transmission and hybridisation of energy demand

For renewable energy, the focus is shifting from lowering the cost of renewable electricity to its integration into the energy system and the surrounding area. Cost reduction still plays an important role in making the built environment and industry more sustainable. For the built environment, the focus is on innovations that enable acceleration by streamlining production and installation processes for the built environment. For industry, closing carbon chains and electrifying industrial processes plays an important role. In addition, the cross-cutting themes of digitalisation, system integration, socially responsible innovation and human capital play a prominent role in the top energy sector.

Competitiveness

Generic innovation policy

The objective of business policy is sustainable economic growth. The government is pursuing this by strengthening the Dutch earning capacity and addressing societal challenges. Business policy is predominantly generic. This is aimed at fostering innovation and entrepreneurship. The Netherlands regards investment in RD &Das an important means of achieving innovation, productivity and solutions to societal challenges through the development and absorption of knowledge and technology. R & ampD is a fundamental source of innovation and has strong spill-over effects on the economy in the form of knowledge spillovers, thus contributing to Dutch prosperity.

The Netherlands has the ambition to invest 2.5 % of GDP in RD &DIn particular, the government aims to stimulate private spending on research and development. It is therefore important to use public funds in such a way as to trigger additional private R &D. Innovation is encouraged, inter alia, through the PPP surcharge, the Act on Promotion of Speur and Development (WBSO) and innovation credit. It also increases access to capital market finance, ensures a good establishment environment and attracts foreign investment, alleviates the regulatory burden and helps seize the opportunities of digitalisation and sustainability.

The Dutch innovation policy thus also aims to increase prosperity and maintain competitiveness. Spending on research, development and demonstration of new technologies should also form a basis for new economic activities. Technology cost reduction continues to play an important role in this respect. Major steps have already been taken in a number of areas, in particular the cost of renewable electricity.

National Growth Fund

The objective of the National Growth Fund is to strengthen the structural earning capacity of the Netherlands in order to contribute to sustainable economic growth. The Growth Fund invests in knowledge development and research and development.

Policies and measures

3.1 decarbonisation dimension

This chapter presents the policies set out in the 2022 Climate Policy Programme and the 2023 Spring Decision-Making. The measures contained in these two policies are now appointed successively, but will be more integrated into the final INEK update.

I. Greenhouse gas emissions and removals

I. Greenhouse gas emission reduction target, ESR and LULUCF

As mentioned above, the new government has tightened the Dutch climate targets. The intermediate target for 2030 has been tightened from -49 % to at least net -55 % compared to 1990, and the government intends to focus on about 60 % emission reductions when drawing up climate policy, so that even in the case of shortfalls the 55 % is not at stake. As we have already described, we have a sectoral policy commitment. The Dutch policy is broadly divided into 5 sectors: industry, electricity, mobility, agriculture energy use and built environment. A sectoral reduction target has been formulated in 2030 and an indicative residual mission has been formulated (see Chapter 2). The main policy measures are described below by sector. Annex 2 provides an overview of the main policy measures.

Industry

Perspective:

A climate-neutral, circular industry is an important driver of the Netherlands' earning capacity and can further enhance this role. Industry now contributes above average to innovation, productivity and quality jobs. At the same time, it is also the most emitting sector. In the energy transition, industry can play a flight role and play a central role in the transition to a circular economy. The Netherlands proposes a significant industrial base as part of a diversified economy. Industrial production remains at 10-15 % of Dutch GDP.51

Description of the policy:

In order to achieve the industrial reduction target for 2030, the Netherlands uses a different policy mix, which is in line with European climate policy. This is discussed below. The rationale for this policy mix is firstly that the sustainability of industry needs to take place here and not elsewhere, as sustainable industrial production is important for the future resilience of the economy and contributes to strategic autonomy. Second, the government's view is that making industry more sustainable will act as a flywheel for the wider energy transition and the transition to a circular economy. Industry demand for renewable energy carriers makes investments in new wind farms and infrastructure profitable, which will also benefit other sectors.

The climate policy for industry therefore includes not only pricing and standard-setting measures, but also support for the transition. This includes subsidies for sustainability and innovation, by promoting the timely availability of renewable energy and raw materials and the necessary infrastructure. With the 20 largest emitters, EZK has been fine-tuned since 2022 on specific support in exchange for additional emission reductions and other environmental performance beyond statutory standards. This does not mean that all companies will become more sustainable. The Netherlands accepts that companies that do not want or are unable to make this transition will eventually disappear.

The public authorities create the framework conditions for companies to make the transition and new sustainable companies to enter the market. Creating the right framework conditions is a complex interplay of different parties, in which the government has to take a regional role. In order to accelerate the climate and energy transition, a National Industry Sustainability Programme (NPVI) was decided in March 2023. Departments and local and regional authorities are working with network operators, clusters and industry representatives to solve bottlenecks (such as speed of permitting), to articulate supply and demand for renewable energy and infrastructure in the industrial clusters, and to steer project implementation.

The 2023 Spring Decision-making states that, according to the 2022 Climate and Energy Outlook (KEV2022), existing and on the

51Parliamentary paper 29826, No 147.

agenda industrial policies offer prospects for achieving the climate target and a significant reduction in nitrogen emissions. However, uncertainty remains high, in particular as regards the establishment of framework conditions that industry needs to make sustainable, such as the timely availability of permits and of infrastructure.
This is the main challenge of the NPVI. Within the package of additional measures taken by the government, an additional contribution is requested from industry. In doing so, the Netherlands monitors the competitiveness of industry and is committed to greening in the Netherlands, so that emissions do not drain to other countries. For this reason, the government is encouraging the sustainability of companies with supporting tools and is working to address the framework conditions for sustainability through the NPVI. Attention is also drawn to the industry that is not located in the big 5 industrial clusters. For these so-called "cluster 6" companies, support is organised within the NPVI to identify and remove concrete bottlenecks to sustainability.

CO2 levy and introduction of CO2 minimum price

The guarantee of climate policy for the industrial sector (including waste treatment) has been achieved through the national CO_2levy. It provides certainty on the 2030 emission reduction target. The design of this levy (with rising rates and decreasing, tradable dispensation rights) provides flexibility and time to make the necessary investments. This avoids leakage. It is not beneficial to the climate if business and emissions are moved abroad. The government uses the CO_2levy to ensure the increased ambitions for industry. The Coalition Agreement also agreed to introduce a CO_2minimum price for industry. The strengthened CO_2levy and the CO_2minimum price are currently being developed.

In the Spring Decision-making of April 2023, it was agreed that the government should take measures to ensure that the commitment of 4 megatons below the CO_2levy agreed in the Coalition Agreement is met. As previously announced, the rate of the CO_2levy will be tightened as of 1 January 2025 on the basis of a tariff study carried out by the PBL. The CO_2levy is also extended until 2032.

Carbon Capture and Storage

The Netherlands regards Carbon Capture and Storage (CCS) as a necessary and effective solution to achieve CO_2emission reductions in sectors that do not (yet) have realistic sustainable alternatives. CCS can also play a role in achieving negative emissions in the longer term. The Dutch government has no set target for CCS. The policy aims to provide incentives for the market to choose the most cost-effective emission reduction measures. The amount of storage space that can be made available depends, inter alia, on market interest and the speed of licensing procedures. Based on publicly announced industry initiatives to develop CO_2storage sites in the North Sea, it is expected that by 2030 10 million tonnes of annual injection capacity could be made available to the market. In the Netherlands, several $CO_{2\ \text{infrastructure}}$projects are currently under development, at different stages of maturity. The most advanced projects are Porthos (with a capacity of 2,5 million tonnes per year) and ARAMIS (with a total final capacity of 22 million tonnes per year). Cross-border infrastructure projects, including candidates for PCI/PMI status, are CO2Transports, Delta Rhine Corridor and Noordkaap.

CCS is expected to make an important contribution to the emission reduction targets in the industrial sector. The Coalition Agreement sets a target for a CO_2reduction of 20 megatons in the manufacturing sector by 2030. Based on techno-economic calculations, the biggest contributor is the capture and storage of CO_2, with around 9 [5-11]52 megatonnes of CO_2emission reductions per year. Co_2capture and storage takes place mainly at chemistry, refining and waste incineration plants (ASAs).53 Recently announced policy targets for achieving negative emissions (0-3.5 Mt in 2030) can increase the national need for CO_2storage capacity.

The Netherlands encourages the deployment of CCS mainly through the Stimulering Sustainable Energy Production and Climate Transition (SDE + +) subsidy scheme. The SDE + + provides subsidies to companies and non-profit organisations that produce large-scale renewable energy or reduce CO_2emissions. For CCS projects, successful applicants may receive grants for the unprofitable top of their project. Put simply, the SDE + + covers the financial gap between the EU ETS price and the marginal emission reduction costs associated with the construction and operation of the CCS project. The SDE + + covers the capture, transport and storage of CO_2. The subsidy is granted to the owner of the capture installation, but also includes an amount for the transport and storage costs that can be paid to a third party for such services.

Renewable hydrogen purchase obligation

The government is exploring the possibilities for a purchase obligation for hydrogen from renewable sources in industry, starting from 1 January 2026, in order to ensure that the Netherlands can meet the expected binding target set out in the Fit-for-55 package

52This is the bandwidth.
53PBL, TNO, CBS &RIVM (2022), Climate and Energy Outlook 2022, The Hague: Environmental Planning Bureau.

for the use of renewable hydrogen. This purchase obligation is a tool to provide market participants with more clarity on the evolution of demand for renewable hydrogen. Later this year, the government will publish a detailed policy plan for the hydrogen market. In general, the obligation should work as the annual energy obligation for transport, allowing companies with tradable certificates to comply with the obligation. The obligation should provide sufficient flexibility in the first years, taking into account, inter alia, the availability of and access to renewable hydrogen by industrial users.

Strengthening generic grant instruments

The various subsidy schemes available to support innovative industrial sustainability have proven to play a crucial role in effectively achieving sustainability in recent years. Within industry, around 60 % of the subsidy budget of the various schemes goes to SMEs. For industry, the Stimulering Sustainable Energy Production and Climate Transition (SDE + +), the Demonstratie Energie- and Climate Innovation (DEI +), the Accelerated Climate Investment Industry (VEKI), and the Topsector Energy Studies (TSE), Energy Investment Deduction (EIA), Environment Investment Deduction (MIA) are important schemes. These arrangements will be further optimised. Before the end of the year, it shall be examined whether it is possible and appropriate to support industrial parties that are or may switch to the use of renewable hydrogen. The National Investment Scheme for Climate Projects Industry (NIKI), which is currently being developed in addition to the SDE + +, is very important for the large-scale deployment of innovative techniques in green chemistry or electrification in industry. The NIKI scheme will support larger sustainable investments, using these techniques, with a subsidy for the start-up years. The planning aims to ensure that NIKI can be published in the second half of 2023, after which a first opening can take place. For the financing of NIKI, the continuation of VEKI and the extension of the DEI +, a budget has been made available in the spring decision making for a multi-annual opening. An additional EUR 1 billion will be made available for NIKI. In addition to what has already been made available in 2023, EUR 530 million will be made available for VEKI.

Maintaining a level playing field

It is important that there is an international level playing field so that companies in the Netherlands invest in sustainability and there is no carbon leakage. The following measures shall be taken to prevent carbon leakage:

1. The instruments shall be designed in such a way as to minimise the risk of leakage of activity and CO_2emissions, in line with the agreement on this subject in the Climate Agreement. In order to measure the impact of the measures, a play field test will be carried out again in 2023, building on the tests of previous years.
2. Be in line with the European level playing field, such as greater harmonisation through the EU Energy Taxation Directive and the introduction of a CO_2price at the border through the Carbon Border Adjustment Mechanism (CBAM). The CBAM ensures that the same CO_2price applies to products on the European market, regardless of where they were produced. This encourages companies and countries outside Europe to become more sustainable and prevents carbon leakage.

Drive up and accelerate the deployment of sustainable infrastructure

Timely implementation of energy and raw materials infrastructure is a critical prerequisite for achieving climate goals and maintaining earning capacity for existing and new industry. This is why the Dutch Government is directing infrastructure projects of national interest through the Multiannual Programme for Infrastructure for Energy and Climate (MIEK, see point 3.1.i under the Electricity sector). The MIEK project overview shows a gap over the full breadth of projects between the desired implementation dates of the industrial clusters and the planned deployment dates of the network operators. Lead times of procedures, nitrogen and sufficient implementation capacity prevent timely construction. The Netherlands is working to remove these barriers. Together with industry, grid operators, energy producers and co-authorities, opportunities are being developed to bring the desired implementation dates of the industry closer to the planned infrastructure take-up dates.

Customised arrangements for major industrial emitters

The Coalition Agreement announced the tailor-made approach to further accelerate the sustainability of industry: the government offers the 10 to 20 largest industrial emitters in the Netherlands the possibility of the so-called tailor-made approach. This makes it possible to offer tailor-made support for sustainability in the Netherlands and to achieve the additional greenhouse gas reduction above the CO_2levy in 2030. In addition to greenhouse gas reduction agreements, where relevant, agreements on nitrogen reduction and improvement of the living environment are also made. With the tailor-made approach, the government aims to help ambitious industrial emitters to become more sustainable within reasonable and fair terms and to ensure that they continue to invest in the Netherlands. This will help to strengthen the establishment environment and maintain sustainable employment for the Netherlands.

Tailor-made arrangements are based on reciprocity. In order to benefit from the tailor-made approach, the company must have ambitious plans to make the Netherlands more sustainable. Companies should be prepared to commit to additional greenhouse gas

savings over and above the reduction they are already expected to achieve under the CO_2levy. If a company is willing to make an additional effort as part of the tailor-made approach to achieve the Dutch climate goals, achieve nitrogen reduction and improve other aspects of the living environment, the government would like to see if it can also do any extra work to facilitate the projects concerned. This can include both reducing or removing non-financial uncertainties (e.g. supporting timely availability of energy infrastructure and a predictable permitting process) and reducing or removing financial uncertainties (e.g. contributing to the unprofitable top in the business case).

With the tailor-made arrangements with the largest industrial emitters, the government intends to declare 3,5 megatons in 2030 in relation to the CO_2levy. In order to achieve this additional reduction, a larger group of companies will be approached where necessary and additional resources will be made available.

The tailor-made approach for the largest industrial emitters is based on the principle that financial support to make companies more sustainable is provided as much as possible through generic subsidy schemes such as the SDE + +, NIKI and VEKI. If the generic toolbox is not appropriate for the project and/or business case in question, tailor-made funding and/or financing may be considered. This is why EUR 750 million will be reserved for this from 2025 onwards. In addition, more than EUR 200 million will be earmarked specifically for possible tailor-made subsidies to waste incineration plants from 2025 onwards.

Making SMEs more sustainable

In addition to the tailor-made approach of the 10-20 largest CO_2 emitters, the Netherlands is committed to making SMEs more sustainable.
In addition to the measures under the energy saving obligation, SMEs can achieve significant CO_2reductions. To this end, the Netherlands supports SMEs in three areas: making the business process more sustainable, making business mobility more sustainable and making the building more sustainable. This support is shaped by four types of support: 1. *Information, inspiration and knowledge* development in order to disseminate and share knowledge on how to make sustainable. 2. *Research and development* to enable innovation within SMEs, thus enabling new ways of making them more sustainable. 3. *Encouragement* to (better) enable the uptake of sustainable techniques in SMEs. 4. *Standardisation* where clear standards support SMEs by making clear when what steps should be taken. For all these forms of support, there are a wide range of schemes, programmes and standards.

However, it can be seen that the volume of schemes, programmes and standards sometimes constitute an unclear whole for entrepreneurs. The Netherlands is therefore working in the coming period to better understand the overlap and possible competition between schemes and programmes to support the sustainability of SMEs. The aim is to make support to SMEs more effective and efficient.

At the same time, many sustainability interventions also require different framework conditions, such as access to infrastructure, affordable sustainable energy and financing, legislation and regulation, R &Dsupport and availability of skilled personnel: very similar to the framework conditions for larger farms. By setting up these framework conditions, the government aims to support SMEs in making them more sustainable.

The recently delivered CES and the Koploper programme of the so-called 6th cluster are an important starting point for meeting infrastructure needs for a large part of the energy-intensive part of SMEs.

Circular Economy

The transition to climate neutrality and a circular economy are closely linked. The perspective is an economy that contributes to climate change mitigation, but also to improving biodiversity, to a cleaner living environment, and to the security of supply of raw materials. Indeed, the scale and pace of global sourcing of raw materials is unsustainable and leads to planetary boundaries being exceeded. In February 2023, the Ministry of Infrastructure and Water Management sent the National Programme for Circular Economy 2023-2030 to the Chamber. The programme is of interest to industry. Indeed, the use of less new raw materials and the reuse of raw materials, and the replacement of fossil raw materials with renewable raw materials, is essential for industrial sustainability and leads to a reduction in CO_2emissions along the entire chain, both in the Netherlands and elsewhere. Part of this programme is to stimulate and create sustainable, circular growth and end markets.

1. Coherence and alignment with Circular Economy is being further developed, building on the NPCE.
2. Market demand for emerging technologies is boosted by more source-based policies in Europe, such as mandatory recycling shares and sustainable circular (bio) raw materials. The Netherlands will explore the possibility of strengthening market incentives to make reuse and renewable raw materials competitive. Standardisation and market incentives shall be determined at EU level.
3. Regulatory barriers are also examined. Removing regulatory barriers is an important pre-condition for the uptake of circular

production processes.

4. Policies are being developed for sustainable industrial growth markets, such as plastics. In the Coalition Agreement, the government agreed that a mandatory percentage of recycling in building materials would be introduced. In addition, the Netherlands is setting ambitious percentages of renewable or recycled feedstock use in Europe for certain product groups.
5. The tailor-made arrangements shall address circular economy and scope 3 emission reductions where relevant. Efforts are also being made at EU level to better reward scope 3 emission reductions in European and international instruments and climate goals.

In anticipation of EU legislation, a national obligation for plastic producers to incentivise the uptake of recycled or bio-based plastics will be introduced as of 2027. The aim is to increase the obligation to 25 % -30 % plastic recyclate or bio-based plastic by 2030. This obligation applies to all plastics produced in the Netherlands and for the Dutch market. Exports are therefore excluded. The government will use the Climate Fund to support companies in this transition to a circular plastic chain. In addition, waste incineration plants incinerate a lot of plastic that can also be recycled, leading to a loss of usable raw materials and unnecessary greenhouse gas emissions. The Government is therefore focusing on increased plastic sorting, further pricing of waste incineration (including plastic) by waste incineration plants (AVIs), combined with subsidy, and application of negative emissions (CCS) where appropriate. Finally, additional funding will be available for scaling up circular innovations to further support the circular transition.

Electricity

Perspective:

The electricity supply should be at the forefront of the sustainability of the Netherlands. The availability of sufficient renewable electricity is an important prerequisite for making industry, transport and services and our homes more sustainable. To cope with this increased demand for electricity, major steps are needed in the greening of our electricity sector. In addition, there is a need to rapidly reduce existing emissions – now about a fifth of our total greenhouse gas emissions. It also ensures that we become more independent from imports of fossil fuels from abroad.

Description of the policy:

The approach and policy instruments for the electricity sector should be considered in conjunction with the transition of the energy system. This section describes the sectoral approach and policy instruments directly targeting emissions from the electricity sector. Policies for the wider energy system are addressed at the following points in the INEK: Climate Fund (point 3.1.I.i) and Fiscal Greening (3.1.I.i), SDE + + (in the next section on renewable energy, point 3.1.II.iii), Energy Innovation (point 3.5.I); At the bottom of this chapter, the topics of grid capacity and hydrogen.

The climate challenge increases the role of the electricity sector in the energy system. Fossil power generation must disappear, and the sustainability of Dutch society will largely consist of extensive electrification of energy consumption in companies, mobility and the built environment. These include both direct electrification of homes, vehicles and production processes, as well as indirect electrification through the scaling up of domestic electrolysis capacity. It is important for the climate challenge that electrification involves the deployment of an increasing share of CO_2– free electricity.

The Netherlands' approach aims at increasing the share of renewable energy from wind and solar, replacing electricity production from fossil fuels with CO_2– free fuels or applying CCS and CO_2– free production of electricity using nuclear energy. Key enablers for the transition are sufficient grid capacity and availability of hydrogen or other CO_2free fuels for electricity generation.

Achieving emission reductions in the electricity sector on Dutch territory is inherently uncertain. After the phase-out of coal, remaining emissions from the electricity sector come from gas-fired power plants. The controllable power of gas plants remains necessary for security of supply, but the actual amount of future rounds is uncertain. The deployment of CO_2– Free generation of electricity reduces the need to deploy gas plants, but the eventual deployment of gas plants depends on developments in the European electricity market. The adaptation of the Climate Law looks at how to deal with emissions from imported and exported electricity.

At the same time, European reduction in the electricity sector is firmly secured through the declining emissions cap of the European Emissions Trading System (ETS1), which will no longer issue new allowances in 2040 after the Fit-for-55 revision. In doing so, account should be taken of increasing electricity demand from other sectors. Recent geopolitical developments on European territory raise serious concerns about the development of energy prices and security of supply. They increase the

urgency of making the energy system more sustainable. Attention to high-risk strategic dependencies[54] as well as circularity is also important from the point of view of security of supply of critical metals, as further elaborated in the National Raw Materials Strategy and the European Commission's proposal for a Critical Raw Materials Act.[55]

Growth of renewable generation from wind and solar

In 2022, the Netherlands designated three new wind energy areas for offshore wind farms and confirmed two previously designated areas. This doubled the total planned offshore wind energy capacity to around 21 gigawatts by 2030. This is a huge task, given the short timeframe. The framework conditions for this ambition need to be in place: sufficient physical and ecological space for offshore wind farms, landing and transport of electricity produced, and sufficient demand for this electricity, especially in coastal areas close to landing, in order to reduce grid congestion. The realisation of offshore wind energy generates costs for other users in the North Sea and nature. The government aims to cover the incidental costs of offshore wind energy from the Climate Fund and the Next Generation EU Fund through the Dutch Recovery and Resilience Plan.

The ambition for onshore electricity production of at least 35 terawatt-hour production by 2030 is within reach. Small-scale electricity production from solar panels is also growing. Growing electricity production from wind and solar reduces the necessary electricity production from coal and natural gas. This is made possible by, inter alia, regional energy strategies and the promotion of cooperative energy generation. In addition to the EU ETS, the Minimum CO_2Price of Electricity Generation Act provides electricity generators with certainty over a long period of time about the minimum level of CO_2they have to pay, so that they can take this into account in investment decisions. In the SDE + +, it is directed towards the realisation of eligible production from wind on land and zon-PV (> 15 kW). In addition, SDE + + also plays an important role in electrification, which indirectly reinforces the business case of renewable generation.

Phase-out of coal, gas plant conversion and nuclear energy

The Act on the Prohibition of Coal in Electricity Production ensures the emission reduction of the coal-fired power plants until 0 from 2030. Gas-fired power plants will continue to be needed after 2030 as a controllable capacity for security of supply. However, the conversion of gas-fired power stations is under way to enable these CO_2free energy carriers to be deployed. The government also aims to contribute to the availability and cost reduction of high-quality renewable energy carriers, such as renewable hydrogen and green gas, through the deployment of funds from the Climate Fund. The Coalition Agreement is clear on nuclear energy: nuclear energy can complement solar, wind and geothermal energy in the energy mix and can be used to produce hydrogen. It also makes the Netherlands less dependent on gas imports. Therefore, in the Coalition Agreement, the government announced that the Borssele nuclear power plant would remain open for longer and that in addition the Netherlands would take the necessary steps to prepare for the construction of two new nuclear power plants. The Climate Fund has allocated funds to nuclear power plants. In view of the discussions on CO_2reduction, which also exist in Europe, the Netherlands is currently examining the role of nuclear energy in the future mix in the Netherlands. A scenario study (for the period 2030 – beyond 2050) examines the relationship between different types of CO_2free power, how nuclear energy can be integrated into the Dutch energy mix and cost-efficiency in relation to the system contributions of nuclear energy, including in particular less land use and infrastructure investments. In addition, a market analysis is carried out on the possibilities, applications and deadlines for the realisation of small modular reactors (SMRs).

Grid capacity

Pressure on the electricity grid is increasing. In the Coalition Agreement, it was agreed that the energy networks would be future-proof, that procedures for implementing energy infrastructure of national interest should be speeded up where possible and that the implementation power of the central government and co-authorities be strengthened. It is important to match the growth of renewable offshore electricity production with sufficient additional demand on the mainland and to adapt its networks. This requires coordination between the plans for additional offshore wind farms, on the one hand, and the plans on electrification in industry and development of renewable hydrogen production, on the other. In addition, the Netherlands is working towards a National Energy System Plan 2050. The electricity system is part of the energy system. For the spatial planning of energy infrastructure of national importance towards 2050, the Netherlands is working on the Energy Main Structure Programme.

Multiannual Infrastructure for Energy and Climate Infrastructure (MIEK)

In order to meet the climate targets (greenhouse gas reduction), sectors need to move from fossil fuels to renewable energy. To this end, the necessary infrastructure needs to be programmed, prioritised and implemented in a timely manner. With the

54Parliamentary Letter on Open Strategic Autonomy, Parliamentary Document 35982, No 9 and Parliamentary Letter Plan of Approach to Strategic Dependencies, Parliamentary Document 30821, No 181.

55BNC fiche EU Critical Raw Materials Act, Parliamentary Paper 22112, No. 3686.

Multiannual Programme for Infrastructure for Energy and Climate Action (MIEK), we are working with local and regional authorities and grid operators to plan energy and raw materials infrastructure projects ahead, prioritise and accelerate grid operators. These projects are essential for the sustainability of industry and for the realisation of offshore wind energy.

In 2023, the MIEK was extended to the provincial multiannual energy and climate infrastructure programmes (PMIEKs). In PMIEKs, provinces indicate which energy infrastructure projects need to be implemented as a priority in order to make the built environment, mobility, agriculture and industry (outside the 5 major clusters) more sustainable. In this context, it is important to work together on smart and effective interaction between provincial and national.

MIEK projects. For example, infrastructure built primarily to make industry more sustainable can also contribute to the sustainability goals of the other sectors.

The government is committed to further strengthening energy infrastructure governance by formalising cooperationprocesses and legally anchoring them where necessary. With the Ministerial Order 'Priority Framework and MIEK', grid extensions for MIEK projects56 are automatically included in the investment plans of grid operators of the electricity grid. This gives MIEK partners assurance that the projects are actually realised.
In addition, the same scheme provides that network operators must carry out MIEK projects with relative priority. In order to further formalise the current path up to a MIEK decision, the balancing framework is being developed, the manual is updated and a cooperation agreement with MIEK partners may be concluded.

Hydrogen
Hydrogen from renewable and low-carbon sources will become an indispensable link in a climate-neutral society. Over time, it replaces an increasing share of the role that natural gas now plays in the energy and raw materials system. Several sectors, such as industry and mobility, can and should switch to CO_2free hydrogen. Plans from the Coalition Agreement, such as the conversion of gas plants and the tailor-made arrangements with large industrial emitters, lead to an additional demand for the use of CO_2free hydrogen. Specifically for the use of renewable hydrogen, the European Commission proposes binding targets in the industry and mobility sectors. In order to achieve sufficient supply in a timely manner, the government looks at both domestic production, coupled with offshore wind energy, and imports. Reducing costs through innovation and scaling up is important to make this offer affordable. This also applies to the facilitation of national infrastructure. The Netherlands has earmarked up to EUR 750 million for the development of the transport network by Gasunie daughter HyNetwork Services (HNS). This is due to the risks involved in investing in energy infrastructure for markets that are yet to develop. Existing LNG import terminals may – after conversion – be used for the large-scale import of hydrogen (or other green energy carriers such as ammonia or derivatives).

The Netherlands scalded 4 gigawatts of domestic electrolysis capacity in 2030, after which it is expected to grow rapidly. The target of 8 gigawatts of electrolysis appears to be achievable at the earliest by 2032, due to the need to keep pace with the growth of offshore wind energy capacity and to avoid crowding out direct electrification. With a total available budget of almost EUR 800 million, seven Dutch high-impact hydrogen production projects are subsidised from the second wave of IPCEI hydrogen. If these projects are planned to be realised, they together generate a power of 1,15 gigawatts. In addition, the National Growth Fund has allocated budget to research, demonstration and investment programme GreensNL. Chapter 2.1.II.iii describes the first demonstration projects for electrolysis. In addition, the government plans to develop a mix of instruments for scaling up renewable hydrogen in the coming years.

The government opts for standardisation and subsidy in order to scale up the hydrogen market significantly up to 2030. A purchasing obligation in the industry should provide potential exporters and producers with clarity on the demand for hydrogen in the Netherlands. In addition, subsidies will be used to redirect the market in a targeted manner and to cover part of the additional costs.

For the scaling up of electrolysers for the production of green hydrogen, around EUR 1,9 billion will be made available from the Climate Fund. It also includes reservations for 2025 totalling over EUR 5 billion. The funds are intended to stimulate the production of electrolysers up to and including 1000 megawatts, both offshore and onshore. The relevant financial instruments for this purpose are still being developed. In addition, EUR 300 million will be made available for H2Global, focusing on hydrogen imports. It is a joint project with Germany, in which tenders are organised to purchase and resell hydrogen on the basis of 10-year contracts in the form of one-year contracts.

56Government Gazette 2023, 11126 | General Government > Official Publications (officielebekendingen.nl).

Complementary policy for the Spring Decision-Climate Policy

Additional policies on the electricity sector were presented in the 2023 Spring Decision and will be further elaborated. It reiterated the need for major steps in the greening of the electricity grid to meet the increased demand for electricity. In addition, there is a need to rapidly reduce existing emissions – now about a fifth of our total CO_2emissions. In addition, the Netherlands ensures that they become more independent from imports of fossil fuels from abroad.

The government is stepping up the ambition for the electricity sector: the aim is to have a CO2 free electricity production in the$_{Netherlands}$as early as 2035, which is affordable and reliable. The perspective is an electricity system in which plants are responsive to times where there is a surplus of cost-effective renewable electricity, and where we use electricity smarter, and are flexible enough to cater for periods of less sun and wind. We monitor security of supply and energy affordability by properly monitoring developments and adjusting them on an annual basis.

While the sustainability of electricity supply is progressing rapidly, the government sees opportunities to accelerate in a number of respects. Increasing the supply of wind and solar energy plays an important role, which also requires investments in the electricity grid. But there is also a need to produce enough electricity at times when there is less or no wind and sun. To this end, the government focuses on the expansion of CO_2– freely regulated power, additional energy storage and additional policy on balancing energy demand.

The Netherlands now relies mainly on power plants using natural gas, coal or bio-raw materials for regulating power. As of 2030, the production of electricity from coal is prohibited. The government is examining what measures could be taken to make existing power plants run on renewable energy carriers as soon as possible. This includes, for example, incentivising the use of hydrogen. Ultimately, in 2035, due to the growth of renewable green electricity and the conversion of plants, the electricity system is completely free of CO_2. The commitment to nuclear energy is that the new plants will play an important role in the CO_2free electricity system by 2035. If two additional plants are operational around that time, the share of nuclear energy increases to more than 10 % of the electricity mix. We are also accelerating the development of Small Modular Reactors (SMRs) that are close to the market at their design stage. We do this by strengthening the value chain and linking SMR developers to the Dutch manufacturing industry.

The Netherlands is committed to electricity storage by investing in battery innovations and by making batteries mandatory for large-scale solar parks. This will allow solar energy to be used even if the sun does not appear and will relieve the electricity grid. The Netherlands also encourages offshore hydrogen production and energy exchanges with other North Sea countries, so that energy can be stored and exchanged for a long time.

The Netherlands is committed to balancing electricity demand. Significantly expanding the electricity and hydrogen networks and connecting them more closely to neighbouring countries, as well as working with countries able to supply hydrogen, will make it easier to import and export electricity and hydrogen and better respond to local supply and demand imbalances. Finally, energy saving remains very important. After all, we do not have to generate or import all the energy we save. Therefore, the Netherlands extends the energy savings obligation to include large consumers as of 1 July 2023. To ensure that everyone contributes to energy savings, energy savings targets are set by sector.

Mobility

Perspective:

In 2050, Dutch traffic and transport no longer emitted harmful exhaust gases and CO_2, which is good for the climate, nitrogen declaration and our health. This requires changing our travel behaviour, moving towards cleaner transport. In this respect, it is necessary for the Netherlands to have sufficient access to transport for poor, rich, young and old, dignified and less well-qualified. Combating climate change must therefore go hand in hand with achieving zero-emission transport for all Dutch people.

Description of the policy:

Sustainable mobility policy is based on four pillars: (1) active mobility and sustainable mobility for people, (2) electric passenger cars, (3) logistics and (4) strengthening of sustainable fuels.

Active mobility and more sustainable mobility for people

The Coalition Agreement allocates up to EUR 2030 265 million for greening passenger transport and travel behaviour and then structurally EUR 29 million per year. In the coming months, the government will draw up a comprehensive, multi-modality plan. The development of this measure, in line with the latest IPCC report (which highlights the importance of behaviour in the climate

transition), will focus on making travel behaviour more sustainable. The Netherlands is also working on policies that have been put in place. In addition, through the Anders Reizen Coalition, the Netherlands grants grants to large employers who then commit to halving their CO_2emissions. The Netherlands also continues to promote cycling and walking in line with the IenW-Fietsambitie 2022-2025 and the National Future Vision Fiets 2040 prepared in Tour de Force. For example, by contributing EUR 780 million to the creation of new housing sites by bike and on foot, the Netherlands makes a structural contribution to a national network of cycling routes. And through the 'Kies de Fiets' and 'Short ritje' campaigns? A Citydeal Fietsen for everyone also looks at how to make cycling accessible to everyone.'

Electric passenger cars

The Netherlands is committed to timely deployment of sufficient recharging infrastructure. Additional resources are needed to achieve the goals of charging infrastructure. The Climate Fund has made funds available for the deployment of energy transition infrastructure, including charging infrastructure for mobility. The link with energy infrastructure is also important here. In the EU, the Netherlands is also working on ambitious charging infrastructure obligations to enable cross-border electric mobility. The Netherlands is also working through policies already in place, such as the Stimulering Elektrische Personenauto Particulieren (SEPP). It is intended to help citizens switch to a new or second-hand electric car. Moreover, the government remains committed to strengthening the current European vehicle standards, including intermediate targets by 2030. In this context, the Netherlands calls for a phase-out of new fossil vehicles by 2030, five years earlier than the 2035 proposed by the European Commission. And we remain committed to behavioural influence and communication as it appears that misconceptions and uncertainties about electric cars can hamper the transition to electric driving.

Road transport logistics

The Netherlands proposes in the Wet BPM 1992 to abolish the trader's exemption for a delivery vehicle (business exemption) with effect from 1 January 2025. The exemption in the BPM for zero-emission vans remains.
The specific attention in the Coalition Agreement and additional funding for sufficient charging infrastructure as described above for electric passenger cars also applies to the logistics sector, public transport by bus and construction. The Netherlands is also working on the logistics pillar to introduce zero-emission zones for urban logistics, the subsidy scheme for Emissieloos Bedrijfsauto (SEBA) and the Zero Emission Trucks procurement subsidy (inception). Through the Schoon and emissionless Building Equipment Subsidieregeling (SSEB), the Netherlands is helping to build their equipment, vessels and vehicles in a sustainable way. Funds will also be made available to contracting authorities, ProRail and associated authorities to support the transition. The Schoon and emissionless Bouwen Roadmap (SEB), with the final reduction of the path for both nitrogen, CO_2 and particulate matter from these vehicles and actions to achieve this, receives the Lower House for the summer. Signature of the accompanying SEB Covenant will take place after the summer. Rapid digitalisation is achieved by creating a Basis Data Infrastructure (FDI) that allows companies to share cargo information among themselves, optimise networks and improve choice of modality.

Sustainable energy carriers

The Netherlands is committed to blending biofuels with a prioritisation for heavy road transport, shipping and aviation. No concrete instrument is yet linked to this.

Sustainable fuels are also promoted at European level (including through REDIII). Some 150 petajoules may be expected as of 2030 instead of 65 petajoules of renewable energy carriers in transport (including air, sea and inland waterways). The Netherlands continues to pursue its sustainable fuels policy. Among other things, the Netherlands is working on an incentive scheme for the application of hydrogen in mobility.

The Netherlands is also working to achieve the objectives set out in the European Alternative Fuels Infrastructure Regulation (AFIR). This Regulation sets requirements for where and how many alternative recharging and refuelling infrastructure should be deployed along major routes and in the urban nodes.

The emissions trading system for buildings, road transport and other sectors (ETS2) offers a decreasing cap on road transport emissions in the EU. According to the PBL, the effect on the final consumer is 12 cents extra per cubic metre of natural gas and 12-14 cents per litre of petrol and diesel respectively in 2030. At this price level, according to the PBL, the ETS GRT for the built environment and road transport together could lead to a reduction of up to 1,25 megatons of CO_2.

Shipping

The Netherlands has one of the largest maritime sectors in Europe. This requires our country to make a significant contribution to the European sustainability challenge, but also offers opportunities. With existing knowledge and innovation, our country can

become a frontrunner in sustainable technologies and become a hub in the production and supply of sustainable (ship) fuels.

Maritime and inland waterway transport are sectors operating internationally. This is why the government is putting in place ambitious policy instruments at international level to maximise the impact while maintaining the level playing field.

For maritime transport, there is now an agreement at EU level to regulate the standardisation of greenhouse gas intensity on board ships (FuelEU Maritime) and the pricing of greenhouse gas emissions from the inclusion of maritime transport in the EU Emissions Trading System (ETS). The International Maritime Organisation (IMO) is working on similar proposals at global level. As in the EU, the Netherlands is withdrawing with other ambitious countries. Within FuelEU Maritime, the use of shore-side electricity will be mandatory for container and passenger ships from 2030, while within the AFIR there will be an obligation to provide shore-side electricity in TEN-T ports.
For inland waterway transport, work is underway at EU level on a Sustainable Fund to support the transition to a sustainable inland waterway fleet in Europe. These international instruments are expected to play a sufficiently supporting role in the energy transition only after 2030. However, in order to reach the goal of climate neutrality by 2050 and prepare the sector for it, an acceleration of the transition is needed earlier. The Netherlands will consider, together with the industry, how this can be achieved in the coming year and what additional impetus is needed. To support this, a project has recently been funded by the National Growth Fund to have 45 battery electric inland waterway vessels and 12 charging stations as of 2026. Within the NGF application for a Maritime Master Plan, a contribution is requested for the demonstration of other fuels and energy-efficient technologies on board ships. The Netherlands will also increase the availability of shore-side electricity in maritime and inland ports to reduce NOx and particulate matter emissions from seagoing vessels at the quay in addition to CO_2. This could in turn contribute to the nitrogen space needed to invest heavily in maritime ports in the coming years in land-based infrastructure for the production, supply and transport of sustainable fuels and energy carriers. Shipping can play an important role in this, both in terms of transport and the use of sustainable energy carriers. Ports play an important role in the production, supply and infrastructure of sustainable energy carriers.

Aviation

The Dutch policy for making aviation more sustainable is set out in the Aviation Note 2020-2050 and continued thereafter. As described in Chapter 2, in addition to the key targets and measures at global and European level, work is ongoing to reduce $CO_{2\ in\ sectors}$ on departing flights. Priority is therefore given to measures that can have a direct impact on them, namely sustainable aviation fuels and innovative technologies.

The Netherlands played a major role in the lobby for a European blending obligation of SAF, which became ReFuelEU in the Fit-for-55 package. On the basis of the proposal, it is expected that this will make a major contribution to blending and thus CO_2reduction of aviation in the Netherlands, while maintaining the level playing field. At the same time, there is a gap between the European target of 6 % blending and the national target of 14 % and there is no legal scope for further national measures. The government is therefore exploring the possibility of achieving this objective by means of incentives.

In 2023, the Dutch Aviation Innovation Strategy will be presented with strategic choices at national level to contribute to climate change mitigation and other goals. The National Growth Fund has allocated up to EUR 383 million for the project Aviation in Transition, which aims to help develop new ultra-efficient and hydrogen aircraft.

The government took a decision in principle in March 2023 to introduce a CO_2cap per airport. This will make the$_{CO2}$reduction targets for international aviation in the sector binding and secure through airports to provide certainty and clarity that our national targets will be met anyway.

Finally, the Netherlands is at the forefront of policy formulation on the underhighlighted non-CO_2climate impacts of aviation, for which an approach was published in March 2023. It focuses on more and more focused research, global standards and European rules, and regional and public-private cooperation.

Complementary policy Spring decision making

The following additional policy on mobility was presented in the spring decision of 26 April 2023 and will be further developed:
The government is accelerating the phase-in of zero-emission passenger cars by increasing the CO_2target for employment-related mobility of people. This creates an incentive for employers to encourage the use of EV, OV or bicycle for both business and home driving. In addition, the government is subsidising the purchase of a second-hand electric car.
This is important to quickly make electric driving attractive to a large group of Dutch people. At the same time, the government is investing in additional charging infrastructure for electric vehicles, so that faster deployment of electric driving is actually possible

in cities and regions.

For heavy transport and transport of goods, the government makes performance agreements with the transport sector on reducing CO_2emissions. The government is also committed to making inland waterway transport more sustainable – by introducing an emission label and pricing fuels through the ETS2. The government intends to help the transport sector in this regard and makes funds available for the purchase of heavy electric vehicles through a return lock of the truck levy. In addition, money is earmarked for the use of hydrogen in heavy road and inland waterway transport. Maritime transport is an international sector and does not count towards the national emissions target. However, it is important to promote sustainability in this sector as well. The government is therefore earmarking resources for the development of sustainable sea-going vessels.

With a large share of current road traffic moving on fossil fuels in the coming years, the use of biofuels in road transport will be increased. As electrification continues, an increasing share of it will be used by transport where there are few alternatives to it, such as heavy road transport.

Agriculture and land use

Perspective:
The shift towards sustainable agriculture and land use is crucial to achieving the climate transition as the Netherlands. It is very important to take into account a future of agriculture that is in line with the policy goal of climate neutrality for the Netherlands by 2050, which contributes to a sustainable and attractive business model for the sector. This comes together in the National Programme for Rural Areas (NPLG), and the further implementation of the climate agreement and the structural approach to nitrogen.

Description of the policy:
The 2030 final targets for agriculture and land use should be achieved through the implementation of the Climate Agreement (2019) and the measures set out in the Coalition Agreement. In addition to the Climate Agreement, the policy consists of the combined approach to nitrogen, climate, nature and water in the rural area (through the NPLG) and a coherent package to make greenhouse horticulture sustainable, with a view to outlining the long-term perspective for greenhouse horticulture in order to successfully complete the transition process until 2040. An individual levy and fiscal measures are part of this package. In addition to these measures, the new Transition Fund and the Climate Fund are important to support the agricultural sectors in their transition. The Transition Fund is used for the combined approach in the rural area. The Climate Fund plays an important role in the energy transition, including agriculture and in particular glasshouse horticulture, such as by incentivising the improvement of energy infrastructure, switching to sustainable fuels, energy saving and promoting renewable energy generation (including hydrogen). A new subsidy scheme is being set up for heat infrastructure for greenhouse horticulture. EUR 300 million will be available from the Climate Fund. The EC scheme is a subsidy for energy-saving measures and the use of renewable energy in greenhouse horticulture. An additional EUR 200 million will be available for the financial years 2023 to 2027.

Two key issues for agriculture and land use are the continuation of the commitments of the Climate Agreement and the realisation of the potential synergies between the different sectors in terms of the energy transition and the transition to a circular economy. Moreover, investments now being made are already important to achieve the goal of a climate-neutral Netherlands by 2050.

Coherent package of greenhouse horticulture
The coherent package to make glasshouse horticulture more sustainable leads the sector and horticulturalists to deliver on the sector's ambition to become climate neutral by 2040. The government supports this ambition by using tools to reduce the use of natural gas and incentivise alternatives such as electrification. The coherent package contains a variety of measures. In April 2023, the final target was set at 4,3 megatons.57 In this context, it is a commitment to reduce an additional 1,0 megatons compared to the commitments set out in the Coalition Agreement and the 2021 Million Note.

Combined approach nitrogen, climate, water, nature in rural areas
A significant part of the transition to sustainable agriculture and land use is channelled through the National Programme for Rural Areas (NPLG). This programme makes an important contribution through a combined approach to the goal of reducing methane emissions by 30 % by 2030 compared to 2020 (Global Methane Pledge) and to restoring the ecological balance with nature, soil and water.

57Spring decision-making on Climate Action April 2023, Parliamentary Document 32813, No 1230.

The NPLG should achieve 5 megatonnes of greenhouse gas reduction in livestock and arable farming by 2030. It is expected that around 1 megatonnes of reduction can already be achieved with buy-back schemes. The remaining 4 megatonnes climate challenge is subject to normative and price-setting policies. The Minister for Agriculture, Nature and Food Quality agrees in the Agriculture Agreement on the practical implementation of the normative and price-setting policy. If this does not cover the 4 megatonnes reduction target, additional agreements are needed. The policy is an input to the NPLG's area programmes, through which provinces implement the declarations in a area-oriented and comprehensive manner. Synergies with target range for nitrogen and water quality are therefore taken into account in the choice of measures. The Government will take into account the findings of the Working Group on Standardisation58 and Pricing Nitrogen and the possibility of area differentiation in the development of a coherent package that will reduce nitrogen deposition, reduce greenhouse gas emissions and improve water and soil quality.

The Ministry of Agriculture, Nature and Food Quality has asked Wageningen University &Research (WUR) to identify additional climate measures for livestock farming that could contribute to the target range of the 2030 residual report in agriculture and the declaration of 5 megaton $CO_{2\ equivalents}$linked to the NPLG. On this basis, additional measures that are possible and necessary to meet the climate challenge for livestock farming are assessed.

The instruments described below are measures from the Climate Agreement and the structural approach to nitrogen, the reduction potential of which is not included in the emission estimates in the KEV2022.

High quality manure processing subsidy scheme

In 2022, the subsidy scheme for high-quality manure processing was introduced, with a first opening of EUR 6 million. A total of EUR 48 million, over a period of 10 years, is available for this subsidy scheme. The aim is to stimulate high-quality manure processing capacity of livestock manure, and thus the production of high quality fertilisers from livestock fertilisers (fertiliser substitutes), thus reducing greenhouse gas and ammonia emissions. This is in line with the outline of the future manure policy and with the transition to circular farming.

Subsidy modules on resource oriented sustainability of stables and management measures

Solar innovations for integral emission reduction (ammonia, methane, smell and particulate matter) are encouraged through the Soil Resource Oriented Sustainability (SBV) modules. This existing scheme consists of an innovation module and an investment module. The innovation module will support livestock farmers in the research and development of innovations, in order to obtain proven techniques for the wider application in the future. The investment module allows livestock farmers to receive subsidies for investments in proven innovations in housing systems. Due to uncertainty with regard to the

Wnb licences and the effectiveness of low-emission housing systems in practice has been temporarily suspended from the announced opening of the investment module.59 Preparations are continuing and Wageningen University &DResearch (WUR) has been asked to identify available techniques, including those that reduce greenhouse gases.

Integrated approach to methane and ammonia emissions

The objective of the research and innovation programme "Intotal Addressing Methaan and Ammoniak in Livestock Farming" is to provide insights into complex biological relationships and workable measures to address them. We now know that the impact and potential of management measures are high. Management therefore deserves a serious role in achieving the reductions. The programme will develop practical measures for feed, grass management, animal, shed and manure for dairy farming. Livestock farmers can use these measures to adapt their holdings economically and in a forward-looking manner to the climate and nitrogen challenges. To do so, the measures will have to be economically sound and the emission reducing effect will have to be included in the emission recording.

Tightening emission standards for ammonia for new stables (part of the structural approach nitrogen)

The structural approach to nitrogen includes the source measure "stabling measures", which includes the tightening of emission standards for ammonia for new stables. On the basis of a sector analysis of the perspectives of existing and new innovative techniques, stricter emission standards for ammonia are set for each animal group in the case of new stables. These requirements will have been addressed for all relevant animal groups in 2025. Existing stables will then be subject to a transitional period to be

58Parliamentary document 34682, No 108, Parliamentary letter on progress in the integrated approach to rural areas and follow-up to the judgment of the Council of State on Porthos.
59Parliamentary document 29383, No 384, Parliament's letter on the future promotes innovation in low-emission stables systems.

defined, taking into account the possibilities of farmers. Farmers are supported by subsidies to make the necessary adjustments.

Nationwide cessation scheme for livestock farms (part of the nitrogen structural approach)

The National Livestock Site Termination Scheme (LBV) is a scheme that allows livestock farmers to receive subsidies if they voluntarily want to end their production and production capacity permanently and irrevocably. The scheme is part of the structural approach to nitrogen. By reducing the number of animals, the scheme has a reducing effect on both nitrogen and greenhouse gas emissions.

Agricultural soils

The National Agricultural Soil Programme is working towards the sustainable management of all agricultural soils in the Netherlands by 2030 and the additional fixing of 0,5 megatons of CO_2equivalents per year in mineral agricultural soils. The programme started in 2019 and will continue. The Slim Landuse research programme will also be continued.

Farm meadow approach

The government wants to step up the peat grazing approach by standardising the groundwater level subject to available funding. The exact standard may vary from area to area and becomes part of the area-based approach. Discussions on this issue are taking place within the framework of the Agriculture Agreement.

The Climate Agreement agreed on a declaration of 1 megatons of CO2 eq greenhouse gas emissions reduction in 2030, to be achieved with concrete measures in an area of about 90.000 ha of peatlands as a sum of 6 regional peatlands. The mix of measures consists of: (a) converting approximately 10.000 ha from agricultural land to agricultural nature and wet crops; (b) increase about 80.000 ha of groundwater levels, use of infiltration and innovative drainage techniques and soil measures. Provinces draw up the peat grazing strategies.

Trees, Forests and Nature Approach

The measures are divided into the implementation of the Forest Strategy and into wet nature measures. The Forest Strategy has ambitions for, inter alia, the creation of new forests inside and outside the Dutch Nature Network, the restoration of forests and the creation of landscape features and agroforestry, and aims to achieve at least 0,26 megatons of carbon sequestration. There is currently no programming with committed hectares per province until 2030 and the ambition for forest expansion outside the Nature Network Netherlands is not yet covered financially. The wet nature measures should

deliver at least 0,14 megatons of carbon sequestration, but these have been limited in the Climate Agreement. For this reason, a project team on nature has been launched, whose task is to come up with realistic programming of measures for lowbogs, raised bogs, transitional areas, sea/coast/salt marshes, open water and river marshes. The measures for new forest and forest restoration set out in the Forest Strategy, the targets for agroforestry and landscape features and the requirement for wet nature are included as targets in the NPLG.

Complementary policy Spring decision making

The Spring Climate Policy Decision of April 2023 stated that the shift towards sustainable agriculture is linked to changes in the behaviour of citizens and businesses. Behavioural change can be supported by measures aimed at making food supply more sustainable. Addressing consumer, market and chain issues involves the Minister for Agriculture, Nature and Food Quality in the discussions of the Agriculture Agreement. This includes, inter alia, levies to promote sustainable food production and consumption. This is expected to require further investigation.

For glasshouse horticulture, the Government is in line with the Agreement on the Energy Transition of Glastuinbouw 2022-2030,[60] by replacing the CO_2sector system as of 2025 with a flat individual CO_2levy as of 2025 and by setting the residual target at 4,3 megatons. The government is committed to the balance between pricing and subsidies and therefore makes funds from the Climate Fund available for energy savings and a heat infrastructure scheme. The CO_2levy is complementary to the fiscal measures announced in the Coalition Agreement; for these fiscal measures, they have grown completely as of 2030 and the government may decide in August 2023, on the basis of an impact analysis still to be issued, to a path of convergence with substantial steps from 2025 onwards. The flat individual CO_2levy is proposed in return. Furthermore, the government opens up the category of 'air-to-water heat pumps' to glasshouse horticulture and earmarks funds for existing renewable heat projects.

Finally, the artificially low water level in peat meadows causes oxidation of the peat, leading to additional greenhouse gas emissions and soil degradation. The Cabinet is working on solutions with provinces and agricultural and nature organisation through the peat grazing approach. The government intends to step up this approach, subject to available funding, by standardising the groundwater level. The exact standard may vary from area to area and becomes part of the area-based approach. Discussions on the setting of standards take place within the framework of the Agriculture Agreement.

Built environment

Perspective:

Millions of homes and buildings were preserved in 2030. A sustainably heated and well-insulated house or building is not only more comfortable, it is also good for the climate and the wallet. We give priority to houses and buildings with the worst energy labels (E, F and G). Additional support and clarity on the final situation to be achieved is needed to enable everyone to participate in the sustainability process. In this way, we bring climate gains and a structurally lower energy bill.

Description of the policy:

Strong environmental requirements for new construction and the sustainability of the existing stock have reduced greenhouse gas emissions in the built environment from 29,1 megatons in 1990 to 22,6 megatons in 2021. This despite a sharp increase in the number of dwellings in recent decades. Despite the fact that much has already been started and continues in the PVGO, we are not yet there. The pace is still too slow. Moreover, climate targets have been further increased over time. The Government is therefore working with all parties to the Climate Agreement to further accelerate the sustainability of the built environment. At the core of the approach in the built environment is the reduction of energy demand through behaviour, insulation and hybrid heat pumps and the development of sustainable heat sources to meet that remaining demand. This is done through multiple tracks at the same time. Both through the area-based approach through municipalities (based on the transitional heat and district implementation plans) and through policies for individual dwellings and buildings, making best use of transaction and replacement times. It is precisely when purchasing a house, moving, refurbishing or replacing the heating installation that it makes sense to take sustainability into account. Special attention is given to affordability of energy bills. This is partly due to the consequences of the war in

[60] Parliamentary paper 32627, No 43.

Ukraine is more topical than ever. Many households and businesses face increased energy bills. It is no longer possible to pay for some of the households. Investments earn back faster than ever before. Research by the IPCC has shown that the price of many sustainability measures has decreased over the last decade. The Netherlands therefore sees this as the time to accelerate with energy savings and insulation. Indeed, a better isolated house is the best insurance against rising energy prices now and in the future. It is important that everyone can participate and that a lower energy bill is accessible to everyone. In doing so, vulnerable

households will be supported in taking energy-saving measures.

The Netherlands achieves the acceleration of the energy transition, which describes the PVGO, through a programmatic approach with clear objectives, intermediate steps, measurement of progress, and agreements with corporations, municipalities and economic operators, among others. This programme builds on previous policies and ensures a cost-effective approach to buildings, with deep renovation of individual homes, a planned approach and demand aggregation of social housing, roadmaps and a portfolio approach for commercial and social property. There is also a strong focus on making energy infrastructure more sustainable with local renewable energy, heat grids and green gas. Knowledge, innovation and the training of professionals will be further boosted and there is a particular focus on tackling energy poverty. Within the PVGO there are five specific programme lines and two transverse programmes.

The five specific programme lines are:

1. The area-based approach to the heat transition (both the transition to 'away from natural gas' and the local isolation approach): the management of existing dwellings and buildings by street and district under the control of municipalities. A National Programme for Local Heat Transition provides municipalities with sufficient resources and support for their tasks. There will also be a new legal framework for competences for municipalities in the local heat transition.
2. The individual approach to owner-occupied and rented dwellings: individual owners of dwellings, both in the purchasing and rental sectors, receive, among other things, easily accessible information, profound relief, subsidies and funding. There will also be a clear phase-out policy for poorly insulated housing, also on the basis of the European directives, and standardisation for the sustainability of housing.
3. The approach for non-residential buildings (commercial and social): an ambitious final standard for non-residential buildings will be set for professional building owners. There will also be standards for phasing out poor energy labels in non-residential buildings. It will help owners of non-residential buildings with grants, funding and practical support.
4. Sources and infrastructure (for developing sustainable sources and accelerating the deployment of heat networks): natural gas is partially replaced by green gas, reducing CO_2emissions and encouraging the development of renewable sources and energy carriers. In addition, the tools and conditions for new infrastructure (heat grids) and appropriate sustainable heat sources will be realised.
5. Innovation in construction: construction and cultivation is becoming more innovative and more sustainable. Therefore, new market-ready products with higher (environmental) quality and lower costs are first introduced for market segments with many similar dwellings; industrial and digitised construction and conversion should then become the standard in all appropriate segments.

The two transverse programmes are:

1. the National Isolation Programme, which aims to isolate 2,5 million dwellings until 2030
2. the Hybrid Heat Pumps Programme to drastically reduce the use of fossil fuels for heating buildings.

Priority in the approach is energy savings

The priority is to save energy. Indeed, saved energy does not need to be generated, transported or paid for. The latter is now particularly important due to high gas prices. Awareness of energy consumption, behavioural change and simple saving measures are therefore an important part of the approach. This could already save a lot of natural gas in the short term. The broad coalition for energy saving and energy saving measures will help to achieve this. Meeting the 2030 targets requires a combination of behavioural change, application of insulation and more efficient installations. This will structurally reduce energy consumption and greenhouse gas emissions and give people a more comfortable home and lower energy bills. In order to meet the remaining energy demand, the Netherlands will provide renewable energy sources. The Netherlands is also developing techniques that only achieve a reduction effect after 2030, so that the Netherlands is also ready for the next phase of the transition. The Netherlands wishes to reduce as much as possible the environmental pressures generated by the sustainability activities themselves. Therefore, the Netherlands encourages the use of (natural) materials with low environmental pressure, the use of zero-emission feed and equipment, the digitalisation of work processes and the industrialisation of sustainability concepts.

Moving from individual measures to a more collective approach, with more sustainable ‘street for the street’ and ‘neighbourhood to neighbourhood’, is not easy. It requires the development of an offer to which people are enthusiastically enthusiastic, the capacity of municipalities to implement and available knowledge and capacity among market players. Lessons learned in recent years, including from the Aarhus programme (PAW), show how a collective approach can be established and scaled up. This will be built on in the coming years through a national programme to support municipalities in the local heat transition.

The necessary greenhouse gas reduction is translated by the government into the following concrete sub-targets that the Netherlands intend to achieve by 2030:

- Isolation of 2,5 million homes with a focus on phasing out bad labels (E, F and G):
  - 1,5 million owner-occupied dwellings
  - 1 million rented dwellings are insulated to the standard for housing insulation.
- Phase out bad labels in non-residential construction:
  - Make the 15 % of the worst energy performance buildings sustainable by 2027, energy label G in accordance with the new label classification up to a minimum C energy label (60.000 buildings).
  - Make buildings with energy label F in line with the new label classification as a minimum C energy label (60.000 buildings) sustainable for 2030.
- Switching to sustainable installations or heat networks:
  - 1 million installed hybrid heat pumps in existing construction.
  - 500.000 new connections to a heat network in the existing building (in residential equivalents).
- Increased use of sustainable resources: Blending 1,6 BCM green gas, equivalent to 2,9 megatonnes of greenhouse gas reduction by 2030.

Depending on the progress of the different measures, the Netherlands is adjusting.

Complementary policy Spring decision making

In the Spring Decision of April 2023, the Netherlands gives priority to the houses and buildings with the worst energy labels (E, F and G). Additional support and clarity on the final situation to be achieved is needed to enable everyone to participate in the sustainability process. For example, the Netherlands ensures climate gains and a structurally lower energy bill.

Vulnerable households are receiving additional support from energy fixing teams that will provide support across the country. The National Programme for Local Heat Transition provides support to municipalities in this regard. The government is also investing in making vulnerable neighbourhoods and villages affected by a high share of energy poverty more sustainable.
Through the Heat Fund, we provide even cheaper financing for low and (low) middle-income earners. The 0 % interest rate is widened to income to EUR 60,000. And for Associations of Owners (FTEs) there will be an interest discount. For example, the number of households affected by energy poverty is decreasing and most vulnerable households observe that climate policy also works for them. In addition, additional funds are available in the Investment Subsidy Sustainable Energy and Energy Savings (ISDE) to support investment in, inter alia, insulation and heat pumps. To finance the unprofitable top of heat networks, the Warmte Infrastructures Subsidieregeling (WIS) has been published. The measure concerns a national subsidy scheme for heat networks in order to limit the unprofitable peak. A total of EUR 600 million will be available from the Climate Fund and a reserve of EUR 1 billion will be included as of 2025. There will also be a Development Fund for Heat Cooperatives. In addition, geothermal activities and scaling up of vegetable production are being pursued.

With legal obligations, the government provides clarity on sustainable requirements for residential and commercial buildings, including social property, so that people know what to do. In doing so, the Government applies as much as possible reasonable time limits and we close as much as possible to natural moments, such as a transaction or renovation. We are asking for more pace from professional building owners than from private property owners.

The 15 % buildings with use functions for shops, accommodation and meeting buildings with the worst energy performance should be preserved as of 1/1/2027 and the next 10 % by 1/1/2030. This means on average the buildings labelled EFG per 2027 and label D per 2030. For the healthcare, education, sports and cell functions, the years will apply as laid down in the final European Energy Performance of Buildings Directive IV. For cultural buildings, the possibility of using the EPBD years will be considered.

With the proposed programmatic approach, the sustainability of social property can be better organised. Rental housing with an EGF label should also be accelerated in the coming years. These dwellings may no longer be rented out as of 2029 if they do not have a minimum D label. They will be preserved directly to the standard for housing insulation by making them more sustainable from 2029 onwards, making them ready for the transition to sustainable heat in terms of insulation.

Inorder to ensure a sufficient pace in the sustainability of the purchasing sector in the future, housing owners are supported by the Heat Fund and by differentiation of lending standards on the basis of energy labels, thus increasing the lending space for EGF-labelled dwellings to make them more sustainable. Citizens can rely on the availability of grants. Finally, we improve the support for FTEs and the provision of information to citizens and local and regional authorities, for example information for tenants through the improvement house.

Climate action in the health and sport sectors

The climate transition affects all – citizens, businesses and civil society organisations in all sectors. The health and sports sectors therefore also play their part by working to reduce their climate footprint.
The government strongly supports this.

The urgency to achieve sustainability is felt as low as in the care sector, as climate change and environmental impact are damaging to public health. Care also contributes to this. More and more parties and professionals want to break this paradox. In recent years, the Ministry of Health, Welfare and Sport (VWS) has facilitated the sector to work towards the sustainability of care, and[61] with the third Green Deal *Working together on Sustainable Care*[62], new commitments have been made with the sector. These include agreements on health promotion, awareness raising, CO_2reduction, circular and economical use of resources and raw materials and environmental impact of medication (use). In Spring 2023, the government has occasionally made available EUR 42 million to make care more sustainable and support the Green Deal. In the sport sector, the Sustainable Sport Roadmap targets, consisting of the CO2 reduction, circularity and environmentally friendly management,have been addressed in recent years. This is supported by the subsidy scheme Stimulering Bouwen en Maintenance Sports Accommodations60 (BOSA), care for owners to promote sustainability through SportNLGroen and financing through, for example, the sports loan.

However, acceleration is still needed. In addition to the more generic climate tools, the Ministry of Health, Welfare and Sport (VWS) is working on integrated programmes for the sustainability of care, well-being and sport, aiming at an appropriate mix of standardisation, pricing and subsidies. Proposals are being developed for possible additional instruments to accelerate sustainability in these sectors and for joint funding from the sector, the Ministry of Health, Welfare and Sport and the 2025 Multiannual Programme for Climate Fund.

Complementary policy Spring decision making for cross-sectoral measures

As the climate transition affects all sectors in the Netherlands, the government is also looking at effective measures that have an impact in several sectors at the same time. These include phasing out tax incentives for fossil fuel and raw materials, adapting energy taxation, tightening the energy saving obligation, increasing the SDE + + budget (see the next chapter on Renewable Energy), widely implementing the new European trading system (ETS2), examining what is needed to introduce a national cap on emissions for ESR sectors, and using the Climate Fund.

Reduction of tax advantages for fossil fuel and raw materials

The Government shall abolish the coal tax for dual use of coal with effect from 1 January 2028. The current tax system in the Netherlands contains even more (indirect) advantages in the form of tax exemptions, rebates and adjusted tax rates that can

60 www.dus-i.nl/subsidies/stimulering-bouw-en-onderhoud-sportaccommodaties.

promote the use of fossil energy and thus slow down the transition to a climate-neutral, circular industry. The Coalition Agreement agreed to explore the possibilities of reducing these financial incentives and then ending the financial stimulus where possible. We do this as much as possible with other countries, in view of our establishment climate.

Tax advantages in the Energy Tax will be phased out over the next few years: several exemptions and reduced rates are gradually being adjusted to reward investments and the shift from fossil to renewable energy. In addition, the tailor-made arrangements, the blending obligation for plastics and the strengthened requirements of the European Third Renewable Energy Directive (RED3) will further reduce fossil fuel and raw materials in the coming years. And the Dutch commitment to negotiating the European Energy Taxation Directive (ETD) aims at accelerating fiscal greening across the EU.

[61] Parliamentary Document 36200-XVI, No 122.
[62] www.greendeals.nl/green-deals/green-deal-samen-werken-aan-duurzame-zorg.

In recent times, there has been an increasing public debate on schemes that also promote the use of fossil energy carriers. The government has therefore already launched an inventory of all fossil exemptions, rebates and adjusted tax rates. The results are expected for the summer. The government will then make proposals as to whether and in what timeframe the remaining tax exemptions for fossil fuels can be phased out. An impact analysis per measure is part of this inventory to ensure that companies have a sufficient trading perspective to free up the transition from fossil to CO_2.

Energy taxation

Energy taxation is being adjusted to make more sustainable wages and lower energy costs for households. The Government therefore introduces a reduced rate to a certain gas consumption. At the same time, the degressivity of natural gas tariffs is being addressed by increasing tariffs above the new bracket. There will be a separate price for hydrogen that is lower than the one for gas, thus encouraging companies to make them more sustainable.
Finally, electricity prices are reduced in the higher consumption bands. These amendments to the Energy Tax are given a task statement of 1,2 megatons. Several variants are being developed, for which a further impact analysis is carried out by the Minister of Finance. This includes a level playing field and a trade perspective for companies to make them sustainable in a timely manner. On the basis of these results, a final path will be established. The exact customisation and sequencing will be decided in the August decision making.

Tightening of the energy saving obligation

Energy savings contribute to the climate challenge and lead to lower energy bills. The government is expected to increase the payback period in the energy savings obligation to seven years in 2027. If all other factors remain the same, increasing the payback period from five to seven years means that more energy-saving measures will become mandatory. The elaboration will identify the additional emission reduction and energy saving effect associated with increasing the payback period, taking into account the effect that higher energy prices already have on the amount of measures covered by current payback periods and the impact of other policies. In further development, consideration is given to the feasibility of the measures for businesses and institutions. Funding will also be made available to support SMEs to implement energy-saving measures.

Wider application of ETS2 and examination of national emission cap for ESR sectors

By aligning as much as possible with European legislation, measures can be kept enforceable. The government intends to introduce the new European Emissions Trading System for the built environment, road transport and small industry (ETS2) as widely as possible in 2027. This is done using the opt-in, whereby all fossil fuels in the Netherlands will be covered by the new trading system. In addition to the ETS2, the government will also examine what is necessary to introduce a national cap on emissions for the ESR sectors and its advantages and disadvantages.

Deployment of negative emissions

Finally, the Netherlands can only achieve climate neutrality by focusing not only on emission reductions but also on negative emissions, the sequestration of CO_2 from the air. Negative emissions are expected to play a limited role in the period up to 2030; the focus on negative emissions should not lead to a reduction in emission reductions. While negative emissions technologies and nature-based solutions still need to be further developed, in the short term there are opportunities to work and gain experience with negative emissions. For example, by capturing and storing (partly) biogenic CO_2emissions (CCS) at Avis, power plants and biofuel production. In doing so, the government is looking into how negative emissions can be stimulated technologically neutral and as efficient and equitable as possible. The use of bioraw materials will always be assessed to ensure that it is in line with the sustainability requirements of the sustainability framework, the availability of bioraw materials, and the need for substitution of fossil carbon with non-fossil carbon.

Methane blurring of the energy sector

The Energy Sector Methane Regulation aims to reduce methane emissions in the fossil energy sector. The Regulation lays down rules for measuring, reporting, verifying and reducing methane emissions in the energy sector. Member States should designate competent authorities responsible for ensuring that operators comply with the obligations imposed. The final regulation has not yet been adopted. In December 2022, member states reached a general approach. The European Parliament still has to vote on their starting position to enter the trialogue phase. After that, the trioloogy phase may start. It is not yet clear what the precise scope of the Regulation will be and when it will enter into force.

The approach in place in the Netherlands for over 18 years has led to low methane emissions in the Dutch energy sector. Unnecessary emission sources have been removed from the processes for a long time and permitrequirements also require all operators to continue to monitor emissions periodically, thus detecting leakages relatively quickly. If they find leakages, operators must repair them. This will be monitored by the State supervision of the Mines, and the implementation of the Regulation will give network operators an additional role in the maintenance of the network. Where until now the network needs to be maintained with regard to security, the entry into force of the Regulation will also give the environment a role in the maintenance of the gas network.

ii. Regional cooperation in this area See Chapter 1.4.I.

iii. Applicability of State aid rules, financing measures in this area at national level, including Union support and the use of Union funds

Climate policy has several financial instruments to achieve desired incentives to make the transition happen. This chapter discusses the main cross-sectoral financial instruments. First on the design and development of the Climate Fund and finally on the tax toolbox.

Climate Fund

The Climate Fund is one of the main instruments of the Coalition Agreement to enable financing for measures contributing to the target of at least 55 % CO_2reduction by 2030.

Objective and scope

The objective of the Climate Fund shall be to facilitate measures to limit global temperature increase and climate change through the provision of financial resources for the following components:

a. Co_2– neutral electricity production in 2035: This includes at least a contribution to the construction of two nuclear power plants, and a subsidy scheme for CO_2– free gas power plants, indicative of EUR 1 billion. The latter is about converting gas-fired power plants so that they can use greenhouse gas free gas to create greenhouse gas free regulatory capacity. This will be elaborated in conjunction with the resources for scaling up high quality energy carriers.
b. Co_2– neutral power supply in 2050: This includes at least a contribution to the early scaling up of renewable energy carriers. The early scale-up phase is a programmatic approach for technologies for – in the first instance – high-performance renewable energy carriers that can only facilitate cost-effective CO_2reduction in case of substantial scaling up. In addition, this concerns energy infrastructure. These are subsidies for the realisation of infrastructure necessary for the energy transition, such as hydrogen and heat infrastructure and charging infrastructure. No ex ante selection is made for certain technologies or sectors.
c. Encouraging the implementation of energy efficiency techniques, the use of renewable energy and other CO_2reducing techniques in industry. These resources from the Fund cover both energy emissions reduction and non-energy emissions.
d. Promote the implementation of energy efficiency techniques and renewable energy use in the built environment.

Decision-making process

There is one decision-making moment per year in line with the existing budget cycle. Departments wishing to use the fund may submit a substantiated proposal to the fund manager, i.e. the Minister for Climate and Energy. The Fund Manager's assessment is reflected in the Multi-Year Climate FundProgramme. PBL provides a reflection on this as part of the decision-making process.

Results of Spring Decision-making 2023: draft Multiannual Programme

As part of the supplementary policy package of April 2023, the draft multiannual climate fund 2024 has been developed.

In preparation for the Spring decision making for 2024, a total of over 80 measures have been submitted to the Minister for Climate and Energy. The PBL gave an independent reflection on the proposals submitted and the initial assessment of the fund manager. The proposals have been assessed against the Fund's objectives and criteria (including effectiveness, efficiency, additionality and feasibility). During the Spring Decision-making, measures were added following the Comprehensive

Complementary Climate Package. A total of EUR 28,0 billion will be mobilised for climate spending. This is covered by the withdrawal of EUR 24,6 billion from the Climate Fund, EUR 2,5 billion from the excess SDE, EUR 350 million from the BOP budget (Coalition Agreement on energy performance requirements for new construction of industry) and EUR 528 million from the revenues from the mobility package.

This means that a large part of the fund is already programmed this year, with the exception of the nuclear lot. Many of the expenses are bookings. In this respect, the measure still needs to be further substantiated and elaborated. Resources that are not spent will be returned to the Fund. Many measures are also granted under certain conditions. The responsible policy department shall provide an addendum to the fund manager justifying that the conditions have been met. In order to ensure that the balance between normalisation, pricing and subsidy is ensured in the implementation, the necessary funds will be set aside from the Supplementary Post of the Ministry of Finance or the Fund budget until sufficient progress has been made with the corresponding normative and/or price-setting measures. Both the Minister for Finance and the Minister for Climate and Energy must authorise the transfer of funds.

The Climate Fund will enable many additional climate spending. Recently, the Court of Auditors has found that the climate expenditure overviews received by the Court are not always consistent. With the draft multiannual programme, the government aims to provide a clear overview of the planned expenditure from the Climate Fund. The final Multiannual Programme is presented to Parliament together with the formal budget of the Fund on Princhi Day. The Climate Fund annual report will include a comprehensive account of the exhaustion of funds made available from the Climate Fund. This justification is also included in the annual report of the department to which the funds have been transferred.

The Act establishing the Climate Fund (Temporary Climate Fund Act) has not yet been adopted by the Lower and Eerste Kamer. The Fund is expected to be formalised as of 1 January 2024. In order to avoid unnecessary delays in the transition, (part of) funds are transferred to the budget of the Policy Department prior to the establishment of the Climate Fund. Before funds are transferred, the expenditure is always submitted to the Lower and Upper Chambers for authorisation.

Fiscal greening

The government's climate policy is based on a combination of subsidising, normalisation and pricing. This policy mix makes sustainable techniques (financial) more attractive and encourages and helps citizens, civil society organisations and businesses to choose the sustainable alternative.

In the area of pricing, a number of important steps have been taken in recent years, such as the introduction of a national CO_2levy to ensure the achievement of the national CO_2reduction target for the ETS1 part of the industry. At the same time, $_{CO2}$emissions are often not yet fully priced, resulting in insufficient incentives for citizens, civil society organisations and businesses to change the behaviour needed to achieve climate goals.

The objective of fiscal greening measures in the climate field is to improve the pricing of greenhouse gas emissions and energy consumption so that citizens, civil society organisations and businesses have a stronger price incentive to adapt their behaviour and reduce CO_2 eq emissions. Furthermore, pricing greenhouse gas emissions contributes to making $CO_{2\ eq\text{-}intensive}$ products relatively more expensive and CO_2 eq-efficient products relatively cheaper. As a result, CO_2 eq-efficient products will be bought/used more often and demand steers supply. In addition, by increasing the price of greenhouse gas emissions, the market has an incentive to reduce emissions in an efficient way: the CO_2 eq reduction takes place there, where it can be cheapest.

Climate change is a global problem and our economy is internationally oriented. An international approach to greenhouse gas pricing is therefore the most effective. One example is the European Emissions Trading System, where a uniform European CO_2 eq price applies to the major emitters.

In addition to the commitment to greenhouse gas pricing at international level, the Netherlands intends to take significant steps in the coming years also at national level. This further fiscal greening is an essential part of the policy package in order to achieve the strengthened national climate targets by 2030.

First, the CO2 levy for industry$_{is}$tightened and a $CO_{2\ minimum\ price}$for industry is introduced. The tightening of the CO_2levy ensures that the ETS1 part of the industry will reduce megatonnes in 2030 4 compared to what was previously agreed in the Climate Agreement.

Secondly, the Netherlands adjusts the rates in the energy tax and broadens the tax base. The purpose of the tariff adjustments is to

tax the consumption of natural gas more heavily and to reduce the consumption of electricity. The tax reduction in the energy tax is also increased to compensate for the green gas blending obligation. The base broadening measures will phase out the reduced rate for greenhouse horticulture and the input exemption for CHP and abolish exemptions in the energy-intensive sectors. This will provide a better energy saving and sustainability incentive, especially in the industrial and greenhouse horticulture sectors. The adjustments to energy taxation will make sustainability options more cost-effective and financially attractive and should be designed in such a way as to minimise the risk of loss of activity and CO_2emissions.

Thirdly, the Netherlands is implementing a number of reforms in car taxation. The BPM exemption for traders' vans will be abolished and, at the same time, the exemption for electric vans remains. As a result, the purchase of a new diesel delivery vehicle will become more expensive, leading businesses to opt for an electric delivery vehicle more quickly. In addition, as of 2030, the Netherlands will introduce a system of payment for use by making the rate in the current car tax dependent on mileage. This makes both an important contribution to the reduction of $CO_2$and the improvement of air quality in the mobility domain (2,5 megatons in 2030) and a solution to the long-term fiscal erosion of car taxes. Finally, as of 2023, the air ticket tax rate was significantly increased.

With this package, the government is taking a significant additional step in greening the tax system. The fiscal climate measures are the most effective in combination with the other climate and circular measures taken by the government – including through the allocation of funds from the Climate Fund – and will therefore be developed in conjunction with the broader policy package. See also the description of climate policy by sector. In addition, in the coming years, the Netherlands will examine whether other measures are sensible to achieve further greening of the tax system.

State aid and use of Union funds

To the extent that national aid measures constitute State aid, the aim is to make maximum use of the possibilities provided for in the General Block Exemption Regulation (GBER); reference: Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty). On the basis of the GBER, State aid can be granted relatively easily and quickly, and notification to the European Commission is sufficient. The European Commission has recently adopted a targeted revision of the GBER related to the green and digital transition, which will enter into force in the short term. In cases where the GBER cannot be used, for example because planned aid does not fall within the scope of the GBER or because the notification threshold is exceeded, this aid measure must be submitted to the Commission for prior approval. The Commission then assesses the proposed aid in the light of its State aid policy, as set out in various guidelines. Relevant in this context include the Guidelines on State aid for climate, environmental protection and energy 2022 (2022/C 80/01), the Temporary Crisis and Transition Framework for State aid measures to support the economy following the Russian aggression against Ukraine (2023/C 101/03) and the Communication from the Commission on Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of Important Projects of Common European Interest (IPCEI Framework, 2021/C 528/02).

The Multiannual Financial Framework 2021-2027 and Next Generation EU have different programmes and funds that contribute to national climate policies.

ETS auction revenues

The auctioning of allowances in the EU ETS generates revenues for the Netherlands. There is a separation of revenue and expenditure in the national budget, which means that specific revenue cannot be linked to specific expenditure. Thus, the ETS revenues are not spent for specific purposes, but are part of the national revenues that also finance national climate policies. National spending on climate policy has a financial value greater than the ETS revenues that meet the requirements of the revised ETS Directive.

II Renewable energy

I Policies and measures to achieve the national contribution

See Chapter 2.1.II

ii. Specific measures for regional cooperation

See Chapter 1.4.I

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

Renewable energy incentive schemes

The Netherlands has different incentive mechanisms for renewable energy. Some of these are important:

SDE + +

The scheme Stimulering Sustainable Energy Production and Climate Transition (SDE + +) focuses on large-scale deployment of renewable energy and other techniques that reduce carbon dioxide (CO_2) emissions. This grant instrument contains a number of features which make the scheme work well according to international standards. These are the characteristics of technology neutrality, competition between them and multiannual certainty for investors.

In 2020, the scheme was broadened so that, in addition to the production of renewable energy, CO_2reducing techniques are eligible for subsidy. This could include technologies such as CCS and CCU, hydrogen production through electrolysis, and renewable heat production through, inter alia, industrial heat pumps and electric boilers. In addition, the SDE + + directs the realisation of eligible production from wind on land and zon-PV (> 15 kilowatt).

In line with the Coalition Agreement, the government aims to reduce emissions by 60 % by 2030 when designing policy measures. The SDE + + makes an important contribution to achieving this cost-effectively. The SDE + + therefore focuses on emission reductions on Dutch territory. The SDE + + encourages the deployment of market-ready and relatively large scale CO_2reducing techniques by covering the unprofitable top of these techniques through an operating subsidy.

In the 2020, 2021 and 2022 opening rounds, EUR 5 billion, EUR 5 billion and EUR 13 billion were opened respectively. It is expected that, if all of them are realised, the projects at their disposal will collectively achieve 9,7 megatonnes of CO_2equivalent reductions per year. The Netherlands plans to open up the SDE + + in 2023 with a budget of EUR 8 billion per year.

Since the widening of the SDE + to the SDE + + in 2020, there is scope for industry to take additional steps in a relatively short term. Due to the size of CCS's CO_2reduction potential and in order to reduce CO_2 in a relatively short term and cost-effective manner, the cap for CCS in industry for the SDE + + scheme has been abandoned as of the SDE + + 2023. The "gates" (see next paragraph) will ensure that, from 2023 onwards, sufficient budget remains for other techniques in the SDE + +.

In the 2023 SDE + + application round, so-called 'gates' ensure that low temperature heat, high temperature heat and molecules production techniques are more likely to receive subsidies, as they are currently less profitable but can achieve cost reductions in the long term and are very important for the climate transition. Part of the opening budget of the SDE + + will be reserved for these techniques from 2023 onwards. The European Commission still needs to approve the application of these gates from 2023 onwards.

In the Spring Decision of April 2023, the government decided, as in 2023, to use part of the SDE + + resources for opening budgets of EUR 8 billion in 2024 and 2025 on the basis of current cash estimates. This will give additional impetus to CO_2 reducingtechnologies – such as the deployment of renewable electricity, sustainable heat and CCS deployment. These techniques support the transition for all sectors. In doing so, the government will, as usual, also look at the expected projects and available cash space. The current understanding therefore leaves sufficient space for these projects in the SDE + + beyond 2025.

SCE

In addition to the SDE + +, the Co-operative Power Generation Subsidy Scheme (SCE) is specifically aimed at helping energy cooperatives and associations of owners (VVEs) to realise small-scale sustainable solar, wind and hydropower projects with local ownership. This will enable more renewable electricity to be produced in the short term and encourage local participation.

The projects selected for the SCE shall be local and cooperative. There are requirements to ensure that the project is organised by a sufficient number of nearby participants. The subsidy is paid on the basis of the actual amount of RES-E produced. The subsidy, like the SDE + +, focuses on the 'unprofitable top' of the project compared to the market price of electricity. During the 2021 SCE Round, EUR 92 million was made available and more than 650 cooperative projects received grants. In the 2022 SCE Round, EUR 150 million was made available and more than 130 projects were supported. The 2023 SCE round is currently open again with a budget of EUR 150 million.

RE +

The Renewable Energy Transition Subsidy (HER +) aims to achieve the energy targets in 2030 more cost-effectively through innovative projects. A HER + project should result in a CO_2reduction by 2030 at the latest.
This is done by subsidising innovative renewable energy production projects through techniques such as wind energy, solar PV

and renewable gas. In this case, the energy generated equals a certain amount of CO_2reduction. In addition to renewable energy production, it is also possible to subsidise innovative projects for other CO_2reducing technologies. Examples include CCS, hydrogen production and electric boilers. These techniques have been added to increase the pace of CO_2reduction towards climate objectives. Because of the addition of these techniques, the HER has been renamed HER +.

Renewable energy projects should lead to renewable energy production in 2030 and save future expenditure on subsidies under the SDE + +. This saving must be greater than the grant requested for the project.

Early scaling up

The Coalition Agreement agreed under the Climate Fund to indicatively earmark EUR 15 billion for scaling up production technologies for high quality renewable energy carriers. Within the framework of that agreement, schemes for, inter alia, the promotion of hydrogen production through electrolysis, production of green gas, renewable fuels through gasification, and geothermal shall be developed from the allocated and earmarked resources of the draft multiannual climate fund programme for 2024. These schemes will give an additional boost to the share of renewable energy.

DEI +

The Demonstration Energy and Climate Innovation (DEI +) aims to support pilot and demonstration projects that contribute to the cost-effective reduction of CO_2emissions by 2030. The research, development and demonstration of new or enhanced renewable energy generation technologies shall be supported by energy innovation schemes. In addition to new, more efficient and cheaper reprocessing technologies, innovation policy on renewable energy is also highly focused on energy system integration (such as storage and conversion to energy carriers), spatial integration (such as multiple space use within energy parks) and ecological integration (such as mitigating the impact of wind energy on birds). Innovation policy is further explained in the sections on "Research, innovation and competitiveness" (chapters 2.5 and 3.5).

The DEI + scheme will be reopened at the end of 2023, taking into account the block exemption renewed in early 2023 in the Environmental Aid Framework. This increases the maximum subsidy amount to EUR 30 million and updates the themes such as circular economy, CCUS and biobased chemistry and sustainable fuels.

ISDE

The Investment Subsidy Sustainable Energy and Energy Savings (ISDE) provides grants for investments for five different types of interventions: (1) (hybrid) heat pumps, (2) solar boilers, (3) insulation measures, (4) heat network connections, and (5) electric cooking supply. The subsidy for (hybrid) heat pumps and solar water heaters is available to business parties and owner-occupiers. The subsidy for insulation measures, heat connections the electric cooking supply is only available to owner-occupiers. These are the flat-rate subsidy amounts laid down in the scheme.

The grant will be opened annually. This year, ISDE has been opened for EUR 350 million. There are no budget divides between the different techniques.

VEKI

The aim of the Accelerated Climate Investment in Industry Subsidy Scheme (VEKI) is to support the acceleration of CO_2reducing investments in industry companies in the short term.

Projects should lead to an absolute reduction of CO_2emissions in the Netherlands by 2030. The investment must have a payback period longer than five years. The scheme was extended to SMEs in 2023 by reducing the minimum subsidy amount to EUR 30,000. The measures must already be proven technology. The DEI + can be used for innovative investments.

NIKI

The NIKI (National Investment Scheme for Climate Projects Industry) is a subsidy scheme for investments and operating costs of large-scale innovative investments in industry. NIKI is broadly similar to the European InnovationFund. Preparations for this scheme are under development and publication of the scheme is expected in the second half of 2023.

EIA

The Energy Investment Deduction (EIA) is a tax scheme for entrepreneurs investing in energy-saving assets and reducing greenhouse gas emissions. The EIA now allows the entrepreneur to deduct 45.5 % of the cost of these assets from the taxable profit. As a result, these entrepreneurs pay less income tax or corporation tax. This tax advantage is a financial incentive contributing to the public objectives of energy saving, renewable energy and reduction of CO_2emissions. The assets that can be

notified for the EIA are included in the Energy List, which is updated annually.

The subsidy scheme promotes sustainable energy and climate transition (SDE + +) encourages the development of renewable energy in a broad sense. The EIA also includes a tax deduction for renewable electricity generation (solar panels; for the investment in a grid connection for solar panels for which SDE + + has been requested; for solar panels without connection to the public electricity network; for solar panels or solar film on means of transport). A deduction option has also been included for sustainable heat systems (solar collectors; heat/cold storage in so-called aquifers; groundwater exchangers).

If an entrepreneur uses the EIA, this is taken into account when awarding the SDE + + subsidy in order to avoid over-stimulation.

Mia and Vamil

The Environmental Investment Deduction (MIA) and the Environmental Investment Investment (Vamil) depreciation scheme are tax advantages for entrepreneurs investing in environmentally friendly assets.

The Environmental Investment Rebate (MIA) allows entrepreneurs to deduct from profits up to 45 % of the investment amount. The percentage of the deduction depends on the environmental impact and prevalence of the asset. The Vamil allows entrepreneurs to write off an investment at any time. The random depreciation is limited to 75 %.

The MIA and Vamil are two different regimes but are often combined. Both schemes use a common list, the Environmental List. This list includes all assets eligible for MIA and/or Vamil. A new Environmental List is published every year.

iv. Assessment of support for electricity from renewable sources

The Netherlands regularly reviews the relevant support mechanisms to incentivise renewable energy production, including electricity. An evaluation of the SDE + was carried out in 2022. The evaluation focused on the whole period 2011 to 2020. Although the focus is on 2016 to 2020, a more comprehensive analysis can be made from this longer period. The evaluation focuses on the effectiveness and efficiency of the SDE + scheme. The evaluation shows that the SDE + has been an important and effective tool for scaling up renewable energy in the Netherlands. Due to the low implementation costs and the (increasingly better) matching of the grant amounts granted to the grant needs of projects, the scheme is efficient.

In 2020, the SDE + + was succeeded by the SDE + +. This evaluation did not deal with the current SDE + + scheme, but draws lessons from the SDE + + that are also applicable to the SDE + + and have been or are in the process of being implemented within the SDE + +. This could include limiting non-implementation in Zon-PV by introducing more targeted requirements to address the most common reasons for non-implementation and the introduction of gates to earmark budgets to ensure that less profitable techniques are better addressed within the scheme.

The evaluation of the extended scheme (SDE + +) is currently being prepared and is expected to be completed by the first quarter of 2024 as agreed.

Changes to the scheme are being extended with the European Commission (DG Competition). The addition of new techniques to the SDE + + will be submitted to the European Commission, as well as changes to the system, such as the addition of gates in 2023. The SDE + + will also be assessed in 2023 under the new State aid guidelines (CEEAG).

The Netherlands is continuously exploring ways to improve the SDE + +. In this context, a study has been launched on alternatives to promote solar PV and wind energy on land. Within the SDE + +, there is a risk that stimulation results in excess profits. However, previous research shows that without any kind of subsidy, the deployment of solar PV and wind energy on land will significantly decrease. Therefore, alternative options are being explored to stimulate these techniques that offer a lower level of financial support than the SDE + +. It also looks at the extent to which these options allow for certain framework conditions, such as grid capacity, public acceptance, circularity and nature inclusiveness. The results of this study are expected at the end of the summer.

An annual independent advisory pathway shall take place on the categories of technologies and levels of incentiveamounts and their effectiveness. This independent advisory process is also subject to extensive market consultation. In addition, the Parliament is informed twice a year of the outcome of the applications and projects at its disposal, also taking into account the cost effects. This shows the distributional effects (to which the subsidy amount is spent) of the proceeds of the promotion. Distributional impacts are regularly assessed and evaluated.

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

The Netherlands has examined whether there are obstacles to entering into power purchase agreements, which does not appear to be the case. This is currently being reviewed in the context of the EHR proposal. Chapter 2.2.II describes how the Dutch authorities streamline administrative procedures. Chapter 1.2.II describes the steps the Netherlands is taking to ensure high-quality training for the energy transition. The "Have the button to" campaign will inform citizens about the possibilities for sustainability and savings (see also Chapter 3.2.IV).

vi. Summary of policies and measures to develop renewable self-consumption and promotion of renewable energy communities

The Netherlands is currently promoting renewable self-consumption through a tax measure for solar panels for retail consumers. In addition to a 0 % VAT rate for the supply and installation of solar panels on or near a dwelling, owners of solar panels connected to a retail connection can benefit from the so-called 'balancing scheme'. The electricity from renewable energy production fed back into the grid shall be deducted from the electricity taken from the grid. As a result, the retail consumer does not have to pay supply costs, energy tax and VAT on electricity purchased from the electricity grid, to the extent that it is offset against electricity returned to the grid. The government plans to phase out the netting scheme over the period 2025-2030. For electricity that cannot be offset, consumers shall receive reasonable compensation from the energy supplier. Offsetting is no longer possible from 2031 onwards. Even with the planned phasing out of the netting scheme, it remains very interesting for consumers to invest in solar panels, the payback period is not expected to exceed 7 years until 2030. The sustainability requirements imposed on dwellings are also an incentive for homeowners to purchase solar panels, and in the case of landlords, to create opportunities for their tenants for self-consumption. In addition, renewable self-consumption is promoted through subsidies and loan facilities at various levels of government.

As already indicated, energy cooperatives and FTEs can also benefit from the Coöperatieve Power Generation Subsidieregeling (SCE). The SCE encourages energy cooperatives and Owners' Associations (VVEs) to generate renewable electricity from solar, wind or hydropower locally and as a cooperative through small-scale projects. Like the SDE + +, the SCE covers the unprofitable top through an operating grant. The grant is paid in the form of an amount per kilowatt hour produced.

vii. Assessment of the need to build new infrastructure for district heating and cooling based on renewable energy sources

The Netherlands plans to make new connections to heat networks in 2030 500.000 (approximately doubling compared to 2020). This requires new infrastructure. These new networks will be fed to a large extent from renewable sources. The planned Collective Heat Act will set requirements for the sustainability of heat networks.
These requirements are becoming more stringent over time. For the development of these networks, the Warmtenetten investment subsidy (WIS) has been available since June 2023. The deployment of renewable sources is difficult with existing heat networks, partly because the supply temperature is too high. In new networks, the temperature that can provide a sustainable source can be taken into account during construction. With these new grids, renewable heat sources, such as geothermal and aquathermia, can grow.

Specific measures to promote the high quality use of sustainable bioraw materials

As indicated above, the Netherlands is convinced that sustainable bioraw materials have an important role to play in the transition to a climate-neutral and circular economy by 2050. For the Netherlands, the starting point is that only sustainable bioraw materials can contribute to this transition and that sustainable bioraw materials should ultimately be used as high quality as possible.

Sustainable bioraw materials are referred to when they are sustainably produced.64 That is to say without adverse effects on people and the environment. Ensuring sustainability criteria for bio-raw materials in regulation limits environmental iscos for unsustainable production and processing of raw materials, such as soil depletion, groundwater and surface water pollution, biodiversity degradation and air pollution. To this end, work is under way to define the environmental criteria and ensure them in regulations on the sustainability of bio-raw materials, specifically in a decision and regulation.

The starting point for setting the environmental criteria in regulation is to follow as far as possible the European system of sustainability assurance for bio-raw materials, as laid down in the European Renewable Energy Directive (REDII). This concerns both the substantive sustainability requirements and65 the system to ensure that companies can demonstrate that the bioraw materials comply with the sustainability criteria through the use of certification. Indeed, the RED also sets requirements for the management of certification schemes (management requirements) and the assurance of sustainability requirements by the chain of custody. The choice to follow the RED as much as possible makes the Netherlands a very thorough and robust system of sustainability assurance and monitoring, while also strengthening the necessary cooperation between all European Member States. This makes it an effective system both to set sustainability

64SER (2020) Balance of Biomass.
65Although the Dutch environmental criteria go beyond the RED in some areas, for example by introducing additional requirements for responsible waste management and water availability (this is already the case in the current Conformity Assessment Decree on solid biomass for energy applications).

requirements and to effectively monitor them. However, different ways of working for biofeedstock uses other than energy may currently exist in practice. As a result, it is not simply possible to take over the entire RED system one in one. In this case, a system is chosen that is appropriate to the practice, without compromising the sustainability of bioraw materials. In addition, European regulations or directives (such as the Construction Products Regulation, which is currently under revision) may not allow for additional national requirements. This will of course be taken into account in further implementation.

Sustainability criteria focus on the application of all types of bioraw materials, including circular economy materials (e.g. construction materials and raw materials for the chemical industry) and use for energy generation. These are biocommodity flows and applications that are encouraged or regulated by public authorities. As we know, the sustainability criteria do not currently apply to the use of bioraw materials for fibres (paper and textiles), and to feed and food production, transport is also excluded.66 In the Netherlands, the ecological criteria for solid bioraw materials for energy applications are currently implemented in the 'Decree on Conformity Assessment of Solid Bioraw Material for Energy Applications' (hereinafter: decision on conformity assessment) and the underlying scheme. The Dutch requirements set out therein continue to apply to existing subsidy decisions – the new decision provides for a transitional arrangement. New decisions for energy applications will be covered by the new Decision when it enters into force. By aligning as much as possible with the European system of sustainability assurance, a level playing field and harmonisation with the European standard will be possible and supervision will have a solid foundation.

As regards the cascade principle, the Dutch sustainability framework for bioraw materials contains an overarching commitment to the use of bioraw materials for different high-grade and low-grade applications. This concerns the use of bioraw materials as an energy source and as a raw material. The guiding principle is that sustainable bioresources are only used when it fits into the final image or in the transition to it. Where sustainable alternatives become available in the short term, this will ultimately lead to a reduction of the subsidy on the use of bioraw materials for those uses.

Currently, for example, this is already happening in the use of bioraw materials for energy. No subsidies were granted for the production of electricity exclusively from woody bioraw materials and last year the decision was announced that no new subsidy decisions will be issued directly for low temperature heat from woody bioraw materials. In addition, the Netherlands has recently announced that it will standardise and promote high-quality uses of bioraw materials. For example, a standard will be put in place for blending 25-30 % recyclate or bioplastic and biobased construction will be encouraged.

With the combination of phasing out the promotion of low-value applications, strict sustainability requirements and incentivising the deployment of bioraw materials for high-value applications, the Netherlands ensures that sustainable bioraw materials are used as high as possible and we are working towards a climate-neutral and circular economy by 2050.

Other elements of the dimension

i. National policies and measures impacting the EU ETS sector

The EU ETS does not have a national target or obligation, but the national objectives of the Dutch Climate Law cover both ETS and non-ETS emissions. After the Fit-for-55 revision, the EU ETS includes emissions from industry, electricity, mobility (including aviation and maritime transport) and the built environment, collectively around. 4/5 of total Dutch greenhouse gas emissions. All national climate and energy policies and measures in these sectors contribute to the European objectives for the EU ETS, see paragraphs in chapters 2 and 3.

Co2 minimumprice of electricity

The Netherlands has a CO_2minimum price for CO_2 emitted from electricity generation by ETS companies, which entered into force on 4 April by the Wet Minimum CO_2 Pricefor Electricity Generation. This measure provides certainty to RES-E investors about the future CO_2price. This guarantee has a positive impact on the cost of capital (WACC) of these investments, making these sustainable investments more competitive with fossil alternatives. Since the introduction of the CO_2minimum price for electricity generation, the ETS price has increased significantly. In the light of this recently increased price of emission allowances, at the request of the Eerste Kamer, a (inter-) evaluation of the price path will take place. On the basis of that interim review, the appropriateness of a re-calibration of the price path shall be considered in view of the (possible) effects on CO_2reduction, security of supply and affordability in the electricity sector. The CO_2minimum price for industry, introduced in the Coalition Agreement, is also part of this review.

Co2 minimumindustrial price

Since January 2023, in addition to the CO_2 minimumprice for the production of electricity, a CO_2 minimum pricefor industry has been introduced.

66Fibres (paper and textiles) and feed and food production are not currently included in the scope of the sustainability framework, as these uses are not included in the SEA opinion "Biomass in Balans". Transport is not included, as the RED requires you not to impose additional requirements for bioliquids at national level.

The Netherlands has introduced this CO_2minimum industrial price in line with the price path of the CO_2minimum price for the production of electricity:

1	2023	2024	2025	2026	2027	2028	2029	2020
Rate *	16,40	18,00	19,80	21,80	24,00	26,40	29,00	31,90
ETS price * *	78,09	81,96	86,02	90,37	94,90	99,62	104,63	109,82

** EUR per tonne CO_2*

** * estimate PBL (Source: National Climate and Energy Outlook, PBL 2022)*

- The Coalition Agreement agreed to introduce a CO_2minimum price for industry. The CO_2minimum price of industry has not been introduced to effectively achieve CO_2reduction, but to provide investment certainty for sustainability.
- In 2023, the price path of the CO_2 minimumindustrial price will be reviewed at the request of the Eerste Kamer. On the basis of this evaluation, the pricing path shall be adjusted taking into account the impact on sustainability, security of supply and affordability.

National CO_2levy on industry

A national CO_2levy has been in place since 2021 to ensure that the target of 18,3 megatonnes of emission reduction compared to the PBL baseline will be achieved in 2030. At the same time, this levy prevents, as far as possible, the relocation of production abroad or diminishes investment readiness in the Netherlands.

This is an objective CO2 levy set by the governmentonthe basis of verifiable metrics that are as close as possible to the European ETS benchmarks already applied by the NEa. In other words, a levy on avoidable tonnes. The PBL calculation shows that this levy achieves the reduction declaration of 18,3 megatons. This means that in 2023 the CO_2levy has a rate of EUR 55,94 per tonne of CO_2 and increases it annually in a linear manner by EUR 11.55 to 2030 for the excess tonnes of CO_2 emitted. In 2024, a review of the CO_2levy is planned for which a new tariff study is being carried out. In 2025, when the new European ETS benchmarks become available, the Government will ask the PBL again to review the necessary level of the CO_2levy in an objective and verifiable manner, within the established framework conditions. This means that the PBL will be asked in 2025 to determine the initial level of the CO_2levy and the level of the CO_2levy in 2030 (and thus also in the intermediate years) in order to achieve the reduction target. The PBL is asked to count on the available subsidies from the broadened SDE +, but also on the measures granted from the Climate Fund. An external party will then be asked about their impact on the Dutch industry on the international level playing field and establishment environment. The Government then sets the price path. These tariffs shall be fixed by or pursuant to law.

The purpose of the levy is not to generate revenue but to encourage companies to make the investments in the Netherlands. Should the levy generate revenue, it will be used for greening the industry via a backlock.

ii. Policies and measures to achieve other national objectives

Circular Economy

In a circular economy, raw materials and products are being used in a resource-efficient and smart way. We use fewer raw materials because we use products longer. Raw materials used will be used again for new products. We also choose raw materials that are always replenished. This makes a substantial contribution to reducing and preventing CO_2emissions. This will reduce the CO_2footprint of businesses and citizens, with a positive impact on biodiversity, clean living environment (reducing environmental damage) and security of supply of raw materials (including critical metals for the energy transition), in addition to reducing emissions. With a package of policy measures focusing on the circular economy, we strongly contribute to achieving the 60 % $CO2_{reduction}$target of the Coalition Agreement, climate neutrality by 2050 and the sustainability of the energy transition.

National Circular Economy Programme 2023-2030

In February 2023, the National Programme Circular Economy 2023-2030 was sent to the Chamber by the Cabinet under the coordination of the Secretary of State for Infrastructure and Water Management. This programme builds on the Implementation Programme Circular Economy 2019-2023, which includes the Cabinet's ambition to make the Netherlands circular in 2050, and has been developed in five transition agendas (Consumer Goods, Plastics, Construction, Maakindustrie and Biomass and Food).

The National Circular Economy Programme (NPCE) contains generic measures to improve the economy of raw materials in the coming years, focusing on four target points: (1) reducing the use of raw materials, (2) substitution of raw materials, (3) lifetime extension of products and components and (4) high-quality processing. In addition, the NPCE includes specific measures for priority product chains and support measures. Supporting measures include, for example, circular entrepreneurship, encouraging consumer behaviour change and

education.

In addition to the input to the climate goal and the coherence between circularity and climate policy, it also highlights how the circular economy contributes to the restoration of biodiversity, a cleaner environment and a healthy living environment and greater security of supply of raw materials.

Action for the ambitious climate target

The government sees a potential of 2 to 4 megatonnes of $CO_{2\ emission}$reductions that can be achieved in the Netherlands by means of policy measures designed to stimulate the circular economy.

In the Spring Decision of 26 April 2023, the government takes additional measures in the area of circular economy in line with the NPCE. Seven measures have been included to promote a circular industry (see industry section 3.1.I.i). Two measures aim at standardising and incentivising bio-based construction and circular demolition, and are therefore at the interface of industry and built environment.

These measures can contribute to national climate goals in the short term, steer both the front and the back of the chain and include flanking policies aimed at knowledge building, innovation, skills and behaviour.

In addition, the government wants to work towards sustainable and circular chains that contribute to both the national and global climate challenges by valuing the reduction of chain emissions. The government is therefore committed to reducing the greenhouse gas footprint of the Netherlands. The GHG footprint uses a chain approach to identify which emissions can be reduced by Dutch citizens and business. The footprint also gives an insight into the emissions in the chains where Dutch companies have a commercial perspective to reduce them.

Better link circularity and climate policy

The government sees several opportunities for further strengthening between the circular economy and climate and energy policies. Circularity shall also be taken into account in the elaboration of the National Climate Fund, including the tailor-made arrangements. Several existing subsidy schemes are also analysed in a (even better) place for circularity as a focus or enabling condition. In addition, the government sees opportunities for circular economy in the different climate sectors and beyond. For example, in the energy transition, it is crucial to circulate solutions related to the security of supply of critical metals and other essential raw materials, and to ensure that they do not end up in waste incineration plants or abroad. This is an important link with the National Raw Materials Strategy. One of the draft principles of the National Energy System Plan is therefore to set conditions for the circular and sustainable use of raw materials in the future energy system.

Exemplary role of government

Public authorities have an exemplary role in driving forward and helping to achieve a circular economy. In addition, the government is also shaping this exemplary role with co-governments and is committed to scaling up market innovations. For example, the Ministry of Infrastructure and Water Management specifically focused on achieving a climate-neutral and circular infrastructure by 2030. This is an additional opportunity for public authorities to play a proactive role in the early stage scaling up of innovations. Upscaling in the first instance entails additional costs and is therefore available depending on the resources; achieving sufficient scale reduces the additional costs. The government also strongly calls on business and civil society to play an exemplary role.

iii. Policies and measures to shift towards low-emission mobility (including the electrification of transport) See section mobility in Chapter 3.1.I.i above.

iv. National policies, timetables and measures for phasing out energy subsidies, in particular for fossil fuels, promote transparency on the presence of energy subsidies and possibilities for phasing them out.

The current tax system in the Netherlands still contains (indirect) advantages in the form of tax exemptions, rebates and adjusted tax rates, which do not always fully price the negative externalities of the use of fossil energy and raw materials. This can hamper the transition to a climate-neutral and circular economy. The Coalition Agreement agreed to explore options to reduce and where possible end these financial incentives. Preferably, this phasing out is done in cooperation with the other EU Member States, in order to ensure a level playing field for Dutch companies within Europe.

The Coalition Agreement announced steps towards a more complete pricing in the Energy Tax as of 2025: several exemptions and reduced rates are gradually being adjusted to reward investments in the transition from fossil to sustainable energy use. In

addition, the tailor-made arrangements, the blending obligation for plastics, and the strengthened requirements of the European Third Renewable Energy Directive (REDIII) will further reduce the use of fossil fuel and raw materials in the coming years. In this context, it is important to adapt the European Energy Taxation Directive (ETD) to allow for accelerated fiscal greening across the EU.

In recent times, there has been more and more public debate on benefits for fossil fuel and raw materials. The Netherlands has therefore launched an inventory of all fossil exemptions, rebates and adjusted taxrates with the aim of increasing transparency and achieving a clear picture of these subsidies on an annual basis. The results will lead to a better understanding of the scale and impact of these energy subsidies. This year, the government will put forward proposals on the timing of the remaining

tax exemptions for fossil fuels can be phased out. In this context, it is important that the phasing out of these subsidies goes hand in hand with a sufficient business perspective to enable the transition from fossil to CO_2free energy use.

3.2 energy efficiency dimension

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

According to Article 7 of the current EED (2018), Member States of the European Union are required to achieve end-use energy savings through national policy measures. The energy savings obligation for the period 2021 to 2030 is 924 petajoule for the Netherlands.67 The Netherlands has determined the cumulative energy savings in the period 2021-2030 on the basis of (the minimum) 0.8 % annual savings of the average final energy consumption in the years 2016, 2017 and 2018 (the reference consumption). The annual energy savings based on the reference consumption amount to 16,8 petajoules. For each year in the period 2021 to 2030, this annual saving is multiplied by the relevant multiplier for that year (see Table 3.1). This summation results in the cumulative energy savings in the period 2021 to 2030.

Table 3.1 Cumulative energy savings from 2021 to 2030

1	2021	2022	2023	2024	2025	2026	2027	2028	2029	2020	overall

The Netherlands has opted for alternative saving measures (under 'Article 7b') to comply with the energy savings obligation under both Article 7.1 (a) and (b). The current Dutch energy and climate policy is anchored in the 2022 Green Agreement, the Climate Plan 2021-2030 and the Climate Law. The 2021-2030 Climate Plan sets out many commitments on actions to be taken and new policy measures to be implemented to achieve the climate target of 49 % greenhouse gas emission reductions by 2030. Many of these policy measures will contribute to the fulfilment of the energy savings obligation under Article 7. In addition to new policy measures, a number of existing policies (adjusted or not) will continue beyond 2020.

Political agreement on the EED recast was reached in 2023. This reinforces the cumulative energy saving obligation. The quantification of this tightening for the national target will follow once the final EED text has been published. Below is a description of the main policy measures that will contribute to the current and strengthened goals.

A specification of which policy measures the Netherlands counts for Article 7 and which calculation methods are used is indicated in the methodology document Energy savings (see Annex 3).

In general

The energy saving obligation requires companies and institutions with an annual energy consumption of 50.000 kilowatt hours of electricity or 25.000 m^3 natural gas (equivalent) to take all energy-saving measures with a payback period of seven years or less. In 2023, this obligation will be strengthened on several aspects:

[67] this is slightly lower than the estimated 925 petajoule mentioned in the final INEK (paragraph 2.2). The 924 petajoule is based on final Eurostat statistics (update June 2020). The 925 petajoule was partly based on an estimate for the year 2018, as no final statistics were available yet.

	10	9	8	7	6	5	4	3	2	1	55
Multiplier (number of years in which savings are counted)											
annual savings including multiplier (PJ)	168	151	134	118	101	84	67	50	34	17	924

- So far, ETS companies, complex licensed companies and the glasshouse horticulture sector were excluded. As of July 2023, these companies will also be obliged to do so.
- The obligation is broadened to include measures to make energy use more sustainable. In addition to efficiency measures, measures to switch energy carriers and measures for indigenous renewable energy generation will become mandatory if they recoup in five years or less.
- The payback period methodology and the Qualified List of Measures are updated with the latest insights on energy prices. This will make more measures mandatory.
- Very large energy users – from 10 million kilowatt hours of electricity or 170.000 m^3 natural gas (equivalent) per year – will be required to carry out a study to make energy use more sustainable. This duty to investigate goes beyond the obligation to provide information, which applies to medium-sized companies. Both reporting obligations go beyond the EED audit, as companies and institutions have to draw up an implementation plan to effectively implement the measures.

Industry

For the industry sector, there are several policy instruments that are being used. On the one hand, industrial companies are faced with the energy saving obligation. This is described in more detail above. In addition, a levy is paid in the Netherlands for CO_2emissions from industrial companies. This is done by the EU ETS, but the Netherlands has also introduced a national $CO2_{levy}$for industry that may be higher than the ETS price. Tailor-made arrangements are being made with the largest industrial companies to make their entire business sustainable.

In addition to obligations and pricing, industry in the Netherlands is also supported to save energy. For example, companies are entitled to the aid scheme for Accelerated Energy and Climate Investments (VEKI), which has been earmarked for EUR 2023 138 million. For more innovative projects, industry is eligible for the Demonstratie Energie Innovatie (DEI +) subsidy scheme, which is budgeted in EUR 2023 65 million. Finally, industrial companies can benefit from tax schemes such as the Energy Investment Deduction (EIA) and the Environmental Investment Deduction (MIA/Vamil). Finally, companies are entitled to the Stimulering Sustainable Energy Production (SDE + +).

Mobility

There is a subsidy in the Netherlands for the purchase of electric passenger cars, both first-hand and second-hand. In addition, there is a subsidy scheme for business users (SEBA) and a subsidy scheme for the sustainability of inland waterway vessels. In order to achieve the desired acceleration towards zero-emission freight transport by 2050, it is no longer necessary to convert an existing vehicle. Today, entrepreneurs can buy a new zero-emission vehicle from the dealer. The Netherlands therefore announced a purchase subsidy (ZeroEmission Trucks) in 2021. This should make it more attractive for a company, which is considering the purchase of a new lorry, to acquire a zero-emission lorry with battery or hydrogen electric propulsion. To that end, the scheme reimburses part of the additional costs of an zero-emission truck (class N2 and N3) compared to a diesel truck.

There is also the Schoon and Zero Emission Building Equipment Subsidieregeling (SSEB), which supports construction companies in reducing nitrogen emissions through cleaner and zero-emission construction equipment. The scheme includes mobile machinery, construction vehicles and seagoing construction vessels. The total number of vessels involved is approximately 80.000. In addition to helping entrepreneurs to deal with nitrogen problems, the scheme also contributes to reducing CO_2emissions, cleaner air and less noise. EUR 270 million has been made available for the scheme from a wider EUR 500 million package of measures by the government. The scheme is expected to run until 2030 and is part of a broader roadmap for clean and zero-emission construction until 2030.

There is also a specific allowance for local authorities for Zero emission buses.

Farming

The largest energy demand in agriculture comes from glasshouse horticulture. This sector is engaged in energy saving in several ways. Firstly, glasshouse horticulture companies will be subject to the energy saving obligation from 2023 onwards. In addition, an energy transition agreement was signed in 2022 by the glasshouse horticulture sector and the public authorities to agree on the sustainability of the sector, setting the target of saving energy by 2030

of around 20 % in 2030 and 30 % by 2040 compared to the average for 2015 to 2017.68 Finally, the subsidy scheme for the energy efficiency of greenhouse horticulture (EC) and the market introduction of energy innovations in greenhouse horticulture (MEI) are opened up annually to stimulate the uptake of energy-saving measures and innovation in this field.

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 (EPBD)

The Long Term Renovation Strategy was last presented to the European Commission on 9 March 2020.
The next long-term renovation strategy will be drawn up on the basis of the new EPBD. The relevant reporting obligation will be called the National Renovation Strategy. It is still unclear when to submit it, as the negotiations on the new EPBD are still ongoing at the time of writing.

III. Policies and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers to the use of energy performance contracting and other models for energy efficiency services

The government encourages and supports an initiative to develop a new open standard to make company buildings more sustainable on the basis of an energy performance guarantee. Financing takes place by reducing energy costs. Market uptake started in 2023 and could be further scaled up if successful.

IV. Other planned policies, measures and programmes

In order to inform citizens, businesses and civil society organisations/institutions about energy savings, the communication campaign Zet De Knop om was launched in spring 2022. The campaign provides quick tips to save energy directly, but also helps to find the right information on more structural energy-saving measures, advice points of contact and support. Businesses and institutions will also be helped to understand which rules they have to comply with and what financial support is available to help them in doing so. The campaign will be further intensified in 2023. Several impact measurements show that the campaign has been effective.

The Netherlands also has specific measures to support SMEs in the field of energy saving. For SMEs, the SME sustainability grant is available, which allows entrepreneurs to request advice on energy savings. EUR 2023 14,4 million is available for this purpose. Entrepreneurs will receive compensation for 80 % of the costs of, and energy advice for, making your business premises and/or business sustainable and/or supporting the implementation of the energy saving and sustainability measures set out in this opinion. The main credit scheme for SME sustainability is the green window in BMKB-Groen (BMKB-Green). The BMKB-Green is monitored and will flourish in the 2021-2025 evaluation of the entire BMKB-scheme. The effectiveness of BMKB-Green is not yet to be assessed because the alternative financiers recently, and by the banks from February this year, only make use of this guarantee. However, this loan scheme focuses precisely on the need for credit as raised from SMEs and lenders.

Finally, a programme on energy savings will be launched in 2023, where, inter alia, indicative national targets will be discussed by sector. The programme aims to give energy savings, in addition to CO_2reduction, a clear role in our climate and energy policies. Energy saving is an important pillar for a sustainable energy system.

68

Memorandum of Understanding on Energy Transition Glastuinbouw 2022-2030, Parliamentary Paper 32627, No 43.

V. Description of policies and measures to promote the role of local energy communities in the implementation of policies and measures referred to in points (i), (ii), (iii) and (iv)

See the explanatory note to the Coöperative Power Generation (SCE) subsidy scheme under Chapters 3.1.II.iii and 3.1.II.vi.

VI. Description of the measures to develop measures to exploit the energy efficiency potential of gas and electricity infrastructure

In the Parliamentary letter of July 2022,[the] government expressed the ambition to produce at least two billion cubic metres (2 bcm) of green gas per year in the Netherlands as of 2030, with a blending obligation for green gas in the built environment with a planned height of 1,6 billion m^3 (= 20 %) in 2030.

Optimisation (including reliability and fitting-out) of the national gas network is carried out under the control of Gaportation Services (GTS). Significant investments in the gas system are submitted to the market and to the ACM and the Minister of EZK, the investment plan/IP. This is a 10-year plan, which can be adapted by means of addenda, and revised every 2 years. In addition to blending with green gas, the current Dutch natural gas infrastructure, both on land and at sea, offers great opportunities for reuse, both for CCS and hydrogen applications. This concerns not only pipelines and gas stations, but also LNG import terminals.

However, it is necessary to make adjustments, particularly technical ones, which must be planned in good time and which will require investment. The final (land-based) hydrogen network is expected to consist largely of existing natural gas lines (around 85 %) of GTS. These pipes are now part of the natural gas grid of TSG. Research shows that the pipes can be technically adapted so that hydrogen can also be transported safely.

Gas storage in salt domes ('cavernes') can be converted/prepared for hydrogen storage.
In Zuidwending (near Veendam) HyStock (daughter of Gasunie) is preparing for this. In line with current planning, the installation will be operational in 2028 with a first caverne. Three more cavernes will be realised soon after 2030, in line with the growth of the renewable hydrogen market. Hydrogen storage shall be accessible to all parties wishing to store hydrogen; short or longer term.

It should be noted that it is still difficult for market players to assess when the switch to renewable energy carriers can be made.[70] This is determined, inter alia, by the increase in demand for (and a simultaneous sharp increase in) the supply of these energy carriers. The competition for the supply of 'own' (Dutch) hydrogen production linked to offshore wind farms (via electrolysers) also plays a role. The government has previously expressed its ambitions in the field of hydrogen production, including through the National Hydrogen Programme (NWP). The rapid rollover of the hydrogen economy will rapidly reduce the use of and demand for LNG, and terminal owners will be challenged to quickly "switch".

The Electricity Regulation requires that the regulatory method of electricity grid operators provides appropriate incentives for energy efficiency. ACM regulates energy tariffs. The costs for grid losses electricity and gas are part of the total costs that ACM takes into account in the regulation. By achieving higher returns if they reduce their costs, network operators have an incentive to reduce the costs of network losses. The costs of network losses are the volumes and the purchase price of the electricity/gas. If a system operator is able to reduce the volumes of network losses, this will contribute to energy efficiency.

VII. Regional cooperation in this area, where applicable

See Chapter 1.4.I.

VIII. Financial measures in this area at national level, including Union support and the use of Union funds

The PVGO includes financial measures to improve the cost-effectiveness of interventions in buildings and to increase the investment capacity and readiness of building owners. In addition, the Dutch approach has several other measures that help to promote the financing of investments. Some important tools include:

IX. The Construction Flows Programme. This is a further development of the Renovation Accelerator, a programme previously developed to promote the merger of projects into larger, more easily bankable investments. A portfolio approach has also been developed to enable owners of non-residential buildings to quickly address their portfolio.

X. Municipal heat plans and standards for buildings. These provide certainty for the parties and thus reduce the risk for public and private investors. This certainty is important because the risks of investment are often difficult to assess. This is due,

[69] parliamentary document 32813, No 1063.
[70] parliamentary document 29023, No 417.

inter alia, to a lack of understanding of future energy systems and the future requirements of a building.

XI. Pooling of public and private money in the Heat Fund to enable attractive financing for building owners. The combination of public and private resources provides a framework in which a lot of funding can be made available (through participation by private parties) and risks are shared (through public participation).

XII. Work on public sector road maps. These make it possible to make targeted investments in upgrading public buildings. A revolving fund will also be set up to help finance investments in public buildings.

XIII. Support to building owners in their investment decisions, for example with the improvement.nl platform and with care arrangements. This will give building owners a one-stop-shop and support in making buildings more sustainable.

For other financial measures, see Chapter 3.1.II.iii.

Making SMEs more sustainable

The Netherlands is also committed to supporting SMEs to make them more sustainable. See more in point 3.1.I.i. and 3.2.IV.

3.3 Dimension energy security

I. Policies and measures related to the elements set out in point 2.3

The Netherlands has a high potential for renewable electricity production. An important element of energy security for the Netherlands is the possibility of large-scale and long-term storage of renewable electricity. The development of power to gas is crucial in order to maintain a large part of its own energy needs and the storage of renewable electricity in the form of gas provides flexibility for the electricity system and a renewable energy carrier for the sustainability of transport and mobility, industry and the built environment. Reducing electricity imports is not an objective in itself for the Netherlands. The Netherlands believes that further integration of the European electricity market can help to continue to ensure security of supply in an energy system in transition to a climate-neutral energy supply.

For electricity there are no targets for increasing the diversification of energy sources and suppliers from third countries. Nevertheless, the decarbonisation and expansion of the share of renewable energy generation targets lead to a change and further diversification of generation techniques in the electricity market. See paragraphs 2.1 (I) and 2.1 (II). The pass-through of the 2022 KEV (policy adopted and planned) shows that the estimated increase in renewable electricity generation will result in around 60 % of Dutch electricity consumption being generated from renewable energy in the Netherlands in 2025 and around 85 % in 2030. Roughly double the number of petajoule electricity generated from solar and wind power. In addition, the planned increase in interconnection capacity between the Netherlands and other European Member States increases the supply of electricity from other Member States. For the next decade, interconnection capacity is expected to double from 5,55 gigawatts in 2016 to 10,8 gigawatts in 2025. See more under Chapter 4.

As regards increasing flexibility in the system, the market organisation of the electricity market in line with European legislation is laid down in the Energy Act. This gives all final customers access to the market on equal terms and allows for example a dynamic price contract to respond directly to the situation on the electricity market.

Energy Storage Roadmap

The Energy Storage Roadmap identifies actions to be taken to promote energy storage, appropriate to its expected role in the future energy system, until 2035 and beyond. The Energy Storage Roadmap looks at all forms of energy storage, divided into electricity, molecular and heat storage.

In the energy system of the future, electricity is the main energy carrier, hydrogen plays an important system role and decentralised sustainable heat supply fills a large part of heat demand. The majority of energy production in a sustainable energy system comes from variable sources such as wind and solar. As a result, the potential differences between supply and demand will be greater than in the former energy system, which mainly consisted of controllable coal and gas power plants and natural gas heating. This increases the so-called “flexibility issue”: in order to balance the energy system, flexibility is needed, which can be provided in different (often coherent) forms: (1) flexible demand response, (2) (CO_2free) controllable power, (3) interconnection (with other countries), also known as transport, (4) conversion and finally (5) energy storage, the subject of this roadmap.

Energy storage has played a crucial role in our energy system for a long time and will continue to do so in the future. The Energy Storage Roadmap states that both electricity, molecular and heat storage are or will be needed in our energy system. First, because they bring demand and supply together within the stand-alone energy supply chains. For example, electricity storage can increase wind and solar power generation and heat storage is crucial to utilise the supply of geo- and solar thermal. Second, because electricity, molecules as heat storage are excellent and necessary to complement each other in terms of capacity and storage time (system integration or exchange between chains). In particular, for short term storage, different forms of electricity storage are suitable, such as batteries, compressed air (CAES) or valleys. Heat storage, for example in buffers or underground, is well suited to store energy in the medium and long term. Finally, molecular storage, for example in the form of hydrogen and hydrogen derivatives or biofeedstocks (green gas, bioethanol), is well suited to store large amounts of energy for the long term.

In addition to the need to complement electricity and molecules as heat storage, there will also need to be (system) integration in order to make the best use of additional conversion techniques, such as power-to-heat and Power-to-Gas.

II. Regional cooperation in this area

See Chapter 1.4.I.

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

In 2023, a temporary price cap for small consumers for gas, electricity and heat was occasionally introduced, as the energy market was in a precarious situation with high prices and high volatility during that period. In order to provide timely support and security to households, the price cap intervened in the energy bill. The mechanism in place with volume limits of 1 200 m³ of gas and 2900 kilowatt hours of electricity per household leaves a full marginal price incentive for part of households, which still means – albeit in a more limited way – market forces and an incentive to make them more sustainable.

3.4 Internal energy market dimension

I. Electricity Infrastructure

i. Policies and measures to achieve the target level of interconnectivity set out in Article 4(d) The 15 % interconnectivity target has already been achieved. With an average electricity consumption of less than 14 gigawatts in 2020, interconnection capacity was 9,1 gigawatt.[71] The Netherlands has interconnection with Belgium, Germany, Denmark, Norway and the United Kingdom. Interconnection capacity continues to grow to 9,8 gigawatts in 2025 and 10,8 gigawatts in 2030.

The Netherlands does not consider a higher, generic target for interconnection to be useful in advance. The added value of additional interconnection varies from one border to another. The level of price differentials between regions is the main indicator of the expected added value of new investments in interconnection. An alternative to new physical interconnection are efforts to use existing interconnection more efficiently or to make better cross-border arrangements. In principle, the Netherlands is in favour of new interconnectors where the socio-economic and environmental cost-benefit analysis has positive results.

ii. Regional cooperation in this area

Regional cooperation with neighbouring countries takes place between Pentalateral Energy Forum countries. Network operators shall also cooperate in sharing information through Regional Security Coordinators (RSCs). When planning infrastructure projects (through ten-year development plans), network operators shall cooperate closely, including through the European Network of Network Operators (ENTSO-E). In the context of the new market design, there are proposals to further expand the role and tasks of the RCSs.

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

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

II. Energy transmission infrastructure

I. The policies and measures to achieve the target level of interconnectivity set out in Article 4(d). As described in Chapter 2.4.II, there are several paths *in place to increase* grid capacity in the Netherlands. Between 2016 and 2022, the Dutch share of renewable energy increased by a factor of 3. Solar energy increased by 11 times in the same period, while the share of electricity from coal-fired power plants decreased by 70 %. Between 2019 and 2021, 8 % of total energy demand was replaced by solar and wind energy. Together with Australia and Vietnam, the Netherlands experienced the fastest transition to wind and solar energy worldwide. The Netherlands has also been installed in recent years with a view to increasing the share of electric transport. All these developments and new policy plans have an impact on grid capacity. The Netherlands is therefore currently developing a framework for the allocation of the current grid capacity. The implementation of an action plan to accelerate grid reinforcement has also started in January 2023. Together with stakeholders such as grid operators, regulators and industrial users of the electricity grid, more than 50 actions have been identified with the aim of (1) accelerating the implementation of grid reinforcement. (2) legislating for efficient use of the existing grid, and (3) increasing flexible use of available grid capacity by companies and industry. Specifically for charging facilities for electric cars, a national agenda has been launched to resolve possible bottlenecks.

For the connection of offshore wind farms, TenneT uses a concept based on standard platforms, which for nearby coastal wind farms can connect 700 megawatts per platform to wind energy. Five of these platforms have now been delivered; two to four will follow. TenneT uses standard platforms of 2.000 megawatts to connect the wind farms further to the sea. The commissioning of eight of these platforms is foreseen for the period 2028-2031.

[71] electricity interconnection capacity, 2015-2021 | Compendium for the Environment (clo.nl).

For the Dutch gas transmission and distribution infrastructure, a new large-scale nitrogen plant is being built to convert 5 to 7 billion m³ of high calorific gas into low-calorific gas on an annual basis. At the end of March 2018, the government decided to build the nitrogen plant so that the reduction in production from the Groningenveld could be absorbed by importing high-calorific gas.

The energy transition legislative agenda includes the following laws: The Electricity Act 1998, the Gas Act, the Heat Act, the

Offshore Wind Energy Act and the Mining Act. The aim of the legislative agenda is to prepare these laws in a clear and coherent way for the transition toalow CO2 energy supply that also ensures reliability, affordability and safety. The main lines of the climate and energy commitments are enshrined in the Climate Law.

ii. Regional cooperation in this area See Chapter 1.4.I.

iii. Where applicable, financing arrangements in this area at national level, including Union support and the use of Union funds.
Not applicable.

III. Market integration (Energy market)

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

The need for more flexibility in the event of a further increase of intermittent sources in the electricity system is recognised. The Netherlands establishes the market organisation with the Energy Act in such a way that flexibility (including for small consumers) can be further accessed and small consumers have better access to the market and rewarded in line with market conditions. Small consumers will have direct access to the market, but they can also benefit from new market entrants, such as the aggregator, which support them. The roll-out of smart meters has been an important prerequisite for this, see Chapter 2.4.III.i.

In the retail market, dynamic prices are increasingly entering. There is already a lot of flexibility in the system, such as large consumers who are flexible and responsive to real time prices by switching up, up to or off, and parties with storage assets offering in the different markets.

Independent network operation ensures fair competition in supply and wholesale markets and increases the reliability of systems. For the degree of affordability, it is good to have competition between different providers in the energy market.

In addition, the system of “programme responsibility” or “balance responsibility” regulates that suppliers and customers themselves balance supply and demand in the energy market. They have an economic incentive to achieve agreed deliveries and reductions. This system, combined with a well-functioning market-based imbalance market, guarantees the system balance. This system therefore remains the basis for the Dutch market design. In addition, the Dutch market system does not have regulated price caps (with the exception of the price cap in response to the high prices caused by the war in Ukraine) and the technical price limits for the imbalance market are so high that market participants have the maximum incentive to balance. External research recognises that the Netherlands has a very well functioning electricity market system.

ii. Measures to make the energy system more flexible with regard to renewable energy production. A number of areas for improvement have been identified in these areas, but in general the barriers to these measures are small. The main measure to make the energy system more flexible is by adapting the regulatory framework in the planned legislative agenda.

The Netherlands has the possibility of two meters on a connection, so that several suppliers can offer different services.

There is already a lot of flexibility in the system, but it is not earmarked as such (large consumers who have already responded flexibly at real time prices offer in the different markets with their assets, but this is not measured separately; is simply intertwined in the market). Within the Topic Energy Sector (TSE), system integration and flexibility receive increasing attention and financial support for research (innovation), including for example (seasonal storage and conversion).

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

There shall be no discrimination regarding the participation of energy from renewable sources. Priority access and (re) dispatch of these sources shall be established by law, in line with European obligations.

iv. Policies and measures to protect consumers and improve competitiveness and competitive pressure in the energy market

In order to be able to supply small consumers, a supply licence has to be applied for.
The Authority for Consumers and Markets (ACM) supervises these authorisations. Licensing obligations are regulated, inter alia, in Chapter 8 of the Electricity Act 1998 and the monitoring of licensed suppliers has been strengthened in autumn 2022.72 In May 2022, the Dutch retail market had 57 suppliers licensed to supply electricity and or gas to retail consumers.

Dutch consumers are also protected against closure and possible bankruptcy of a supplier. As indicated above, the Netherlands has a system of authorisation for supply to small consumers. If a supplier's licence is withdrawn by, for example, bankruptcy, retail consumers are assured of supply by a supplier of last resort mechanism. The legislation on this subject first provides for the possibility to sell all or part of the customer base to one or more other licence holders before the actual withdrawal of the supply licence. If this is not successful, or only partially, the remaining small consumers who lose their supplier at the time of withdrawal of the supply licence will be distributed among the other licensed suppliers. Thus, all suppliers to small consumers in the market operate together as a supplier of last resort. This scheme applies to both electricity and gas. Under the scheme, the national electricity grid operators (TenneT) and gas (GTS) have a central and coordinating role.

[72] zoek.officielebekendmakingen.nl/stcrt-2022-26273.html and www.acm.nl/nl/publicaties/beleidsregel-betrouwbare-

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

The need for more flexibility, including through demand response, in the event of a further increase of intermittent sources in the electricity system is recognised.

Through the legislative agenda for the coming years, the Netherlands sets up the market organisation in such a way that demand response (including for small consumers) can be further unlocked and small – consumers have better access to the market and rewarded in line with market conditions. To this end, it must be possible for small consumers to be accommodated by an aggregator. The smart meter is explained in Chapter 2.4.III.i.

supply of electricity togas and continuousenergy suppliers.

IV. Energy poverty

Monitoring

A better understanding of the development of energy poverty is needed at national and local level. Therefore, in order to identify energy poverty, alongside income and purchasing power, (1) energy affordability, (2) energy quality of dwellings and (3) opportunities to invest in sustainable improvements in housing are considered. A monitoring system has therefore been developed on behalf of the state government to gain a better overview of energy poverty. In January 2023, the first monitor was released on the basis of the most up-to-date figures (2020). This shows that in 2020 more than 450.000 households struggle to pay their energy bills (CBS, 2023). In producing these figures, three dimensions of energy poverty are considered: the affordability of energy, the energy quality of the house, and the possibility of participating in sustainability. Based on these dimensions, four indicators have been developed to measure energy poverty:

1. HEQ: a high energy equote.
2. LIHE: low income combined with high energy bills.
3. LILEK: low income combined with low energy quality dwellings.
4. LEKWI: low income combined with low energy quality housing and little investment space to improve the dwelling.

Chapter 4.5.V Energy poverty explains the CBS's first publication of the Energy Poverty Monitor.

Approach

The government is aware of the difficult situation in which many households find themselves due to the increased cost of living. Therefore, several purchasing power measures have been adopted for 2023 that strengthen the income position of vulnerable households and mitigate the negative effects of high energy prices. The survey of the current situation shows that many households are better placed in 2023 than they were at the end of 2022. Specific measures have also been taken within the purchasing power package to mitigate the impact of high energy bills on households. In addition, since winter 2022, households have been better protected against energy disconnection if they cannot fully pay their energy bills. From 1 April 2023, this protection is of a structural nature, provided that they come into contact with the energy supplier and make a payment arrangement and comply with it or are subject to a (request for) debt relief path.

A strong commitment to energy savings has also contributed to this. For example, by the public campaign 'Set the button too'. In addition, there are specific measures to achieve energy savings in the built environment.

Acceleration in the local isolation approach

In 2023, the Netherlands will accelerate the deployment of EUR 100 million from the national insulation programme from the Climate Fund for the local isolation of municipalities for structural insulation measures in the owner-occupied dwellings. Funds for the national isolation programme from later years will be frontloaded for this purpose. The total amount available in 2023 therefore increases to more than EUR 230 million. Combined with an amount of EUR 75 million in 2024, which will also be used for these plans in the first tranche, in the short term the government is increasing the scope of local isolation from around 142.000 homes to over 200.000 homes. This will allow municipalities to request more funds in the first tranche of the local approach.

Scaling up energy fixers and energy fixation teams

In recent years, energy fixers have emerged significantly. In the last winter, many residents have been actively approached and helped to control energy use and improve housing comfort. With energy fixers, the Netherlands means all approaches from volunteers to professionals providing energy advice to residents and taking small to medium-sized measures. Many municipalities are already using the energy poverty funds provided in 2022 to support energy fixers. The Netherlands considers fixation teams and energy ecoaches important to reduce energy poverty among vulnerable households and reduce energy bills in the short term. The Netherlands is boosting this by means of additional resources. The approach to energy fixers in combination with the isolation programme actively addresses people and takes away practical and administrative concerns about sustainability. To scale up energy fixation teams, the government will make available EUR 200 million in 2023 to support vulnerable households in rented and owner-occupied housing. Energy fixers are also seen as a first contact with households and are therefore valuable in follow-on actions to take housing into account in the energy transition. The Netherlands is doing everything in its power to have as many homes as possible visited for the coming heating season. When drawing up the proposals, specific account will be taken of vulnerable households in the 20 focus areas of the National Liability and Security Programme.

Support tenants in exercising their right of initiative

The Netherlands is working on the necessary possibilities to support tenants in exercising their legal right of initiative through

support through the municipalities. To this end, municipalities can use the means to tackle energy poverty. Indeed, many municipalities already focus on supporting tenants. They do so in the context of poverty reduction, sustainability through the use of so-called fixation teams, and the deployment of rental teams.

Joint ambition and tackling energy poverty

The Government is working with local and regional authorities to tackle energy poverty. They have done so, inter alia, since 2022 within the 3-year National Energy Poverty Research Programme. This research programme will also work towards a common ambition including energy poverty policy objectives. The aim is to adopt them in 2023.

Cash Care, Poverty and Schulden approach

In addition to housing quality, security of life is also an important element of energy poverty. In this context, the financial care approach, Poverty and Schulden (2022) should also be mentioned. This approach consists of a wide range of actions, initiatives and measures in various areas. With a concrete target of halving the number of children in poverty in 2025 compared to 2015, and halving the number of people in poverty and the number of households with debt problems in 2030.

Municipalities, among others, also have an important role to play in tackling poverty and debt. The municipality can help low-income earners in different ways. The Government has asked the Social Minimum Commission to submit a final report by the end of June 2023 on what a number of household types need in order to get around and participate in society. The Committee's report may also be of interest to the approach to (energy) poverty described above.

3.5 research, innovation and competitiveness dimension

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

Energy innovation

The government is using the knowledge and creativity of Dutch industry and knowledge institutions to achieve our climate goals. The focus is on achieving the Integral Knowledge and Innovation Agenda Climate and Energy (IKIA) and Multi-annual mission-driven Innovation Programmes (MMIPs). The Netherlands focuses on the whole chain of basic research to pilots and demonstration projects. Research and development will support the ambitions of accelerating new infrastructure and early scaling up of, for example, sustainable energy carriers.

To achieve this ambition in the field of energy innovation, the Netherlands is working on a package of instruments aligned with the increased ambitions of this government for 2030, for 2035 and for 2040:

- The recalibration of IKIA and MMIPs together with industry, knowledge institutions and public authorities. This will determine the necessary innovation commitment in favour of the Coalition Agreement.
- Stepping up deployment on early stage scaling up, as indicated in the Coalition Agreement (see section on early stage scaling up).
- Commitment to industrial research, experimental development, pilot and demonstration projects; to generate sufficient solutions eligible for scale-up towards 2035 and 2040.
- The Netherlands considers this in conjunction with:
  - The intensification of industrial research, experimental development, pilot and demonstration projects in the industrial sector (see section ‘Strengthening generic subsidy instruments’ in the Industry Sectoral section);
  - The strengthening of commitment to basic scientific and applied research from the Ministry of Education, Culture and Science (through the NWO). The content-related mission-driven innovation deployment will be determined after consulting companies and knowledge institutions in the course of 2023;
  - The possibilities offered by the permit granting procedures for offshore wind farms to foster innovation, for example for better system integration, reducing negative environmental impacts and increasing energy yield through deployment of solar farms in offshore wind farms.

National Growth Fund

As indicated above, the National Growth Fund is used to promote structural economic growth. It also highlights innovation programmes that are relevant for climate and energy. There have now been three rounds of submission of the National Growth Fund out of the five rounds foreseen. The results of the first two rounds are known. The National Growth Fund was set up to strengthen the competitiveness of the Netherlands. The primary objective is economic, but this is closely intertwined with the social transitions that take place in the coming decades. In the two completed rounds, EUR 876 million have been mobilised for research, knowledge development and scale-up in renewable hydrogen production and use. EUR 200 million has also been made available for research and innovation in heat infrastructure. By mobilising these public resources, private funding on these issues will also be reinforced. It is expected that 1,5 to 2 times more private investment will be mobilised in this way.

The third round included proposals on circular high-efficiency solar panels, battery storage, biobased raw materials, CCU, circular concrete and research on greenhouse gas emissions through satellites. The opinion of the independent evaluation committee for the 3th round is expected in July 2023 and will be decided by the Cabinet.

II. Cooperation with other Member States in this field, including information on how the policies and objectives of the SET Plan are translated into a national context

For energy innovation, especially for a relatively small country such as the Netherlands, it is important to link well with the international level playing field. This strengthens the knowledge base, leads to economies of scale, accelerates the innovation process and offers economic opportunities. In addition, it may be attractive to apply innovations developed abroad first and to act as testbeds. Working together internationally on a number of strategically selected topics will enable the Netherlands to achieve climate and energy ambitions cost-effectively, strengthen the knowledge base and competitiveness and position Dutch in a highly globalised energy market. The basis for this international cooperation is the Climate Agreement, the related Integrated Knowledge and Innovation Agenda for Climate and Energy and the 13 Multi-Year mission-driven Innovation Programmes.

At the international level, the Netherlands cooperates closely on energy innovation through the European Strategic Energy Technology (SET) Plan, Horizon Europe, the International Energy Agency, Mission Innovation and the Clean Energy Ministerial. In doing so, climate and energy innovation policies contribute to the missions and objectives set out in the national climate agreement and the energy and climate targets at EU level.

Cooperation with European Member States

The Netherlands actively participates in the Steering Group and several Implementation Working Groups (IWGs) of the SET-Plan. The IWGs provide a forum to exchange knowledge and experience between Member States. Relevant knowledge, such as geothermal knowledge, is used in national contexts. The Netherlands does not have a separate subsidy pot for the SET-Plan or other international partnerships. National subsidy schemes can be used for this purpose, provided that the activities benefit the Dutch economy or other Dutch interests. In addition, Union funds may be used at European level.

Other international cooperation

Mission Innovation

Mission Innovation (MI) is an international cooperation between 25 countries and the European Commission, with the aim of accelerating clean energy innovation. MI was launched in 2015 and margins of the Paris Climate Conference. In terms of content, the commitment is designed within Missions. Within a mission, knowledge sharing and R &Dshall take place with other participating MI Member States and the private sector. Participating countries are free to decide which Missions they are participating in.

The Mission on Integrated Biorefineries was launched in 2022, at the initiative of the Netherlands and India. The objective is to develop and demonstrate innovative solutions to accelerate the commercialisation of integrated biorefineries, with the aim of replacing 2030 10 % of fossil fuels, chemicals and materials with biobased alternatives by 2020 (compared to 2020). The Netherlands opted for co-leadership of this Mission because the Netherlands has strong agricultural, industrial and logistics sectors. Biorefinery solutions are much needed to achieve climate goals. These innovations will reduce CO_2emissions in the transport and chemical sectors. Globally, these sectors now emit roughly one third of all CO_2. In addition to the Netherlands, India (co-lead), Brazil, Canada, the United Kingdom and the European Commission participate.

Clean Energy Ministerial

The Clean Energy Ministerial (CEM) is a group of 29 countries whose aim is to stimulate the deployment of existing clean energy technologies. This is done through initiatives involving both public and private parties. These initiatives are open to both members and non-members. Countries can propose initiatives based on their own national priorities. This pragmatic approach allows the Netherlands to selectively engage in policy-relevant areas where we benefit from international exchange and in which Dutch parties can position themselves internationally. The Netherlands is co-lead of the Hydrogen Initiative and of the Biofuture Initiative.

International Energy Agency

The Netherlands operates within the IEA and the technology network and takes part in about half of the Technology Collaboration Programs (TCPs) (18 out of 38). A TCP supports the work of an independent international expert group, which in turn helps governments and businesses to lead programmes and projects in the field of energy technologies and related topics. Through this cooperation, these experts work to promote research, development and the commercialisation of energy technologies. The Netherlands is affiliated to the following TCPs: Energy Technology Systems Analyses (ETSAP), Buildings and Communities (EBC), Energy Efficient End-use Equipment (4E), Energy Storage (ES), Heat Pumping Technologies (HTP), user-centered Energy Systems (Users TCP), Smart Grids (ISGAN), Industrial Technologies and Systems (IETS), Hybrid and Electric Vehicles (HEV), Bioenergy (BIO), Hydrogen (HIA), Ocean Energy Systems (OES), Photovoltaic Power Systems (PVPS), Solar Heating and Cooling (SHC), Wind Energy Systems (Wind), International Energy Agency Greenhouse Gas R & ampD Programme (IEAGHG), District Heating Cooling (DHC), Decarbonisation of Cities and Communities (Cities).

Digitalisation

Digitalisation is a key focus for the design of the energy system. It should help us to match the supply and demand of electricity and to do so on a local scale where possible. Digitalisation is therefore included as a cross-cutting theme in the National Energy System Plan due by summer 2023. This includes privacy, cybersecurity and vendor lock prevention.

III. Financing arrangements in this area at national level, including Union support and the use of Union funds

See Chapter 3.1.I.i for an overview of the Grant Operations.

Part B.
Analytical basis

4. Current situation and projections with adopted policy

This chapter describes the developments in the Netherlands with regard to the five European energy dimensions based on the adopted policy as it was known as of 1 May 2022. In particular, the National Climate and Energy Outlook (KEV) of the Planning Bureau voor de Leefomgeving (PBL) of 2022 (PBL, 2022a) is used. Where sources other than the KEV have been used, this is mentioned. For the rest, this single reference to the KEV 2022 is sufficient.

The draft update of the INEK plan 2021-2030 provides an updated picture of developments compared to the 2019 INEK plan based on the 2019 Climate and Energy Exploration. The main differences are discussed in text box 1. Most of the policy measures contained in the 2019 National Climate Agreement have now been included in the projections as adopted or planned. Agreements from the 2022 Coalition Agreement, the 2022 Climate Policy Programme and the proposals contained in the so-called Fit-for-55 package of the European Commission were still limited. The legislative proposals contained in the Fit-for-55 package have in principle been considered as a policy on the agenda. In some cases, the legislative proposals were sufficiently concrete to be taken into account as intended policies in the projections. These include the revision of the LULUCF Directive, adaptation of ETS conditions for aviation, tightening of CO_2emission standards for passenger cars and vans, revision of the alternative fuels infrastructure regulation and the ReFuelEU Aviation proposal. Although the revision of the ETS Directive has been considered as a policy on the agenda, the revision results in higher CO_2prices in defined and planned policies as market players already partly anticipate them.

This chapter discusses developments on the basis of the policies adopted.[73] The effects of the planned and planned policy on the agenda as known as at 1 May 2022 are discussed in Chapter 5, as far as a quantitative impact assessment was possible. Detailed figures and parameters can be found in Annexes 4 and 5.[74]

The KEV describes both the achievements (from 2000 onwards) and the expected developments up to 2030 (including a look through 2040). The projections used relevant information available on 1 May 2022, such as expectations on economic and sectoral developments, technological developments, energy and CO_2prices and policies (see also paragraph 4.1). These figures generally relate to the year 2020 and, where possible, to 2021. More recent information has been incorporated into texts and figures where possible, but could not be used in the projections. These include, for example, new (preliminary) energy and emissions statistics, recent economic developments and energy and CO_2prices. Unless otherwise indicated, figures referring to achievements are taken from the Statistics Netherlands (CBS).

The Climate and Energy Outlook presents the most plausible developments in the field of energy and greenhouse gas emissions in the period up to 2030. However, the developments outlined contain inherent uncertainties, for example around the evolution of the prices of energy carriers and CO_2emission allowances, uncertainties about the impact of policies and the interaction with foreign energy markets. Therefore, ranges reflecting these uncertainties are given around the main results. Moreover, emissions from the electricity sector are no longer subject to a central projection, but only to a bandwidth (independently of the range mentioned above). This range reflects the (large) uncertainties about production patterns within the North-West European electricity market of which the Netherlands is part.

[73] *Annex 2* provides a complete overview of which policy measures have been included in the projection with defined policies (indicated by "WEM"). A detailed explanation of how policy has been taken into account in the projection can be found in the annex to the KEV 2022: www.pbl.nl/publicaties/beleidsoverzicht-en-factsheets-beleidsinstrumenten-achtergronddocument-bij-de-klimaat-en-energy reference-2022.

[74] Detailed projection results are included for the variants with established policy ('WEM') and with adopted and planned policy ('LMO'). The figures in Annex 5 are still provisional, as their quality control by the European Commission has not yet been finalised.

The KEV provides a look through for the period from 2030 to 2040, based on a continuation of the adopted and planned policy as known from 1 May 2022. This should be seen as a look-through, as the uncertainties after 2030 are significant and policy has generally been formulated until 2030. The study "Reference scenario greenhouse gas emissions 2040-2050 for the purposes of the

2023 INEK reporting" (TNO, 2023a) was used to provide an overview of developments in the period 2040 to 2050. In this study, the input parameters and the projection results from the KEV2022 (up to 2040) were used for the modelling of greenhouse gas emissions and energy consumption in the post-2030 period.

Text box 1 Main differences between projections in the draft update and the INEK plan

The projections in chapter 4 of the 2019 INEK plan with adopted policy were based on the KEV 2019 with 'established policy'. A major difference from the QEV2022 is that most of the policy measures set out in the 2019 National Climate Agreement have now been taken into account as adopted or planned. Where sufficiently concrete, planned and planned policies of the Rutte IV Cabinet have also been taken into account. In addition, due to geopolitical tensions, the $CO_2$and energy prices used are significantly higher than in the KEV2019. Another difference with KEV2019 is that KEV2022 uses the Global Warming Potentials (GWPs) according to the 5th (instead of the 4th) IPCC Assessment Report.

In the KEV 2019, an emission of 145 [136-159] megatonnes of CO_2– equivalents was expected with only established policy for 2030. With planned policy, an emission of 144 [135-159] megatons of $CO_{2\ equivalents}$was expected. In the KEV2022, emissions of 113-138 megatons of CO_2equivalents are expected in both variants (based on GWPs according to the 4th Assessment Report). This is mainly due to lower emissions in the electricity sector and industry. The closure of coal-fired power plants in (no later than) 2030, higher $CO_2$and energy prices and the CO_2levy for industry are a major contributor to this. The differences between the policy variants with adopted and planned policies in the KEV are discussed in Chapter 5.

4.1 Factors affecting energy management and greenhouse gas emissions

This section describes the factors relevant to the expected development of energy management and greenhouse gas emissions, such as economic developments and energy prices. This is based on the figures and insights assumed in the KEV 2022 (PBL, 2022a) and the GHG Reference Scenario 2040-2050 (TNO, 2023a). Newer insights and/or figures are not included.

I. Macroeconomic developments

Demographic and economic developments have a major impact on energy consumption. This section discusses the main developments in the Netherlands.

Population and number of households growing

At the end of 2022, the population was 17,8 million people (see Table 4.1). The population is expected to increase to 18,5 million people in 2030 (PBL, 2022a). Population ageing has stabilised the potential workforce in recent years. With the increase in the retirement age, the potential labour force will increase in the coming years, but slowly decline after 2030. For consumers' energy consumption, the number of households is more important than the size of the population. Larger households have economies of scale compared to smaller households, resulting in lower energy consumption per person. The average size of a household has been declining for decades and this trend continues in the future. The growth in the number of households is therefore higher than that of the population.

Table 4.1 Demographic developments (Source: implementation according to CBS (2023a), PBL projections; in PBL, 2022a)

	2000	2005	2010	2015	2020	2021	2025	2030	2040
Population (million)	15,9	16,3	16,6	16,9	17,4	17,5	18,0	18,5	19,2
Potential labour force[1] (million)	10,8	11,0	11,1	11,1	11,6	11,6	11,9	12,0	11,9
Private households (million)	6,8	7,1	7,4	7,7	8,0	8,0	8,4	8,7	9,0
WV single-person households (million)	2,3	2,4	2,7	2,9	3,1	3,1	3,3	3,5	3,7
Average household size	2,3	2,3	2,2	2,2	2,1	2,1	2,1	2,1	2,1

[1] *the potential labour force consists of all persons aged between 15 and the AOW age.*

Economic recovery from the coronavirus crisis continues

On average, gross domestic product (GDP, in 2021 prices) is growing by 2.2 % per year between 2 020 and 2030 (see Table 4.2). The permanent economic damage caused by the coronavirus crisis seems to be covered (CPB, 2022a). Earlier, lower trend labour productivity growth was expected as a result of the coronavirus crisis, both due to weaker capital stock growth and lower productivity growth. Given the high resilience and the rapid recovery of the economy in 2021, these effects appear limited. However, there is still a lot of uncertainty surrounding trend productivity developments; for example, the scale and impact of learning disadvantages and protracted coronavirus complaints on the labour market are still unknown, as are the impact of accelerated developments, such as digitalisation.

Longer-term economic growth held back by ageing

In the coming years, ageing populations are holding back labour supply and thus potential economic growth (CPB, 2022a). Population growth between the ages of 15 and 75 is slowing down further in the coming years. In most age groups, employment rates are increasing further, but at a slower pace than in recent years. In addition, the working age population is ageing, reducing the average employment rate. Average GDP growth thus levelled down to 1.4 % per year between 2 030 and 2040.

Exports continue to make an important contribution to economic growth, alongside household investment and consumption. Government consumption growth is expected to be lower than economic growth from 2040 onwards.

Table 4.2 Macroeconomic developments; index (2021 = 100) (Source: implementation according to CBS, PBL projections; in PBL, 2022a)

	2000	2005	2010	2015	2020[1]	2021[1]	2025	2030	2040
Economic growth (gross domestic product growth)	76,1	81,3	87,1	90,4	95,4	100,0	109,3	116,0	129,2
Consumption of households	91,4	95,8	96,6	96,9	96,5	100,0	110,0	117,4	129,1
Consumption of general government	64,3	72,6	88,4	87,5	95,0	100,0	109,5	119,7	125,1
Fixed capital formation of enterprises	76,6	75,7	76,9	93,6	96,9	100,0	116,5	123,7	141,2
Exports of goods and services	50,4	60,0	69,0	86,2	95,0	100,0	116,0	130,6	167,8
Imports of goods and services	51,5	60,6	69,9	89,7	96,1	100,0	119,2	136,2	173,9

[1] *provisional data.*

II. Sectoral developments

In particular, sectoral development determines energy consumption

This section discusses the main sectoral developments. Broadly speaking, activities in the services sector demand much less energy than those in industry or agriculture. However, there may also be significant differences within the sectors. For example, the basic industry within industry and greenhouse horticulture in agriculture is relatively energy intensive.

Service sector dominated in the economy

More than three quarters of GDP are currently realised in the services sector (see Table 4.3). The share of the services sector has increased in recent decades and, despite a decline in the pace of growth, is likely to increase further in the future. Commercial services are mainly responsible for growth. Cuts in both health, education and public administration lead to lower average growth in these semi-public sectors. Industry has been the first to benefit from the recovery of the economy after the crisis. As a result, its share in the Dutch economy initially increased slightly. The industrial share of GDP is expected to decline again after 2020.

Table 4.3 Share of gross value added by sector[1] in percentage (Source: implementation according to CBS, PBL projections; in PBL, 2022a)

	2000	2005	2010	2015	2020	2021[2]	2025	2030	2040
Energy companies[3]	0,9	1,2	1,2	1,3	1,4	1,4	1,3	1,3	1,2
Manufacturing (including petroleum) and mining and quarrying	15,9	15,7	14,8	14,0	13,4	13,5	12,3	12,1	11,8
Construction, environmental services and water supply	6,2	5,8	5,2	4,9	5,9	5,7	5,6	5,3	4,7
Trade, transport and business services	53,8	53,2	54,0	55,5	55,8	56,2	56,5	56,8	58,4
Government, education, care, culture and recreation	21,2	22,3	22,9	22,3	21,6	21,4	22,6	23,0	22,3
Agriculture, forestry and fishing	1,9	1,9	1,9	1,9	1,9	1,9	1,7	1,7	1,6

[1] *breakdown by sector according to the main activity of business on the basis of the CBS Standard Business Classification.*
[2] *provisional data.*
[3] *electricity and heat producers, grid companies.*

Energy consumption mainly affected by production

In terms of energy consumption, it is not so much the value added but rather the physical production that matters. This section looks at the value of production expressed in euros (see Table 4.4). The services sector's share of output is lower than the service sector's share of value added or employment. In 2021, the service sector accounted for around 65 % of production (in euro). On the contrary, the industry, which uses relatively high levels of materials and semi-finished products, has a higher share (in euros) of production than in value added or employment. The manufacturing share (in euro) of the industry was around 22 % in 2021 and is expected to remain roughly the same in the period following.

Table 4.4 Share of production by sector[1] in percentage (Sources: implementation according to CBS, PBL projections; in PBL, 2022a)

	2000	2005	2010	2015	2020	2021[2]	2025	2030	2040
Energy companies[3]	1,3	1,5	1,5	1,3	1,3	1,3	1,2	1,2	1,1
Manufacturing (including petroleum) and mining and quarrying	25,2	24,7	23,7	24,1	22,3	22,1	21,3	21,7	21,8
Construction, environmental services and water supply	8,7	8,3	7,7	7,1	8,4	8,3	8,3	7,8	7,1
Trade, transport and business services	47,6	47,4	48,0	49,5	50,5	50,8	51,0	50,9	52,0
Government, education, care, culture and recreation	14,7	15,8	16,8	15,7	15,3	15,4	16,2	16,4	16,0
Agriculture, forestry and fishing	2,4	2,3	2,4	2,3	2,2	2,1	2,0	2,0	1,9

[1] breakdown by sector according to the main activity of business on the basis of the CBS Standard Business Classification.
[2] provisional data.
[3] electricity and heat producers, grid companies.

III. Global energy trends, international fossil fuel prices, EU ETS carbon price

This section discusses the price developments of energy carriers which are fully or to a large extent imported by the Netherlands on international markets. It also discusses the evolution of the allowance price in the European ETS. These prices are important exogenous parameters for projections of energy consumption, energy mix and greenhouse gas emissions.

Recent developments in energy markets

Demand for fossil fuels increased sharply in the course of 2021 with the decrease in COVID-19 measures compared to previous years. As a result, global coal consumption in 2019 was 2021 1 % and gas consumption 3 % higher than in 2019 (IEA, 2022a). The sharp increase in demand compared to 2020 has led to a sharp increase in prices. The average price of natural gas was EUR 31 cents per m³ compared with 13 cents in 2020. In the last quarter, the average price of natural gas was 56 cents per m³ (CBS, 2022a). The average price of coal was EUR 94 per tonne, compared with a price of EUR 58 in 2020. By December 2021, the price increased further to EUR 133 per tonne (CBS, 2022a). Oil consumption has not yet reached the same level and is 3 % lower than in 2019 (IEA, 2022b). However, the price of oil has risen as a result of a fall in supply, reaching almost USD 71 per barrel on average in 2021; in 2020 it was more than USD 43 per barrel (CBS, 2022a).

Demand for fossil fuels increased sharply in the course of 2021 with the decrease in COVID-19 measures compared to previous years. The Russian invasion of Ukraine has led to an unprecedented further increase in energy prices, bringing fuel prices to historically high levels in 2022.

Future evolution of prices of energy carriers

Developments in the markets for fuels and CO_2allowances play a major role in the functioning of the energy system. The future evolution of prices in these markets is inherently uncertain and sensitive to unexpected events, as also illustrated by the impact on fuel prices of the Russian invasion of Ukraine in February 2022. Uncertainty will also be heightened in the longer term due to the war in Ukraine.

One way to deal with these uncertainties is by using different price scenarios.
On the other hand, the alternative price scenarios for the KEV 2022 are not necessarily less likely than the central price scenario that has been fully applied. Therefore, in addition to the central scenario for the full calculation of the KEV, two alternative price scenarios for oil, coal, gas and CO_2 have been used this year: a price path with higher and one with lower prices. With these alternative price scenarios, electricity prices have also been calculated for all the current years of the KEV, and the different prices for 2030 have been used in the uncertainty analyses of all sectors.
Fuel prices in the projections of the KEV 2022 in Table 4.5 are based on an opinion issued by the European Commission in April 2022 to Member States for their reporting on greenhouse gas emissions in 2023 (EC, 2022).
Prices for the coming years in this opinion are based on prices on forward markets; the KEV has followed a similar approach to shorter-term prices in recent years.

Table 4.5 Prices in the QEV2022 with established and planned policy (constant 2021 prices) (Source: PBL, 2022a)

	2000	2005	2010	2015	2020	2021	2025	2030	Layer 2030	High 2030	2040

	46	58	71	53	39	60	92	92	70	107	97
Oil North Sea Brent (euro per barrel)											
Wholesale price of natural gas (EUR per m^3)			0,22	0,23	0,13	0,31	0,43	0,37	0,21	0,45	0,37
Import boiler coal Netherlands (EUR per tonne)	48	71	82	65	58	94	81	81	60	120	86
Wholesale price of electricity base load (EUR per MWh)	63	56	58	44	33	103	93	73	50	93	87
Co_2 European Emissions Trading System (ETS) (euro per tonne)			17	8	26	53	86	110	87	149	179

IV. Evolution of technology costs

Projections of future developments in the energy system rely on the National Energy Surveys System, a model cenite with different models for supply and demand sectors.75 The data and information on expected costs, potentials and technical characteristics used is regularly updated on the basis of new insights from studies from, for example, TNO, IEA, IRENA and scientific literature (see Table 4.6). PBL also uses the detailed studies carried out within the Netherlands to justify the subsidies granted under the SDE + scheme for different renewable energy technologies.

75 For more information see calculation models for Climate and Energy Assessment (KEV) see | PBL Environmental Planning Bureau.

Table 4.6 Overview of sources used for expected cost developments of energy technologies in KEV2022 (sources: PBL, 2022b, TNO, 2023b)

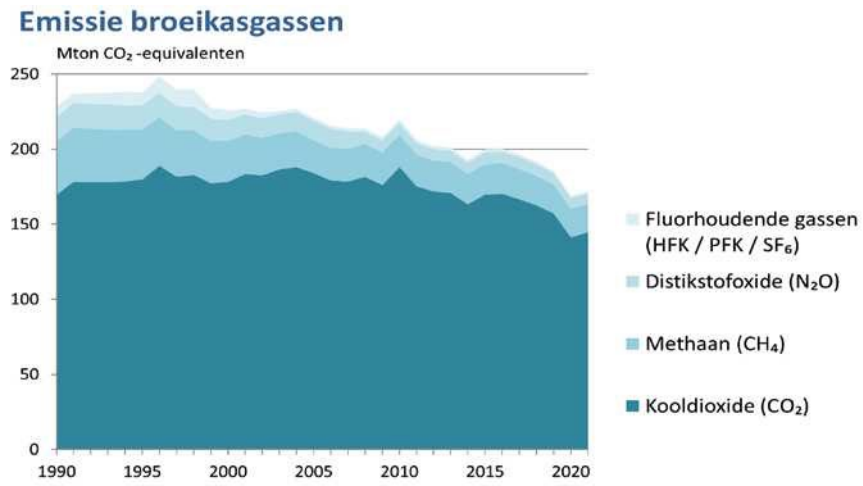
Technology	Author (s)	Year	Title	Reference (s)
Geothermal heat	CE delft, IF Technology	2018	Road from Gas, opportunities for the new concepts of Lage Temperature temperature Aardheat and mine water	Delft, CE Delft, May 2018, see report on CE website
Biofuels	IEA	2020	Advanced biofuels-potential for cost reduction	
Biofuels	PNNL	2013	Process Design and Economics for the Conversion of Lignocellulosic Biomass to Hydrocarbon Fuels Fast pyrolysis and hydrofluating Bio-oil Pathway	
Biofuels	PNNL	2015	Biomass Direct Liquefaction Options: Technological and Life Cycle Assessment	
Biofuels	Zhang Z, Zhu Z, Shen B, Liu L	2019	Insights into biochar and hydrochar production and applications: a review	Energy
Biogas	Qie, S., Hailg, L., Longcheng, L., Zhixin., Xinhai, Y.	2015	Selection of appropriate biogas upgrading technology a review of biogas cleaning, upgrading and utilisation	Renewable and Sustainable Energy Reviews 51 (2015) 521-532
Bioraw materials chemistry	JRC	2019	Insights into the European market for bio-based chemicals	
Biomass	Dimitriou, I., Goldingay H., Bridgwater A.V.	2018	Technology and uncertainty analysis of Biomass to Liquid (BTL) systems for transport fuel production	Renewable and sustainable Energy Reviews 88 (2018) 160-175
Bio-methane	Capra, F., Magli, F., Gatti, M.	2019	Biomethane liquefaction: A systemic comparative analysis of refrigeration technologies	Enhanced thermal Engineering 158 (2019) 113815
Biooil	Elliott, D.C.	2007	Historical Developments in Hydropro-cessing Bio-oil	Energy &Fuels
Various renewable electricity technologies	IRENA	2021	Renewable Power Generation Costs in 2020	
Advanced biofire-substances	Landälv, I., Waldheim L.	2017	Building up the future cost of bio fuel	
Methanol	IRENA	2020	Innovation outlook-Renewable Methanol	
Hydrogen	EIGA	2013	Best Available Techniques for the Co-production of Hydrogen, Carbon monoxide their Mixtures by Steam Reforming	
Hydrogen	IEA	2019	The Future of Hydrogen, Report prepared by the IEA for the G20	
Hydrogen	IEA	2017	Technological Economic Evaluation of SMR Based Standalone (Merchant) Hydrogen Plant with CCS.	
Hydrogen	NOW	2018	Industrialisierung der Wasserelectrolyse in Deutschland	
Wind on land	IRENA	2019	Future of wind	www.irena.org/publicati-ons/2019/Oct/Future-of- wind
Wind on land	Beurskens, L. (TNO)	2021	Wind onshore technology factsheet	energy.nl/wp-content/ uploads/technology facts- heet-wind-onshore-9.pdf

Technology	Author (s)	Year	Title	Reference (s)
Wind at sea	Beurskens, L. (TNO)	2021	Wind offshore technology factsheet	energy.nl/wp-content/ upload/technology facts- heet-wind-offshore 9.pdf
Solar PV	Beurskens, L. (TNO)	2019	Variable technology factsheets on solar PV	energy.nl/wp-content/ uploads/ solar_pv_15kwp-1_mwp_south-1-7.pdf energy.nl/wp-content/ uploads/ solar_pv_15kwp-1_mwp_east-west-1-7.pdf energy.nl/wp-content/ uploads/ solar_pv_ground-based_above_1_mwpsouth-1-7.pdf energy.nl/wp-content/ uploads/solar_pv_floating_ above_1_mwp_south-1-7. pdf

4.2 Decarbonisation dimension

I. Trends and projections of greenhouse gas emissions and sequestration

Figure 4.1 Emissions of greenhouse gases in the Netherlands from 1990 to 2021 in megaton $CO_{2\ equivalents}$(including LULUCF) (Source: CBS et al., 2023)



Historical trend of national greenhouse gas emissions so far

After an initial increase between 1990 and 1996, greenhouse gas emissions in the Netherlands show a declining trend with a peak in 2010 (due to a relatively cold winter) and a limited increase in 2015 (see Figure 4.1). In 2021, emissions amounted to 172 megatons of CO_2equivalents (including LULUCF), 25 % below 1990 levels. Preliminary figures show that the decline continued in 2022: in that year, greenhouse gas emissions fell by 9 % compared to 2021 (CBS, 2023a). CO_2emissions decreased by around 25 megatons between 1990 and 2021, much of which after 2016. This is largely due to the closure of coal-fired power plants and an increase in the production of energy from renewable sources.

For the non-CO_2 emissions, a decreasing trend has been observed for a long time. For methane emissions, the decrease was mainly due to the decrease in the use of landfills; emissions of fluorine-containing gases have mainly been reduced by regulation. The largest reduction in nitric acid production was due to a change in the nitric acid production process.

National greenhouse gas emissions forecast (including LULUCF)

Greenhouse gas emissions to decrease until 2030

In the policy variant “defined policies”, national greenhouse gas emissions decrease to 122,5-127,9 [114-139] megaton CO_2equivalents by 2030. This is a decrease of 44,5 megatons of CO_2equivalents compared to 2020 (see Figure 4.2) (source: PBL, 2022a). Of this expected decrease, almost 12,5 megatons of CO_2equivalents are due to developments in industry (see Table 4.7).

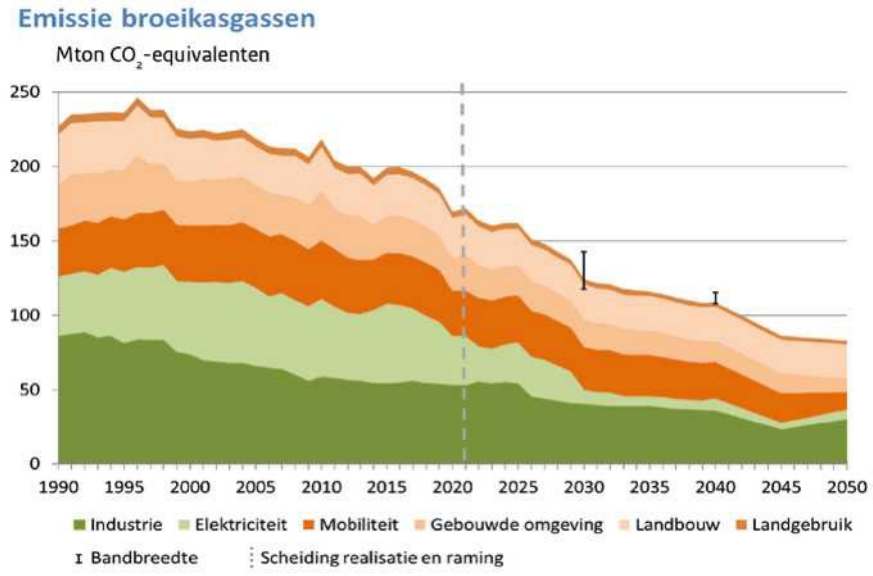
The decrease is mainly due to the introduction of CO_2 emission-reducing techniques that become profitable due to the combination of the high CO_2price in the European ETS, the SDE + + and the national$_{CO2\ levy}$for industry. The biggest contributor is CO_2Capture and Storage (CCS), electrification, energy saving, and methane and low gas emission reductions.

In the built environment (households and services), emissions are estimated to decrease by 3,5 megatons of CO_2equivalents between 2030 and 2020. While the number of households is increasing, gas consumption and associated emissions are expected to decrease. This is due to sustainable new construction, sustainability during regular housing improvements, warmer winters and efficient combustion behaviour due to high gas prices. In the case of buildings in the services sector, we see the same developments.

In the mobility sector, emission reductions between 2020 and 2030 have been estimated at 1,7 megatons of CO_2 equivalents, due to an accelerated growth of electric cars and the use of more renewable fuels. Emissions in agriculture are estimated to fall by

almost 4 megatons of CO_2 equivalents between 2030 and 2020, mainly due to lower gas consumption in greenhouse horticulture. Emissions from livestock and arable farming are decreasing due to less fertiliser use and a smaller herd. Net land use emissions are expected to decrease by 0,5 megatons of CO_2 equivalents in 2030 compared to 2020, due to reduced grassland area, policy measures that reduce the emissions of CO_2 from peat and moy land and increased CO_2sequestration in existing forests.

Figure 4.2 Historical and projected greenhouse gas emissions by sector (incl. LULUCF) in the period 1990-2050 (Sources: Emission recording (achievements), PBL (projections with adopted policies up to 2040); in PBL, 2022a, and TNO (projection to 2050); in RIP, 2023a)



Projected GHG emissions between 2030 and 2050

In the period after 2030, national greenhouse gas emissions are expected to decrease further in the adopted policies. The decrease in emissions after 2030 is mainly explained by expected developments in industry, mobility and built environment. Emissions in these sectors decrease by 13 megatons of CO_2equivalents between 2040 and 2030 (see Table 4.7). EZK requested TNO to make a baseline scenario of GHG emissions from 2040 to 2050, in addition to the KEV 2022 projections, in line with the projections of the KEV 2022 (TNO, 2023a). According to this study, projected emissions fall to 83 megatons of CO_2equivalents in 2050. As a result, emissions reductions by 2050 are over 63 % compared to 1990. Figure 4.2 shows that emissions fall after 2040 but show a slight smoothing between 2045 and 2050. On the one hand, this is due to falling emissions in the built environment and transport sectors, but an increase in the energy and industrial sectors in 2050.

Table 4.7 Amount and expected greenhouse gas emissions per climate table (in megatons of CO_2equivalents) (Sources: Emission recording (achievements), PBL (projections with adopted policies up to 2040); in PBL, 2022a, and TNO (projection 2050); in RIP, 2023a)

Sector[1]	Statistic				Projection		
	1990	2005	2010	2021	2030	2040	2050
Electricity	39,6	52,1	32,7	32,7	7,5-12,9	6,2-11,6	6,3
Industry	86,4	66,3	53,3	53,2	40,8	36,2	30,4
Built Environment	30,0	29,3	21,8	24,5	18,3	14,5	9,5
Agriculture (excluding land use)	33,1	26,1	27,1	26,9	23,3	22,7	22,6
Use of land	5,7	5,2	4,2	4,3	3,7	2,9	2,7
Mobility[2]	32,2	39,8	30,6	30,5	28,9	24,4	11,6
Overall	**227**	**219**	**170**	**172**	**122,5-127,9**	**106,9-112,3**	**83**
Reduction from 1990 [%]	**—**	**4 %**	**25 %**	**24 %**	**44-46 %**	**51-53 %%**	**63 %**

[1] sector classification based on the Climate Plan 2021-2030. This differs from the CRF classification used in EU and UN reports. For example, emissions

from mobile tools are all covered by mobility in this table. In the Annex [5], emissions are presented according to the CRF classification.
[2] excluding international aviation and shipping.

Large uncertainties in projections

The Climate and Energy Outlook (PBL, 2022a) was issued in 2022 in a context of high uncertainty. The Russian invasion of Ukraine is causing unrest and scarcity in energy markets. The extent to which a relatively cold or hot combustion year is also a significant uncertainty for emissions in a specific year. The projected emissions from the KEV for 2030 and 2040 have therefore been published with ranges. The uncertainties for 2050 are even greater, as there is hardly any policy for this. However, only a point value for this point is determined (TNO, 2023a).

Trends and projection of greenhouse gas emissions in EU ETS sectors

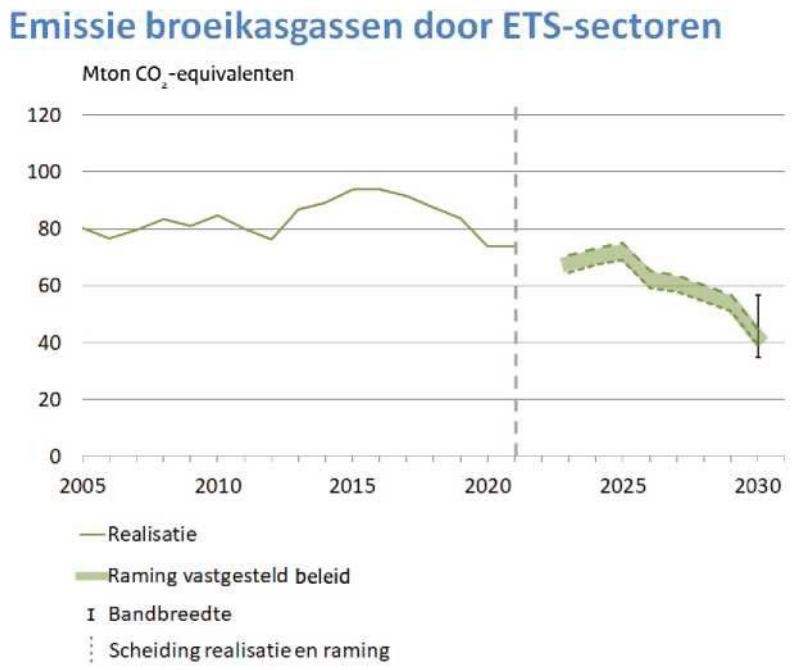
Trend ETS emissions

In the period 2005-2012, emissions from Dutch companies participating in the European Emissions Trading System fluctuated around 80 megatons of CO_2equivalents. In 2013, ETS emissions increased significantly mainly due to an administrative reallocation of activities (with emissions) from non-ETS to ETS. In 2015 and 2016, total ETS emissions increased to around 94 megatons of CO_2equivalents due to large emissions in the electricity sector and then decreased to 74 megatons of $CO_{2\ equivalents}$in 2020 and 2021 megatons of CO_2equivalents. This decrease in ETS emissions until 2021 is mainly due to decreasing emissions in the electricity sector (from 50 megatons in 2015 to 32 megatons in 2021). There are several reasons for this trend, in particular the increased use of renewable energy and lower electricity production from coal. ETS emissions from the Dutch industry were around 44 megatons of $CO_{2\ equivalents}$in 2013 and fall to 42 megatons of CO_2equivalents in 2021.

ETS emissions are expected to decrease towards 2030

ETS emissionsare expected to decrease to 33 to 2030 megatons of CO_2equivalents (see Figure 4.3). This decrease is due to the decrease in electricity production from coal and gas (see explanation above).

Figure 4.3 Historical and projected greenhouse gas emissions from ETS sectors in the period 2005-2030 (Sources: Emission recording (achievements) and PBL (projections with defined policies); in PBL, 2022a)



Trends and projection of greenhouse gas emissions in non-ETS sectors

Cumulative non-ETS emissions target

In Europe, national targets for greenhouse gas emissions not covered by the European Emissions Trading System have been agreed, further referred to as N-ETS. This includes emissions from mobility, almost all emissions from the built environment, the majority of agriculture and a limited part of industry (land use emissions are not covered by the N-ETS targets). For the period 2013-2020, the N-ETS targets and regulations are laid down in the Effort Sharing Decision (ESD). The ESD indicates an emission reduction declaration for the Netherlands of 16 % in 2020 compared to 2005. For the period 2021-2030, the Dutch N-ETS declaration appears in the Effort Sharing Regulation (ESR). In the ESR, the Netherlands has a (adjusted) emission reduction report of 48 % in 2030, also compared to 2005. On the basis of these two reduction statements, two series (2013-2020 and 2021-2030) were derived with annual ceilings of permitted quantities of emissions.

These annual ceilings should then be added up per period, following a cumulative target per period. The target in the ESD is a set of annual emission ceilings for the period 2013-2020, which together serve as a cumulative target for the whole period. The maximum cumulative emissions allowed for the Netherlands under the ESD for the period 2013-2020 were 921 megatons of CO_2equivalents. For the period 2021-2030, new targets have been agreed under the new ESA. For the Netherlands, this is expected to be a cumulative emission allowance of 839 megatons of CO_2equivalents (but still to be determined).

Decreasing trend of non-ETS emissions

Non-ETS emissions decreased from 134 megatons of CO_2equivalents in 2005 to 108 megatons in 2013 (see Figure 4.4).

The decrease in the period 2005-2013 is mainly due to the reduction of NETS emissions from industry by around 20 megatons of CO_2equivalents. Reductions were also achieved in the electricity generation (3 megatons) and mobility (4 megatons) sectors during that period. In 2013, N ETS emissions decreased, inter alia, by an administrative reallocation of activities (with emissions) from non-ETS to ETS. Between 2015 and 2018, N ETS emissions stabilised around 102 megatons of CO_2equivalents. Emissions of non-CO_2 greenhouse gases also decreased significantly by 8 megatons in this period, mainly due to reduction measures in nitric acid production.

EU non-ETS obligation for 2013-2020 met well

The maximum cumulative emission allowed for the Netherlands for the period 2013-2020 is 921 megatons of CO_2equivalents. The total emissions for that period are 787 megatons of $CO_{2\ \text{equivalents}}$, well below the mandatory cumulative emission cap (see Figure 4.4).

Table 4.8 Emissions of non-ETS greenhouse gases 2 005 to 2030 based on defined policies (in megatonnes CO_2-equivalents; excluding LULUCF; scope under the third ETS trading period from 2 013 to 2020)
(Sources: Emission recording (achievements) and PBL (projections); in PBL, 2022a)

Sector[1]	2005	2010	2015	2020	2021	2025	2030
Electricity	5,2	2,5	3,2	0,7	1,1	0,2	0,2
Industry	33,2	25,8	11,1	11,5	10,8	11,7	9,1
Mobility[2]	39,8	39,0	34,3	30,6	30,5	31,6	28,9
Built environment	29,1	33,96	24,1	21,5	24,2	19,7	18,1
Agriculture and horticulture	25,3	28,3	26,0	26,0	26,1	24,2	23,2
Totals	**132,5**	**127,3**	**99,0**	**90,2**	**92,7**	**87,7**	**79,5**

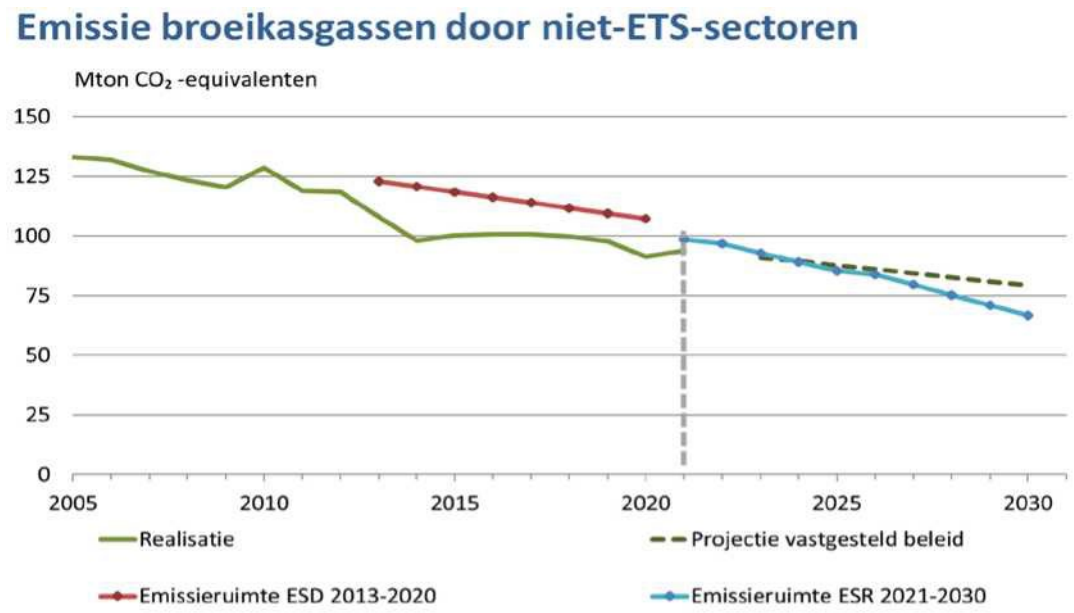
[1] sector classification based on the Climate Agreement. This differs from the CRF classification. For example, emissions from mobile tools are all covered by mobility in this table. Annex 5 shows the emissions according to the CRF classification.

[2] excluding international air and maritime transport

EU non-ETS obligation for 2021-2030

The maximum cumulative emissions allowed for the Netherlands for the period 2021-2030 are expected to be 839 megatons of CO_2equivalents. Based on established policies, the cumulative estimated NETS emissions for 2021-2030 are 867 megatons of $CO_{2\ equivalents}$and a deficit (and thus policy statement) of 28 megatons of CO_2equivalents remains over the period under consideration.

Figure 4.4 Historical and projected greenhouse gas emissions from non-ETS sectors in the period 2005-2030 (Sources: Emission recording (achievements), PBL (projections with defined policies; in PBL, 2022a)



Sectoral developments of greenhouse gas emissions in non-ETS sectors until 2030

Built environment

Emissions in the built environment have gradually decreased since 1990 from 30 megatons of CO_2– equivalents to 24 megatons in 2021 (without temperature correction, of which 0,3 megatons are covered by ETS), despite the fact that in this period the number of households increased from 7,1 to 8,0 million (CBS, 2023a) and the floor area of non-residential buildings increased. Emissions are expected to decrease to 18 megatons of CO_2 equivalents in 2030 (of which 0,2 megatons are covered by ETS) (PBL, 2022a).

The decrease in household consumption is due to reduced natural gas consumption due to insulation measures and the use of more efficient heat boilers in existing construction, demolition and the construction of energy-efficient new buildings.
The decline in the services sector is due to energy savings in existing construction, demolition, energy efficient new construction,

less space heating due to climate heating, increased use of electric heat pumps instead of natural gas-fired boilers and less use of cogeneration. In the services sector, a downward trend has also been observed from 2011 onwards due to efficiency requirements from the Ecodesign Directive on lighting, ICT, pumps and fans in buildings. In the period after 2021, the energy saving obligation also plays a role in further reducing energy consumption.

Industry

A limited share of greenhouse gas emissions from industry is not covered by the ETS (around 11 megatons of CO_2equivalents in 2021). The developments mentioned above, which are relevant for industry ETS emissions, are also relevant for the non-ETS emissions. Non-ETS CO_2emissions are expected to gradually decrease to around 9 megatons in the period up to 2030. This is mainly due to decreasing methane emissions from landfills and F-gases as a result of the implementation of the European F-Gas Regulation.

Mobility

Between 1990 and 2008, CO_2emissions increased by around 8 megatons due to an increase in domestic traffic and transport as a result of economic growth. After the 2008 economic crisis, emissions fell rapidly. Despite the recovery of the economy, emissions remained broadly stable in the period 2015-2 019 at around 35 megatons of CO_2equivalents. The relatively strong growth in transport volumes in 2018 was offset by a more efficient vehicle fleet and increased use of biofuels for mobility. In 2020 and 2021, emissions fell to 30-31 megatons of CO_2 equivalents, also due to the coronavirus pandemic. Greenhouse gas emissions are expected to decrease slightly to 29 megatons of CO_2equivalents in 2030. This decrease is largely due to the strengthened European source-based policy for CO_2emissions from new vehicles, despite growing traffic volumes.

Greenhouse gas emissions from the combustion of bunker fuels from international aviation and shipping are not included in the national emission totals. Between 2000 and 2006, these emissions increased from 53 to 67 megatons of CO_2equivalents. Thereafter, emissions fell to around 44 megatons in 2021. Under defined policies, this item is expected to grow to 49 megatons of CO_2equivalents in 2030. The sale of bunker fuels to international maritime shipping is expected to remain stable in the coming years. Greenhouse gas emissions in 2030 are estimated at 34 megatons and are therefore at the same level as in 2021. Emissions from the sale of bunker fuels to inland waterway transport also remain stable and are estimated at 2,8 megatons of CO_2equivalents, equivalent to 2021. Emissions from sales of bunker fuels to aviation in 2030 are estimated at 11,9 megatons of CO_2 equivalents, a level equivalent to 2018 and 2019, with established policies. In 2021, this figure was 7,3 megatons linked to the coronavirus pandemic.

Agriculture and horticulture

Greenhouse gas emissions from agriculture and horticulture in 2021 amounted to around 27 megatons of $CO_{2\ equivalents}$.
A large part of this (around 19,3 megatons) is made up of methane and nitrous oxide, mainly from livestock farming and arable farming. Mainly due to a shrinking herd due to cessation and extensification and additional reduction measures, emissions are expected to decrease by 18,2 megatons of CO_2equivalents in 2030.
CO_2emissions in 2021 amounted to 7,8 megatons (Emission registration, 2023). Most of the emissions of $CO_2$from agriculture come from greenhouse horticulture (of which around 0,1 megatons within the ETS). There, a lot of energy is consumed to heat, highlight and fertilise greenhouses with CO_2. The total area under greenhouses has fluctuated in recent years: after a gradual increase between 2000 and 2010, the area decreased by 13 % until 2018. The area then increased again to its 2010 level (> 10.555 ha in 2021). CO_2emissions from agriculture and horticulture are expected to decrease further due to more efficient and innovative greenhouses to around 5 megatons by 2030 (of which 0,1 megatons within ETS).

Trends and projection of greenhouse gas emissions in LULUCF sectors

Reducing emissions from LULUCF

In the Netherlands, grasslands, farmland and cultivated land are the main sources of land use, Land Use Change and Forestry (LULUCF) emissions. Forests record net CO_2. The net emissions of all land use categories together show a downward trend from 5,7 to 4,2 megatons of CO_2equivalents per year from 1990 to 2020 (see Figure 4.5). In addition to a small contribution from nitrous gas and methane (respectively 0,08 and 0,24 megatons of CO_2equivalents), these emissions consist almost entirely of CO_2. The reduction in net emissions achieved is the result of decreasing emissions from agricultural land use changes (smaller area, fewer peatlands), an increase due to expansion of the cultivated area, and lower net uptake by forests. Forest uptake has gradually decreased from 2,4 to 2,2 megatons of $CO_{2\ equivalents}$. This decrease is linked to increased deforestation, and the gradual ageing of the Dutch forest, which reduces carbon sequestration in existing forests. Emissions from agricultural land use (cropland and grassland) over the period 1990-2020 show a decreasing trend, from 7,2 to 5,1 megatons of CO_2equivalents. This trend is due to a decrease in agricultural and peatland areas. Emissions from the increase in urban areas (built-up areas) increased from 1,2 to 1,5

megatons of CO_2equivalents in this period.

LULUCF projected emissions

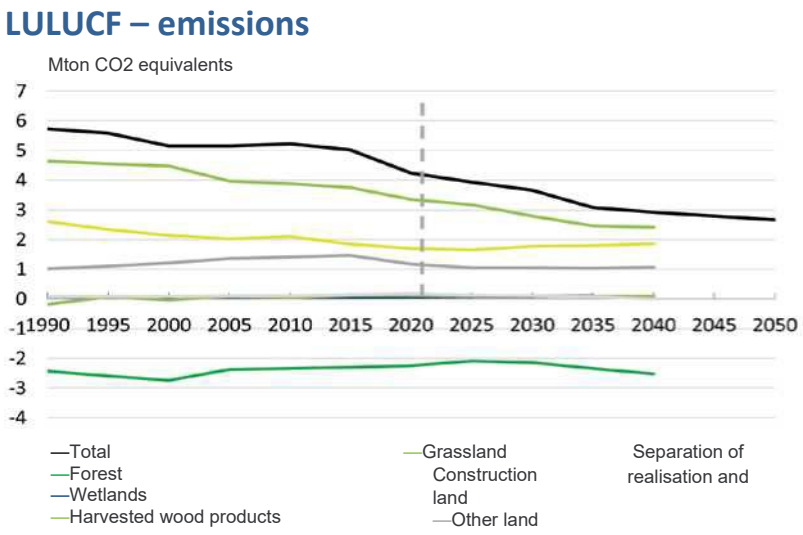
Total net LULUCF emissions are estimated to decrease from 4,2 megatons of $CO_{2\ equivalents}$in 2020 to 3,7 megatons of CO_2equivalents in 2030 (PBL, 2022a). This is due to a multitude of small changes. The decrease is mainly due to slightly lower emissions from cultivation, an increase in carbon sequestration due to afforestation and a decrease in emissions from cropland.

The projected total net emissions from land use will increase after 2020 to 5,6 megatons of CO_2equivalents in 2030. This increase is the balance of several developments. Emissions from agriculture fall by 0,5 megatons of CO_2equivalents until 2030 and are mainly due to a decrease in grassland area, a decrease in the area of peat and moy land and, in addition, lower CO_2 emissions due to policy measures in two provinces of peat and moy land.

In the period after 2030, these trends are expected to continue and forests are expected to commit more megatonnes of CO_2equivalents of greenhouse gases. The estimate for 2040 for total net LULUCF emissions is 2,9 megatons of $CO_{2\ equivalents}$. According to the TNO Reference Scenario, the decrease continues to reach 2,7 megatons of CO_2equivalents in 2050 (TNO, 2023).

The analysis of emissions ('debits') and removals ('credits') from the current estimate until 2030 shows that at the end of both performance periods under the LULUCF Directive, 2025 and 2030, annual net debit is expected to be on average 1 megatons of CO_2equivalents (2025) and 1,1 megatons of CO_2equivalents (2030). As a result, in the first performance period (2021-2025) the net debit is 4,9 megatons of CO_2equivalents and in the second performance period (2026-2030) it is 5,8 megatons of CO_2equivalents.

Figure 4.5 Emissions and sequestration of CO_2 by LULUCF sectors (Source: Emission recording, PBL, 2022a; TNO, RIP 2023)



II. Trends and projection of renewable energy

Historical trend in the share of renewable energy

The share of renewable energy according to the European Renewable Energy Directive (2009/28/EC) has increased since 2000 from 1.6 % to 11.5 % in 2020 (see Figure 4.6). With an administrative purchase ('statistical transfer') of 2.5 % (49 petajoules) from Denmark, the European target set for the Netherlands was met: a renewable energy share of 14.0 % in 2020. In 2021, the domestic share increased further to 13.0 %76 (CBS, 2023b). Major reasons for the increase are the introduction of renewable energy subsidy schemes (MEP in 2003 and SDE in 2008) and the blending obligation of renewable fuels in transport from 2007. In 2021, total gross final consumption amounted to 2.010 petajoule, of which 261 petajoule comes from renewable energy sources (CBS, 2022)77 biofeedstock in 2021 120 petajoule: 49 % of the total renewable energy. The contribution of wind energy to the total final renewable energy consumption in the Netherlands was 2021 25 % in 2020 and the contribution from solar energy was 16 %. Geothermal and soil energy have grown relatively strongly in recent years, accounting for almost 5 % of final consumption of energy from renewable sources in 2021. Outdoor air heat accounts for 4 % of final consumption in 2021.

Renewable electricity consumption has also increased, with renewable electricity from bio-raw materials stabilised in recent years, while wind and solar electricity has increased rapidly. In 2021, gross normalised domestic production of renewable electricity was 33.4 % of electricity consumption (CBS, 2022).

The share of renewable heat in total final energy consumption for heat has been increasing slowly since 2000, reaching 7.8 % in 2020 in line with the RED definition (TNO, 2022).

The share of renewable energy in transport based on the physical consumption of renewable energy has increased since 2005 to 8 % in 2021 (CBS, 2022), in particular in the form of biofuels. This is about four percentage points lower than in 2020. The decrease is caused by new rules in the RED II. The share of renewable energy in transport achieved is not exactly the same as the national obligation on the companies supplying biofuels due to differences in definition. For example, it is possible for fuel suppliers to maintain administrative stocks. According to the Dutch Mission Authority, fuel suppliers have complied with their national renewable energy blending obligation, which amounts to 2021 17.5 % in 2020 (NEa, 2022).

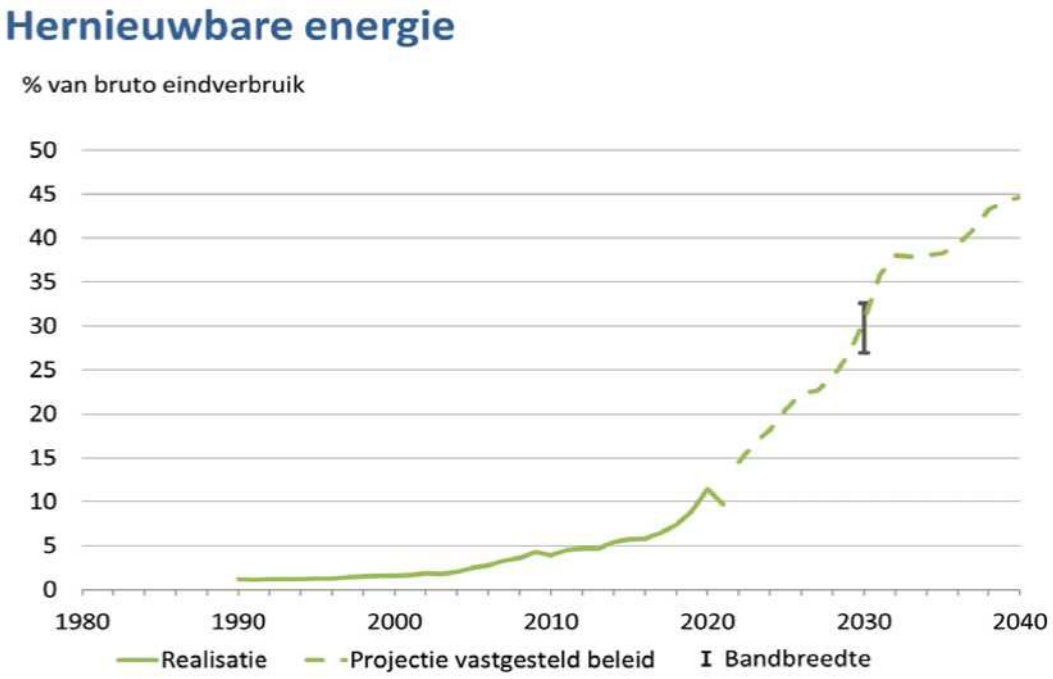
Projected evolution of the share of renewable energy

Renewable energy share is growing sharply in the period up to 2040

The share of renewable energy is expected to increase from 13.0 % in 2021 to 30,5 [26,9-32,6]% in 2030 and 44.6 % in 2040 with adopted policies alone (see Figure 4.6, PBL, 2022a). The 2021 National Energy and Climate Plan (INEP) 2019-2030 sets out an indicative trajectory of at least 19.6 % renewable energy contribution in 2025 and 27 % in 2030. Due to policy adjustments initiated over the past year, in particular to build additional offshore wind farms, the initial indicative target for 2030 is likely to be met. Under REDIII and RePowerEU, the European Council and the European Parliament reached a provisional agreement to increase the share of renewable energy from 32 to 42.5 % at European level in 2030. This will significantly increase the contribution of the Netherlands. In order to achieve this, a significant additional effort would therefore be required compared to the adopted (and planned) policies.

Figure 4.6 Evolution of renewable energy with defined policies as a share of gross final consumption between 2000 and 2030 (Source: PBL, 2022a)

76Refers to a more detailed provisional figure.
77These figures are tentative.



In 2019, 49 % of renewable energy consumption came from bioraw materials (see Figure 4.7). Consumption of energy from bioraw materials continues to grow until 2025, but then falls back to levels similar to 2021 in 2030. Growth until 2025 is mainly driven by a (temporary) increase in coal-fired power stations. 184 petajoule energy consumption from biofeedstock is expected for 2040, mainly due to an increase in energy consumption from biogas.

The installed capacity of wind turbines increased from 4,4 gigawatts in 2017 to 7,3 gigawatts 2021. A very large increase is expected in the coming years: wind power generation is expected to rise to 23,2 gigawatts in 2030, of which 15,8 gigawatts are due to offshore wind energy. In 2040, this is expected to grow to 28,3 gigawatts, of which 21,2 are due to offshore wind.

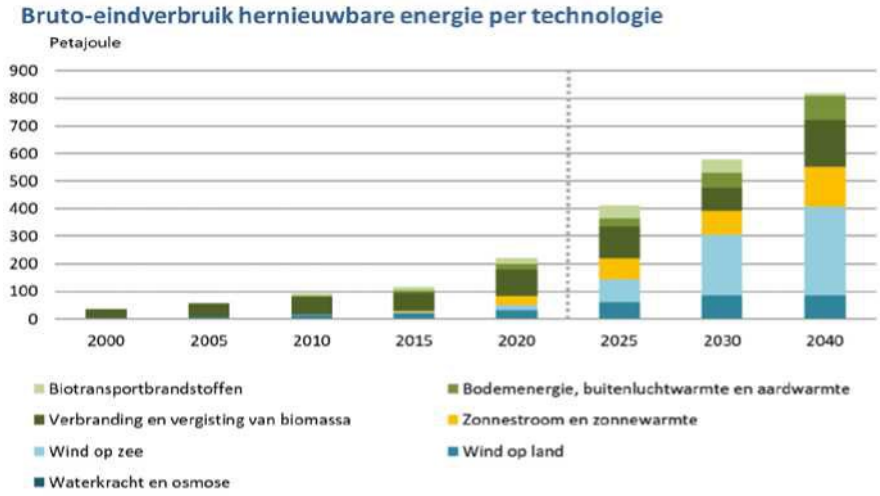
Consumption of solar energy (mainly electricity) increased from 2018 to 42 petajoules between 13 and 2021. The installed capacity of solar panels for solar electricity increased from 4,4 gigawatts in 2018 to a total of 14,6 gigawatts. The planned capacity is expected to grow further to 22,7 gigawatts in 2025 and 25,7 gigawatts in 2030 and to 42,6 gigawatts in 2040. Despite the expected growth, solar generation capacity is limited due to bottlenecks on electricity grids. Subsidy for small-scale solar panels through ISDE is available until 2023. In the context of the SDE + +, an alternative form of encouragement for zon-PV and land-based wind is being explored, offering a lighter level of financial support than the SDE + +, in order to avoid excess profits in the future.

The expected share of renewable energy in gross electricity consumption will almost double as a result of these developments, from 33.4 % in 2021 to around 86.2 % in 2030 and 95.5 % in 2040.

The use of renewable energy in the built environment shows a steeply increasing trend that continues in the coming years. This is due to the increasing use of heat pumps in the new building under the influence of building regulations and requiring a tightening of energy performance. There are also more heat pumps in the existing building as a result of the ISDE scheme (where more budget is available) and the deployment of zero-on-metering renovations in rented dwellings. Outdoor air heat and soil energy are expected to double from 15,9 petajoules in 2021 to 38,2 petajoules in 2030 and 57,6 petajoules in 2040. Deep geothermal is expected to increase from 6,2 petajoules in 2021 to 15,9 petajoules in 2030 and 28,3 petajoule in 2040. For fermentation techniques, large growth is expected only after 2030: while consumption increases from 9,7 to 15 petajoules in 2021 to 17,6 petajoules in 2030, 2040 63,8 petajoules are expected.

> The share of renewable heat in 2021 was between 7,4 and 8.4 % of the total final energy consumption for heat. This is similar to the share of heat in 2020 (8.1 %). According to the KEV, this share doubles and increases to 14 % in 2030 and to 21 % in 2040. The consumption of biogas increases from 14,5 petajoules in 2020 to 17,6 and 63,8 petajoules respectively in 2030 and 2040.

Figure 4.7 Development of renewable energy technologies with established policies (Source: PBL, 2022a)



The use of renewable energy for transport is regulated in the Netherlands in the form of an obligation on fuel suppliers to make an increasing share of the energy supplied to transport renewable. This annual commitment increases from 17.5 % in 2021 to 28 % in 2030. Within this obligation, a minimum shall apply to the use of advanced biofuels (biofuels from specific types of waste and residues laid down in European legislation) and a cap on the use of biofuels from food and feed crops. The obligation can be fulfilled by using different forms of renewable energy.

The increasing annual renewable energy obligation until 2030 is expected to be filled with renewable electricity for an increasing share. To date, the vast majority of the obligation has been met with the use of biofuels, but this will change in the coming years.

Due to the rising annual obligation, the share of biofuels in the transport fuel supply increases from 6 % in 2021 to 9 % in 2030 (PBL, 2022a). The share of renewable energy in transport calculated in the European Directive is much higher, inter alia because it allows for double counting of some biofuels and also contributes to the use of electricity. The contribution of renewable electricity in 2022 is estimated to be only around 2 %, compared to around 24 % in 2030. Electricity consumption in road transport is increasing relatively rapidly and an increasing share of it comes from renewable sources. Electrification is also emerging in other forms of mobility (such as inland waterways and construction machinery). Indeed, the contribution of biofuels in the mobility sector is decreasing after 2025.

4.3 energy efficiency dimension

I. Historical evolution of energy consumption[78]

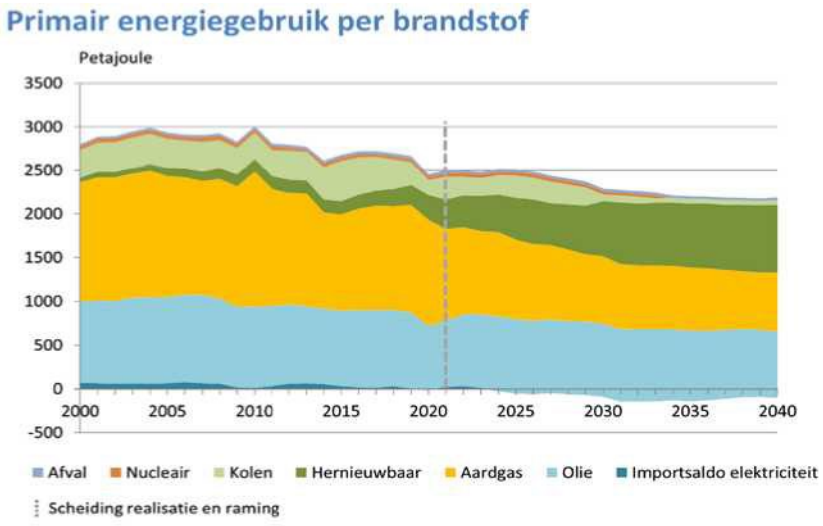
Decreasing primary energy consumption 2000-2021

Total primary energy consumption in the Netherlands decreased by 9 % from 2.803 petajoule in 2000 to 2.547 petajoule in 2021 (see Figure 4.8) (Eurostat, 2023a). Since the oil crisis in the early 1980s, primary energy consumption has increased until 2010. Consumption was then 3.003 petajoules. Thereafter, consumption decreased by 15 % between 2010 and 2021. Since 2000, natural gas consumption fell most, from over 1.364 petajoules in 2000 to over 1.212 petajoules in 2020, down by 11 %. This decrease is mainly due to decreasing final consumption of natural gas for heat. Natural gas is the main source of energy for heat consumption. In addition, the contribution of natural gas to electricity production has decreased. Consumption of renewable energy sources increased sharply during this period, from 56 petajoules to 284 petajoules. Coal consumption increased by 20 % between 2000 and 2017, with the launch of three new coal-fired power stations and due to developments in natural gas and coal prices, but fell sharply in the period thereafter to a level of 50 % below 2000 levels in 2020. Nuclear fuel consumption in 2020 was slightly

78In these paragraphs, primary and final energy consumption is based on the Eurostat definition “2020-2030” (both excluding non-energy consumption).

below its level in 2000; consumption of oil was 22 % lower.

Figure 4.8 Realisation and projection of primary energy consumption per energy carrier (excluding non-energy consumption) (Sources: Eurostat (achievements), Eurostat 2023a; PBL (projections with adopted policies), PBL, 2022a)

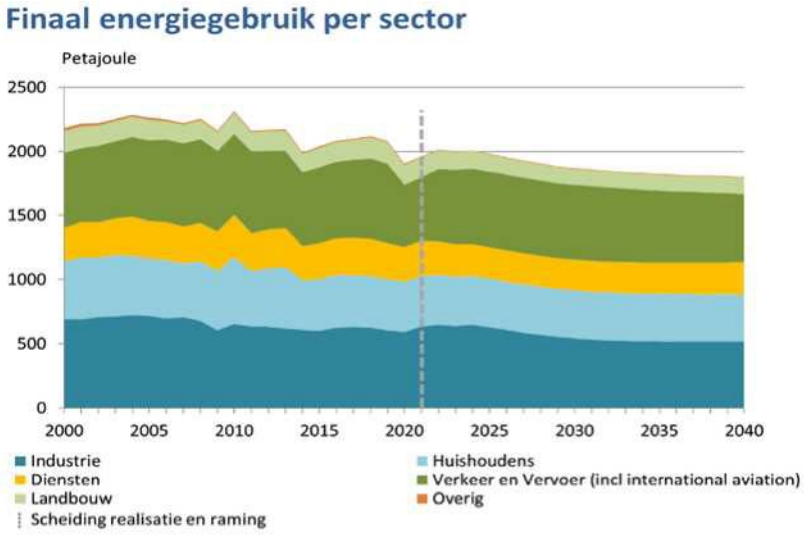


Decreasing final energy consumption 2000-2021

Final energy consumption in the Netherlands decreased between 2000 and 2021, from 2.181 petajoules to 1.962 petajoules (Eurostat, 2023b; see Figure 4.9) although there was an increase in final use between 2000 and 2010. Since 2010, there has been a gradual declining trend, with an additional large decrease in 2020 due to the COVID pandemic. The trend is mainly due to reduced energy consumption by households, which decreased by 13 % from 2000 onwards. This is due, inter alia, to improved housing insulation rates and efficiency gains in heat supply, both through renovations and new construction. On the other hand, electricity consumption increased during this period due to an increase in the use of electrical appliances.

Total final consumption in industry decreased by 8 % between 2000 and 2021. In traffic and transport, consumption increased between 2014 and 2021, and more or less in line with the development of traffic and transport modules. In 2020, as a result of the coronavirus crisis, energy consumption fell by 22 % compared to 2019, and in 2021 it was still 20 % lower than in 2019. Final energy consumption in agriculture, including greenhouse horticulture, decreased by 7 % between 2000 and 2021. Consumption for heat is dominated mainly by glasshouse horticulture. It has been reduced by austerity measures, renovation and scale-up of companies (PBL, 2022a).
Electricity consumption in the agricultural sector increased until 2019, including through intensification of exposure.
In 2020 and 2021, consumption fell again, partly due to lower production volumes due to the coronavirus pandemic.

Figure 4.9 Realisation and projection of final energy consumption by sector (excluding non-energy consumption) (Sources: Eurostat (achievements), Eurostat, 2023b; PBL (projections with adopted policies), PBL, 2022a).



II. Projected energy consumption

Use of fossil energy carriers is gradually decreasing

Primary energy consumption in the policy variant "defined policies" is expected to decrease to 2.238-2.279 [2.085-2.447] petajoule in 2030 and further to 2.113-2.156 petajoule in 2040. This is still above the current target consumption of 1.950 petajoules in 2030. Natural gas consumption will decrease (see Figure 4.8) due to the continued reduction in the use of natural gas in (mainly decentralised) electricity production through cogeneration and reduced natural gas demand for heating buildings. Coal consumption will continue to decrease beyond 2020 and the remaining consumption of coal for electricity production is expected to end in 2030.

For the time being, oil retains its dominant role as a fuel in transport and as a raw material in the chemical industry. Consumption of oil remains broadly stable. In the defined policy scenario, there are no new investments in nuclear energy the nuclear power plant in Borssele will close in 2033. The contribution of renewable sources is expected to increase further in the coming years, in particular due to the growth of renewable electricity generation (see paragraph 4.2.II).

Final energy consumption further decreases

Until 2018, final energy consumption increased again, probably due to the strengthening of the economy. A slight decrease was observed in 2019, followed by a sharp drop in 2020 due to the COVID pandemic. The projection foresees a further downward trend. Final energy consumption is expected to fall further to 1.872 petajoules in 2030 in the policy variant "defined policies", thus still above the target consumption of 1.837 petajoule in 2030. The further decrease is mainly due to lower heat consumption in the built environment due to demolition, new construction, energy-saving measures. Final energy consumption is expected to fall further to 1.800 petajoules in 2040. In many cases, this development is the result of increasing levels of activity that are offset by increased energy efficiency. Uncertainty about the size of economic activities and the evolution of energy prices are important uncertainties that may lead to higher or lower expected energy consumption.

Expected final consumption in the built environment decreases mainly due to increased insulation measures, efficiency measures and increase in the number of heat pumps. In industry, final consumption is projected to remain constant on balance, but consumption of natural gas is expected to decline and electricity consumption is projected to rise. The increase in electricity consumption is due to the deployment of electric boilers, industrial heat pumps, CCS installations and the production of hydrogen through electrolysis. Introduction of alternative heat production, such as biofeedstock boilers and electrification of heat supply, reduces the role of fossil fired CHP installations in particular.

The decline in natural gas consumption depends heavily on energy prices. In the estimate, non-energy consumption increases slightly. This development is mainly due to a limited growth of the petrochemical industry (CE Delft, 2021), but this volume effect is uncertain. Final energy consumption for traffic and transport (including international aviation) is more than 6 % lower in 2030 than in 2019. This decrease is mainly due to the fact that the use of energy in electric vehicles is more efficient than in fuelled vehicles.

In agriculture, final consumption is reduced by saving and making energy consumption more sustainable.

Expected energy savings well above the target EED

Article 7 of the European Energy Efficiency Directive (EED), renewed in 2018, required the Netherlands to achieve 482 petajoule energy savings cumulatively in the period 2014 to 2020. Only savings attributable to Dutch policy count. With the implementation of the MJA/MEE, EIA and the policies in the built environment, 672 petajoules have been saved during this period and this target has been largely met.

For the period 2021 to 2030, energy savings of 924 petajoules in final terms. For the Netherlands, total EED savings based on both the adopted and planned policies are expected to range between 721 and 939 petajoule. The savings from adopted policies alone are not known.

III. Developments and potential for cogeneration and district heating and cooling

Combined heat and power generation

Until 2010, the use of CHP installations by final consumers increased: for example, between 2005 and 2010, greenhouse horticulture capacity increased from over 1.200 to 3.000 megawatts of electrical power installed. The period 2012-2016 was characterised by a less favourable situation for CHP plants: the difference between the selling price of electricity and the purchase price of gas decreased during that period. In recent years this ratio has been more favourable and this has not led to an increase in the power of final consumers in recent years, but to a further increase in the number of rotary hours of CHP installations. 51 % of the heat and electricity supplied by final consumers is produced from natural gas and mainly from the fuels waste, process gas and a small proportion of coal.

Decrease in CHP expected to come years

From 2022 onwards, a small increase in capital is expected due to a favourable spark spread for feed-in. It is more positive in greenhouse horticulture than for industry. In agriculture there are mainly gas engines, while in industry mainly steam and gas turbines are installed with other characteristics. For both industry and glasshouse horticulture, the number of rotary hours towards 2030 is expected to decrease somewhat with a reasonably constant capacity of CHP installations.

District heating has a small share of the Netherlands

The share of dwellings connected to heat networks is increasing in the Netherlands. According to the CBS, 6 % of dwellings were connected to heat networks in 2020. The number of connections has increased since 2010 (4.6 %), mainly due to a number of major new-build projects. The supply of heat to homes increased from 8 petajoules in 2000 to 13 petajoules in 2021. In 2030, this will have increased further to around 16 petajoules according to established policies.

Several industrial pledges also have a heat network. This involves steam production, usually from a CHP.
In total, this was 35 petajoule in 2017 (ECN and CBS, 2019). There is little visibility of these networks and their development. Some growth is expected to take place here due to several industrial heat exchange initiatives.

IV. Development of energy performance requirements in the built environment

Historical development of energy performance requirements for built environment

In December 1995, the energy performance standard for new buildings was introduced in the Netherlands and requirements for the minimum energy performance of a new building, known as the Energy Performance Coorient (EPC), were included in the building regulations.

The EPC shows the building related energy consumption. This consumption relates to heating, hot water supply, ventilation, lighting and possible cooling of a building, based on a standard occupant/user. It does not take into account the energy consumption used for e.g. cooking, washing and watching TV. In addition, a standardised outdoor environment and consumption of the building is assumed. The height of the EPC requirements for non-residential buildings depends on the building function. For example, a distinction is made between a teaching function and an office function.

In the period from 1 995 to 2015, EPC requirements have been tightened several times, thus incentivising energy savings while at the same time making the measures technically and financially feasible for all buildings. In this way, in line with the European Energy Performance of Buildings Directive (EPBD), cost-effective and cost-option policies within the built environment are being pursued.

New methodology and energy performance requirements for built environment

In June 2019, the new methodology to determine the energy performance of buildings, the NTA 8800, was published and designated in the building regulations as of 1 January 2021. This methodology makes it possible to determine the energy performance for both the existing (refurbishment) and new construction. Also, the NTA 8800 and the recording protocols generate the energy labels of dwellings and buildings.

For all new buildings, whether residential or non-residential, the application for an environmental permit must comply with the requirements for nearly zero-energy buildings (NZEB and TOJLY requirements) from 1 January 2021. NZEB derives from the Energy Agreement for Sustainable Growth and the EPBD. The energy performance is determined on the basis of three indicators:

1. Energy demand in kilowatt hours per m^2 area of use per year;
2. Primary fossil energy use in kilowatt hours per m^2 use area per year;
3. The share of renewable energy as a percentage.

For the purposes of existing construction, building regulations impose, inter alia, requirements in the situation of:

- Conversion (partial renewal, modification or extension of a building);
- Renewal or replacement of insulation layers;
- Refurbishment or replacement of windows, doors and frames;
- Major renovation;
- Conversion with adaptation of the technical building system (installation).

Expected developments in energy performance of built environment

The EPBD II (2010/31/EU) requires Member States to report every five years on the cost-optimal of the minimum energy performance requirements applicable within the built environment. In accordance with the European Regulation (244/2012), the requirements should be tightened if the cost-optimal point of the situations examined for which requirements are laid down in the building regulations differs by more than 15 % from the requirements set. The relevant studies are expected to be completed by the end of 2023. Based on the results, energy performance requirements for new and/or existing construction can be adapted as of 2025.

4.4 Dimension energy security

As discussed in section 4.2, the energy mix is expected to change in the current decade. The use of natural gas and coal will decrease, while the use of renewable sources will increase. Natural gas extraction is largely being phased out and the war in Ukraine leads to further diversification of (imported) energy sources. With growth in RES-E production, the (international) transport of electricity will increase. This will require adjustments to the electricity and gas networks (see paragraph 4.5). This section discusses trends and projections based on the KEV per energy carrier.

I. Security of supply of natural gas

The Netherlands has substantial stocks of natural gas which have been widely extracted since the 70s, both to meet domestic gas demand and to export. Most of the Dutch natural gas is located in the Groningenveld. Annual combined gas production from the Groningenveld and the small fields fluctuated around 80 billion cubic meters (bcm) for years, but started to decline from the year 2015 onwards due both to the constraints on the extraction from the Groningenveld and to the decline in supply from the small fields. Due to the seismic risk in Groningen, it was decided in 2019 to stop extraction from the Groningenveld as soon as justified. This plan is still valid, with the amount of extraction determined each year. On 1 April 2022, the Minister set the extraction from Groningen for the gas year 2021-2022 at 4,5 bcm (EZK, 2022). Previously, 3,9 billion cubic metres were assumed. From October 2022, the Groningenveld is on the pilot flame for the safety of the residents of Groningen. It is only available if the need is high. For example, in the event of extreme cold winter or major supply problems. The remaining sites produce only at pilot flame level (minimum flow) so that they can be used as an ultimum remedium. The Government remains committed to closing the Groningen Field definitively by 2023 or by 2024 at the latest.

In order to achieve the planned phasing out of the extraction of low-calorific natural gas from Groningen, measures have been taken to produce more low calorific gas from high-calorific gas and temporarily store it underground, to phase out exports of low calorific gas and to switch large consumers to high-calorific gas.

Domestic consumption of natural gas was close to 50 BCM per year until its peak in 2010, after which consumption started to decline. Because of the decision to completely phase out gas extraction from the Groningenveld, the Netherlands has been a net importer of natural gas since 2018.

The Netherlands imported natural gas in 2021 44,7 billion cubic metres (CBS, 2022a); this represents a decrease of 6 % compared to 2020. The imported natural gas entered the Netherlands via various pipelines from Norway, Germany, the United Kingdom and Denmark (Eurostat, 2022). The final origin of this gas is not precisely known. It is clear, however, that most gas entering the Netherlands via Germany came from Norway and Russia (24 %). The Netherlands also exported 39,7 billion cubic metres of natural gas via pipelines in 2021, whether or not after regasification of liquefied natural gas (LNG); this has increased by almost 7.4 % since 2020. Imports of LNG increased: about 9,8 billion cubic metres of liquid gas were imported in 2021, compared with 9,1 billion cubic metres in 2020 (CBS Statline 2022a). Of these imports, 80 % came from Russia (40 %), the United States and Norway (Eurostat, 2022). The Netherlands also exported around 1,3 billion cubic metres of LNG in 2021 (CBS, 2022a). Following Russia's invasion of Ukraine, the Netherlands decided in early 2022 to work towards independence from Russian gas imports as soon as possible.

Gas storage in the Netherlands has been in strong interest since the end of 2021, with concerns about sufficient gas supply in times of high demand. Annual imports into Dutch soil gas storages amounted to 2021 6,8 billion cubic metres in and returned to 11,6 billion cubic metres. The Netherlands had two underground storage sites for high-calorific gas (Bergermeer and Grijskerk), but in 2021 Grijskerk was converted to a storage for low-calorific gas and this storage was put into use as such in 2022. This is added to the three existing low-calorific gas storage sites (Norg, Zuidwending and Alkmaar). In 2020, a fifth salt caverne was put into service as gas storage in Zuidwend and since 2022 a gas storage at Nüttermoor, Germany, has been classified exclusively for the Dutch market. This is a storage of high-calorific gas with 0,1 billion cubic metres of storage capacity. The total underground gas storage in the Netherlands has a volume of 14,9 billion cubic metres, with Norg being the largest storage with a maximum storage capacity of 6 billion cubic metres (PBL, 2022a).

II. Security of supply of coal

Coal is used in the Netherlands for electricity generation and steel production. The Netherlands has large reserves of coal, almost 1.300 Mtonnes of mining reserves (TU Delft, 2018). In the Netherlands, coal mining has been halted since the 70s and is therefore

entirely dependent on imports. Coal imports in 2021 amounted to almost 9 Mton in 2017, making the Netherlands one of the largest coal importers in the EU. A large part of the coal is re-exported to other European countries. There are little security concerns for coal as it is widely available on several continents. In 2021, coal (and other solid fossil fuels) originated mainly from Russia (38 %), the United States (24 %) and Australia (22 %) (Eurostat, 2023a).

Coal consumption increased by more than one third after three new coal-fired power plants were brought into operation between 2013 and 2015, before falling significantly to 172 petajoules in 2020 and 235 petajoules in 2021 (PBL, 2022a). The first phase of this decline was due to the closure of five older coal-fired power plants. Subsequently, the competitiveness of coal-fired power stations in relation to gas power stations deteriorated (especially in 2020) and from 2020 onwards the increase in the use of bio-based raw materials and the temporary shutdown of the Onyx coal-fired power plant on the Maasvlakte.

Due to the production cap for coal-fired power plants and the high CO_2price in the European Emissions Trading System (ETS), coal consumption will remain low in the coming years. Most bio-based raw materials will also reduce coal consumption in the coming years. Coal consumption is projected to fall sharply in 2030, as electricity can no longer be generated from coal as of that year. The bulk of the remaining coal consumption (3 % of primary consumption) comes from the steel industry. This further reduces import dependency on coal.79

III. Security of supply of oil

The Netherlands was the largest crude oil importer in the EU with 141 Mtonnes in 2021 (Eurostat, 2023b). The main countries of origin were Russia (23 %), Belgium (12 %) and the United States (9 %). The countries of origin of the oil did change in the course of 2022. For example, the loss of Russian crude oil has been largely offset by additional imports from Saudi Arabia, Iraq and Kazakhstan (CBS, 2023c). Half of the imports are sent directly to other countries such as Germany and Belgium. The other half is consumed by the refineries in the Netherlands.

The Dutch refineries have an international outlet, especially within north-west Europe, but to a lesser extent also intercontinental, mainly in Atlantic Ocean countries. Demand for oil products in developed economies – such as those in north-west Europe – is expected to decline further, and this is also pushing refineries under economic pressure (IEA, 2021). Part of this pressure is mitigated by distilling as many quality products as possible and minimising the placing on the market of residual oil.

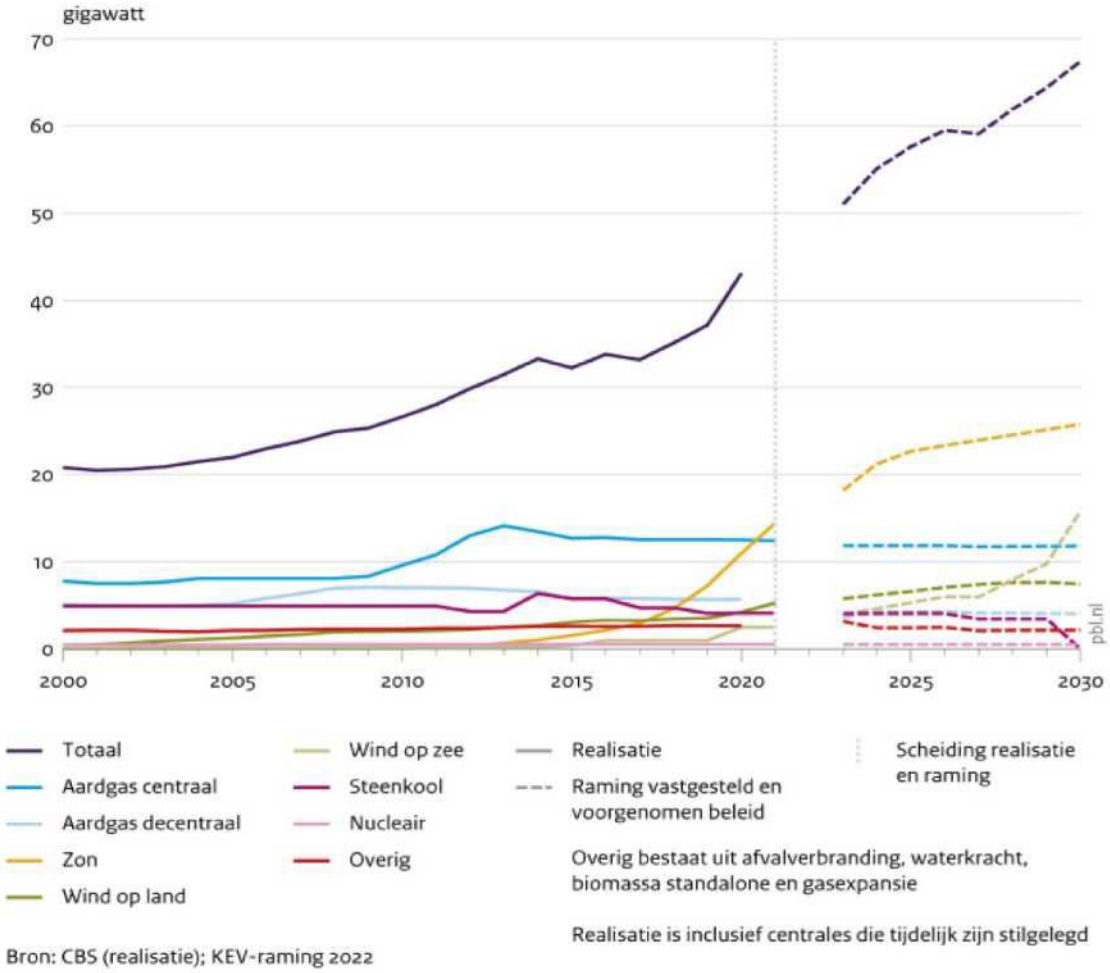
As a result of EU sanctions, imports of Russian crude oil and oil products to the EU have almost completely stopped, with the exception of a number of countries that still benefit from specific exceptions. There has also been a price cap and restrictions on Western services for the transport of Russian oil to other parts of the world. European parties have found new suppliers of oil and oil products, global trade flows have shifted and no shortage of oil or oil products has emerged. The price has also remained stable, and even fell slightly, leading to reductions in OPEC + production. However, Russian oil may still enter the European market via processed products, this is not prohibited under the current sanctions.

IV. Security of supply of electricity

Domestic production capacity in the Netherlands increased from almost 21 megawatts in 2000 to over 47 megawatts in 2021 (CBS, 2023d). Coal power ends with the ban on coal in the Netherlands (the Amercentrale is no longer allowed to use coal for electricity production in 2025, and the Rotterdam power plant, the Eemshavencentrale and the Onyx plant follow in 2030). Wind and solar power increases sharply under defined and planned policies (see Figure 4.10). In addition, flexibility from other sources is increasing, such as electricity demand for electric vehicles or for heat in industry and storage in batteries. The central gas-fired power was over 12 gigawatts in 2021; this remains roughly the same until 2030.

Figur4.10 Setted electrical power (metered policy) (Sources: CBs (realisation), PBL (projection); in PBL, 2022a)

79Parliamentary paper 30196, No 567.



Bron: CBS (realisatie); KEV-raming 2022

Total electricity production decreased by 2 terawatt-hours in 2021, despite a limited increase in demand of 0,6 terawatt hours compared to 2020. Electricity imports and exports were close to balance in the Netherlands in 2021, while in 2020 there was still net exports of 2,7 terawatt hours. In the longer term, the Netherlands is expected to be a net exporter on an annual basis (PBL, 2022a). This is due, inter alia, to the decommissioning of nuclear power plants in Germany and Belgium, as well as the reduction of the capacity of coal and lignite plants in Germany.

The electricity security of supply standard, the Loss of Load Expectation (LOLE), is an expected value of up to 4 hours per year with insufficient generation capacity available to meet demand. Security of electricity supply is considered with and without import and export of electricity.

For 2025, no hours with shortages were found, so security of supply is at a very high level (TenneT, 2022). However, in 2030, the LOLE for the HB scenario exceeded the standard of 4 hours per year by a LOLE of 4,5 hours per year. Furthermore, in 2030 there was a strong impact due to the decrease in the production capacity of coal-fired power plants while electricity demand is increasing. The significant increase in zon-PVC and wind power – for as long as storage is not sufficiently possible – makes a small contribution to determining security of supply because of its intermittent nature. This trend is reinforced by the fact that it also reduces the opportunities for imports from abroad at a time of shortages. The direct current interconnectors with Norway and the United Kingdom are expected to contribute relatively much to security of supply. Although relatively high interconnection capacity to Germany and Belgium is available, its absolute value for security of supply is limited by simultaneous shortages in continental Europe. At the same time, the assumed situation in the Netherlands, in particular due to a higher amount of battery capacity in the central scenario, has improved somewhat. Nevertheless, in 2030 the Netherlands continues to rely to a large extent on the rest of the world for its security of supply.

4.5 Internal energy market dimension

I. Electricity interconnectivity

Current interconnectivity

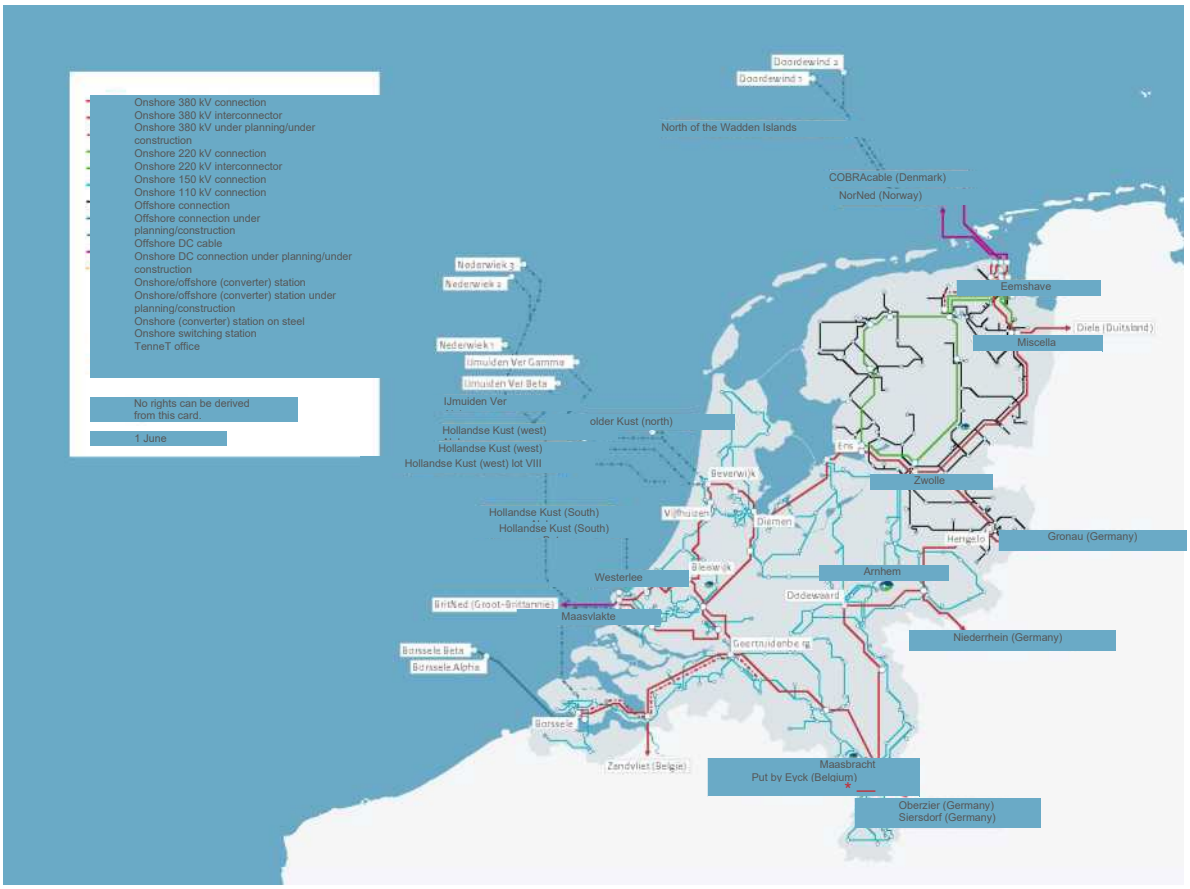
An important aspect of the integrated electricity market is the development of network connections between countries, the so-called interconnectors. Currently, the Netherlands has connections with Germany, Belgium, Great Britain, Norway and Denmark with a total import/export capacity of 9,1 gigawatts (see Table 4.9).

Table 4.9 Netherlands interconnection capacity in megawatts (Source: TenneT Monitor Security of Supply, 2022)

Connection	Reference [GW]	All scenarios [GW]	
	2020	2025	2030
DE-NL	4,3	5,0	5,0
BE-NL (imports)	2,4	2,4	3,4
NL-BE (export)	2,4	3,4	3,4
UK-NL	1,0	1,0	1,0
NO-NL	0,7	0,7	0,7
DK-NL	0,7	0,7	0,7
Overall	**9,1**	**9,8**	**10,8**

Theelectricity markets of Belgium, France and the Netherlands have been integrated since 2008. Later, the markets of Germany (since 2010) and the United Kingdom (since 2014) were also linked to the Dutch market. Links to this regional market have also been established with the Scandinavian and Central European markets (TenneT, 2018). This leads to a highly integrated (north-west) European electricity market in which the Netherlands plays an important pivotal role. This integration contributes to competition in the energy market, enhances security of supply and facilitates the integration of renewable electricity. Indeed, with a high degree of interconnectedness, national surpluses or shortages of electricity can be absorbed more easily. Figure 4.11 shows the transmission network.

Figure 4.11 Transmission network and interconnectors (Source: TenneT,



Expected extensions of interconnectivity

Electricity grid connections with Germany and Belgium are increasing

Currently, the Netherlands has direct connections with Germany, Belgium, Great Britain, Norway and Denmark. Due to enlargements, this increases from 9,1 to 10,8 gigawatts in 2030. There are no concrete enlargement plans for the connections with Norway, Denmark and Great Britain. Between the Netherlands and Denmark, the COBRA 700 megawatt cable became operational in 2019. The capacity between Belgium and the Netherlands is increasing from 2 to 3,4 gigawatts for 2025 due to the delivery of the Rilland transformer station, the installation of an additional transducer at Maaseik in Belgium and internal reinforcements in the Belgian network in view of the closure of the Doel nuclear power plant.

Following the decision of the European Council of 23 October 2014 to have 2020 10 % European interconnectivity in 2020 and 2030 15 % in 2020, the European Commission has set up an expert group which, on 15 November 2017, issued a report on the expected European interconnection capacity needed until 2030. This report cites two new ways of measuring interconnectivity, with the Netherlands achieving the objectives well with both alternative metrics (EC, 2017a). Table 4.10 shows the percentages of interconnectivity based on the definition used by the European Commission (EC, 2017b). On the basis of this definition too, the Netherlands achieves the objectives.

Table 4.10 Interconnections, electricity generation capacity and interconnectivity (Source electricity generation capacity: PBL, 2022a (projection with defined policy))

2019		2020	2025	2030
Total capacity interconnections (MW)	7,1	9,1	9,8	10,8
Electricity generation capacity (GWe)	37,1	43,1	57,6	67,4
Interconnectivity (%)	19.1 %	21.1 %	17.0 %	16.0 %

Gas network connections developments

Following the earthquake in January 2018 near Zeerijp, the Minister of EZK decided to stop gas extraction from the Groningenveld. There are currently no plans to substantially expand the gas network. However, in the long run, parts of the low-calorific natural gas network can be made suitable for the transport of high calorific natural gas, hydrogen or green gas, due to the phasing out of the use of low calorific natural gas and the possible increase in the use of high calorific natural gas, hydrogen and green gas.

The latest investment plan of the national gas transmission network operator (GTS, 2023) provides for investments in the conversion of gas storage from H-gas to L-gas for the period up to 2025 and the increase of nitrogen capacity through the construction of the Zuidbroek nitrogen plant and the conversion of G-H gas.

There are no plans to extend connections to the gas network in the longer term.

II. Energy transmission infrastructure

Characteristics of existing transmission infrastructure

Grid size and voltage level

The high-voltage grid connects the additional high-voltage grid to the distribution networks. The high-voltage grid includes power plants, energy-intensive industries and larger wind farms (35 to 500 megavoltaic amperes). The high-voltage grid consists primarily of systems with a voltage level of 50 kilovolts, 110 kilovolts or 150 kilovolts, with networks with the last two voltage levels listed above being operated by TenneT since 1 January 2008. The high-voltage grid consists of approximately 10.000 km above ground line and underground cables.

Transmission of natural gas network

The transmission networks managed by Gasunie Transport Services (TSG) consist of lines and stations.
Thetransmission networks are divided into a main transmission network (HTL) and a regional transmission network (RTL) on the basis of pressure class. Based on the type of gas flowing through the network, the HTL is subdivided into a Groningen Gas (G-gas) transmission network and a high-calorific gas transmission gas network (see Figure 4.12).

Figure 4.12 transmission network for high calorific gas (yellow) and Groningen gas (black) (Source: CTS, 2022)

The HTL networks are interconnected through blending stations, where different combinations of H-gas and nitrogen are added to the G gas network. The HTL networks contain a large number of compressor stations in addition to lines. Through these stations, the gas in pressure can be increased to allow for further transport. Gas is fed on the HTL at entry points. These may be feed points for gas from domestic production, border points where gas from other networks (or via an LNG terminal) enters and points connected to gas storage facilities. Gas can be fed through the connections with Germany and Belgium and in the form of LNG on the Maasvlakte (the GATE LNG terminal). The possibility of allowing limited inputs from the United Kingdom via the Bacton Balgzand Line (BBL) is being explored.

Gas is extracted from the HTL after transport at exit points or at monitoring and control stations. Exit points are the transhipment points for domestic customers (the gas receiving stations), border points where gas is transferred to other networks and points

connected to gas storage facilities. The RTL starts with a monitoring and control station fed from the HTL gas and, in turn, the networks of the regional network operators are largely supplied by exits on the RTL. The RTL is used almost exclusively for the transport of G gas.

Expected extension of transmission infrastructure

Electricity transmission network developments

The Netherlands has one of the most reliable national electricity networks in the world with 99.99 % reliability (Netbeheer Nederland, 2023). In order to optimise the operation of the electricity market and to maintain a reliable supply of energy, the capacity of the high-voltage grid will be increased in the coming years.

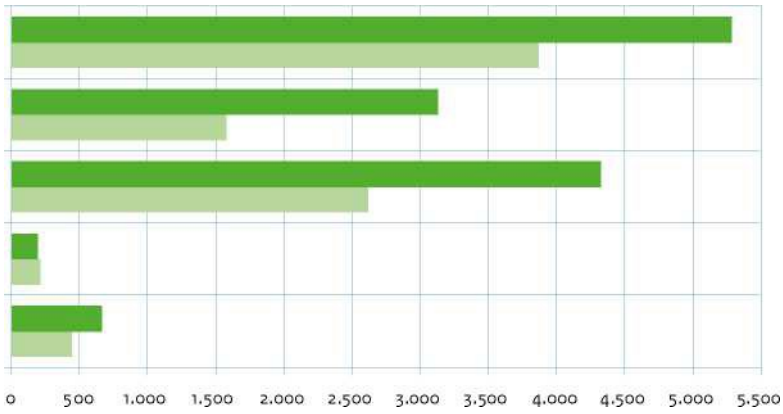


Figure 4.13 Total volume of investment by category up to 2026 (Source: TenneT Investment Plan, 2022)

T totalinvestment volume IP2020

Capacity project 380/220 kV-net

Natural gas transmission network developments

Capacity project 150/110 kV nets

GTS prepares an Investment Plan (IP) every two years, the most recent IP being IP 2022 (see also above). This IP shows, on the

Replacement investments

basis of three scenarios, that the gas transmission system in the Netherlands is robust enough to cope with the expected changes in

Functionality extensions

gas supply and demand over the next decade and that any necessary investments are limited. The volume to be transported will

Client projects and reconstruction

decrease until 2025 due to the decrease in L-gas exports to Germany, Belgium and France. In these countries, final consumers of L-gas will be converted into H-gas in the coming years, reducing exports of L-gas to zero. In addition, gas demand in the

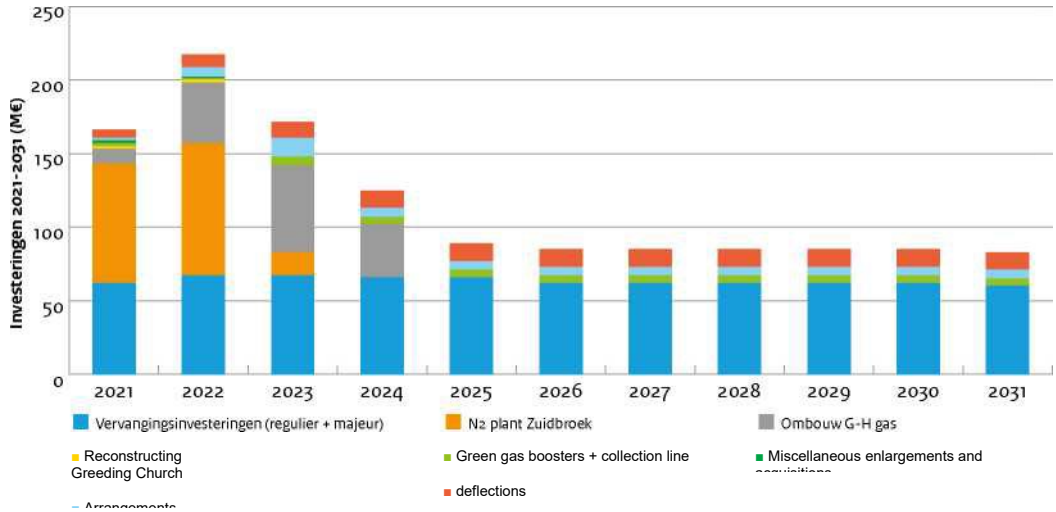
EUR

ToTotal investment volume IP2022

Netherlands and neighbouring countries is also decreasing over the period considered. From 2025, the L-gas will be partially replaced by additional transit flows of H-gas. The necessary transport capacity is reduced less quickly than the volume to be transported.

Domestic production is declining faster than falling domestic gas demand. It is therefore clear that additional imports are needed to compensate for the loss of Groningen production. The additional imports are expected to be filled by Russian gas (via Germany) or LNG (via Gate Terminal and/or Belgium). Analyses show that this additional volume is available within Europe.

Figure 4.14 Total investment CTS (Source: CTS Investment Plan 2022-2032)



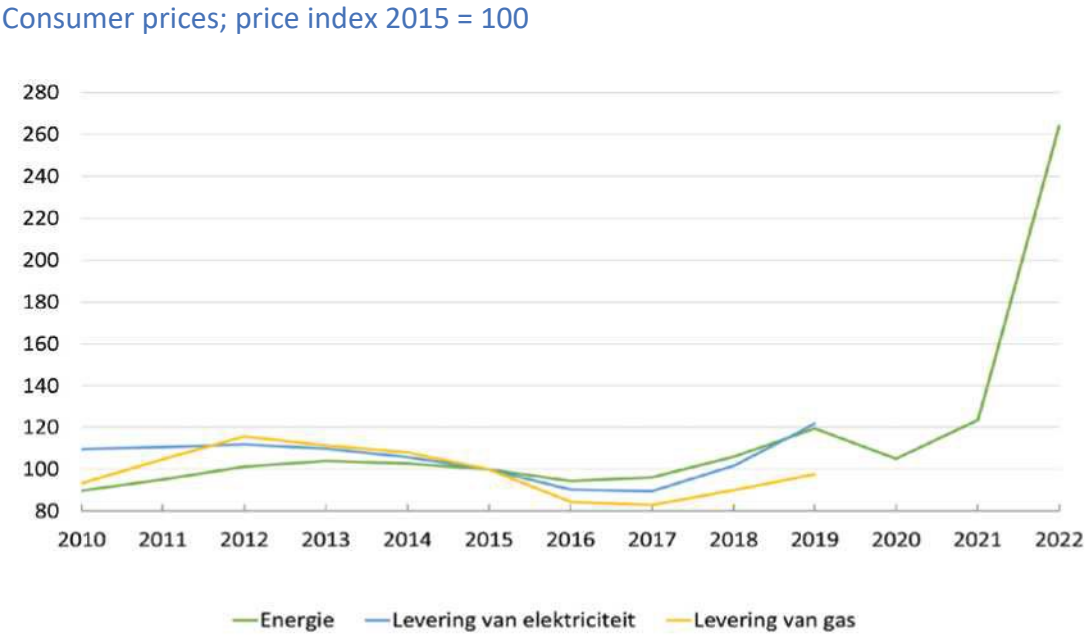
III. Electricity and gas markets and prices

Trends in energy markets and prices

Energy prices for final consumers

The Consumer Price Index (CPI) energy reflects the price evolution of natural gas and electricity consumption by households (see Figure 4.15). Household energy bills have increased on average by 9.5 % per year since 2000, while inflation is at an annual average of 2.2 %. The relatively large increase in energy prices for households is driven by the large increases in 2020 and 2021. The CPI energy fell sharply during the crisis at the end of 2008 before reaching a provisional ceiling in early 2013. Since then, there has been a significant decrease (CBS, 2023f).

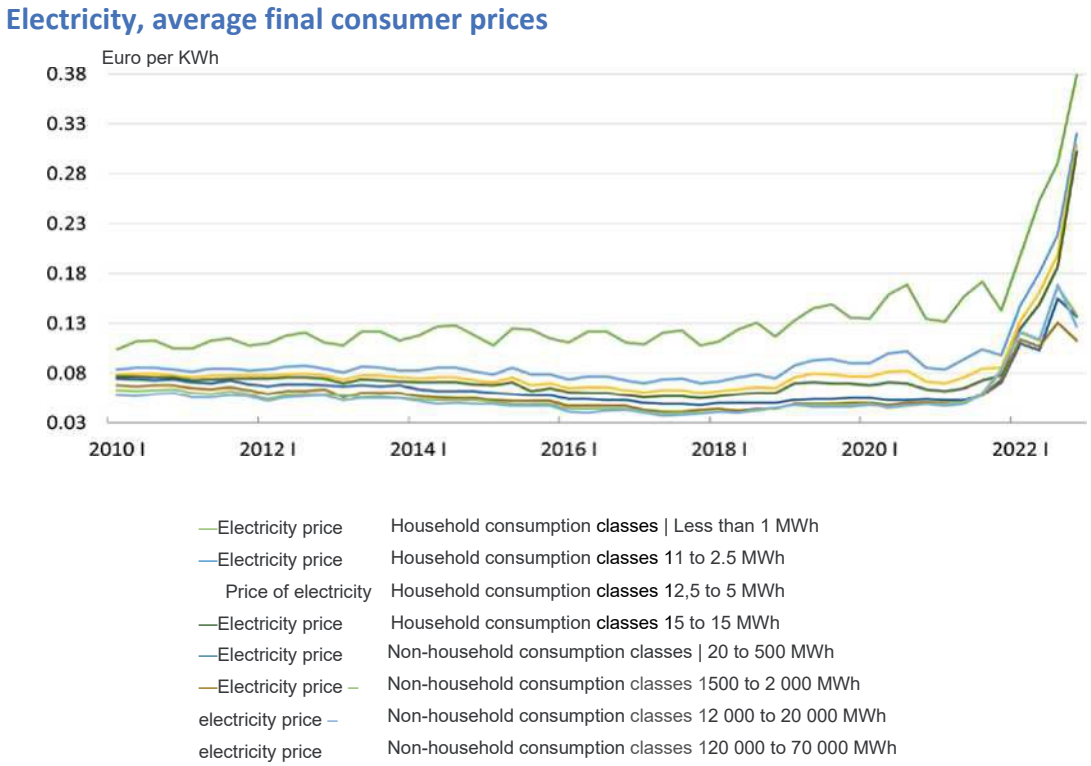
Figure 4.15 Consumer Price Index (CPI) for energy, electricity and gas (Source: CBs 2023f)



Electricity price for final consumers

Electricity prices depend, inter alia, on oil, coal and natural gas fuel prices (see Figure 4.16). Another important component is the costs for the transmission and distribution systems. The war in Ukraine and has increased the prices of all final consumers.

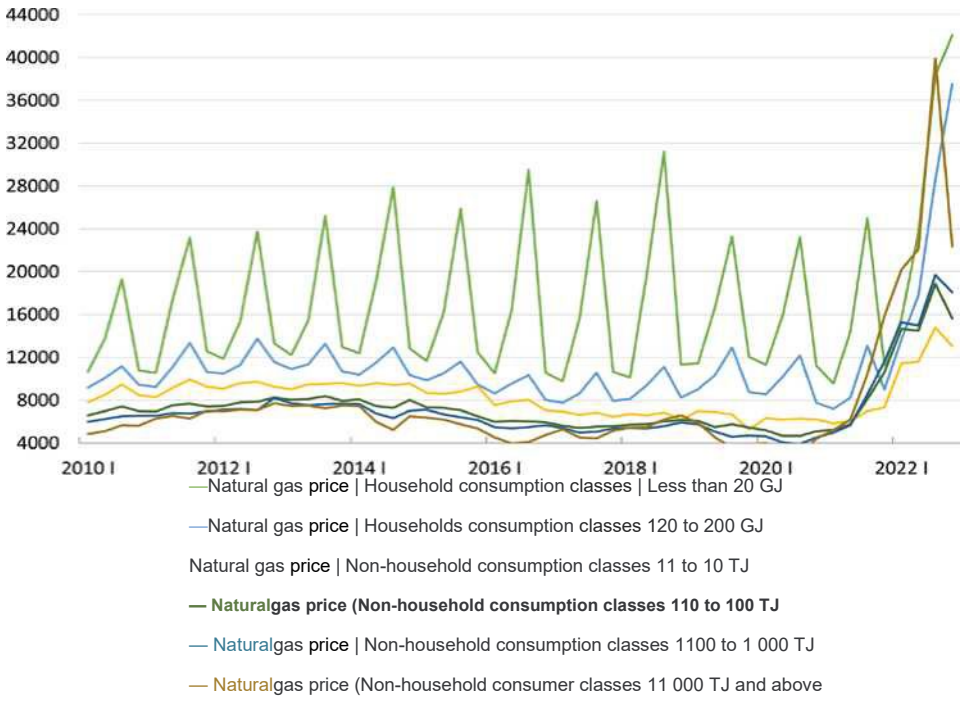
Figure 4.16 electricity prices for final consumers (Source: CBs 2 023 (g)



Natural gas price for final consumers

Figure 4.17 shows the evolution of the natural gas price for final consumers from 2010 onwards. In general, the price of natural gas follows the price of crude oil (see Section 4.1.III). The fluctuations in the price of households within one year are due to the strong demand for natural gas during the winter period. Important global events also have an impact on the price of natural gas, in particular the Russian invasion of Ukraine.

Figure 4.17 Natural gas price for final consumers (Source: CBs 2 023 (g)



Projection of electricity market developments

The average electricity price in 2021 was more than three times higher than in 2020, with an average day-ahead price of EUR 103 per megawatt-hour. This high price is due to the sharp increase in gas and coal prices.
The electricity price increased further in early 2022 following the Russian invasion of Ukraine due to the sharp further increase in gas and coal prices.

For the electricity sector, several possible future developments are conceivable, but there is no one specific scenario that is most likely. A reason for this is the high degree of uncertainty in the development of electricity demand and supply abroad. Indeed, the Dutch electricity market has been strongly integrated into the north-west European market. In addition, the evolution of fuel and CO_2prices is uncertain; changes in relative prices (including in the short term) may have a significant impact on the market position of the Dutch coal and gas power plants and thus on the import and export of electricity. In addition, occasional developments, such as sharply rising prices due to the war in Ukraine, the outages of plants such as the current low availability of nuclear power plants in France, and the impact of the weather on hydropower and wind and solar electricity, also have a major impact on trade in electricity between countries, and thus on electricity generation in the Netherlands.

Despite uncertainty about future electricity production, some trends can be identified. A first trend is that electricity generation from coal and gas is declining over the entire bandwidth in the long term. The main reasons for this declining trend are the ban on coal in electricity production in 2030 and the increase in renewable electricity generation in both the Netherlands and other countries. In addition, transport capacity between the Netherlands and neighbouring countries (interconnection) is increasing, leaving more scope for the exchange of electricity between countries. This means that less conventional production is needed in a country to cover periods of low renewable production, as these periods and demand peaks do not coincide in all connected countries.

Figure 4.18 Evolution of the average wholesale electricity price (Source: PBL, 2022a)

euro$_{2021}$ | per megawatt-hour

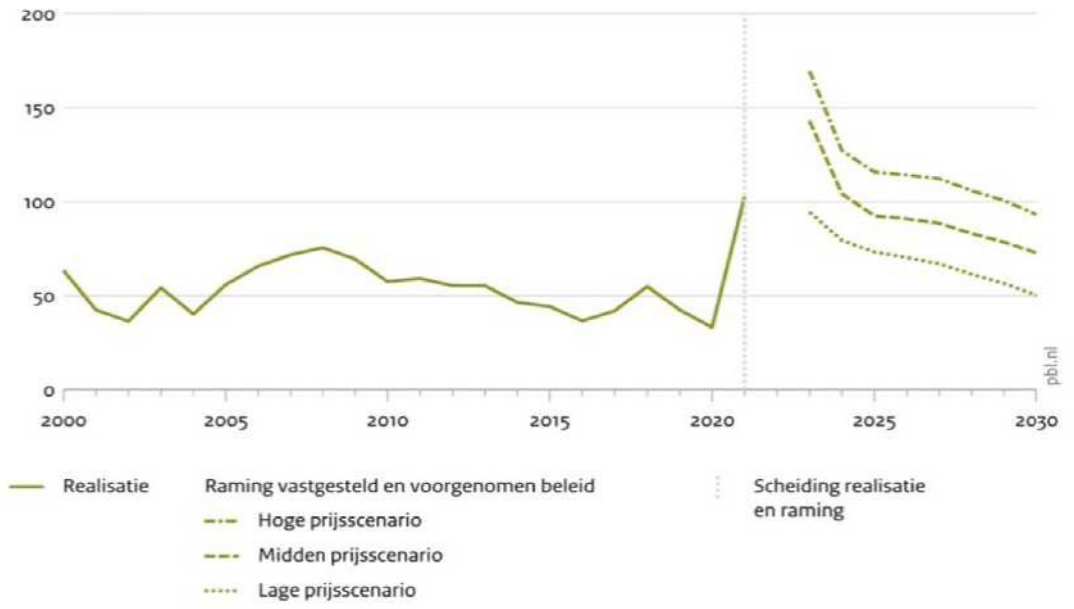


Figure 4.18 shows the expected wholesale price in the Netherlands for three scenarios. To reflect uncertainty about the future evolution of energy prices, the KEV presents three price scenarios for fuels and CO_2. Electricity prices have also been calculated for these price scenarios, based on fuel and CO_2prices in the scenarios. The assumptions about the evolution of fuel and CO_2prices are based on European Commission figures. These assumptions determine to a large extent the evolution of the electricity price, other price developments for coal, gas and CO_2 will lead to different electricity prices. In the high price scenario, the electricity price in the direction of 2030 is EUR 93 per megawatt-hour. In the low price scenario, the electricity price becomes EUR 203 050 per megawatt-hour.

IV. Functioning of electricity and gas markets

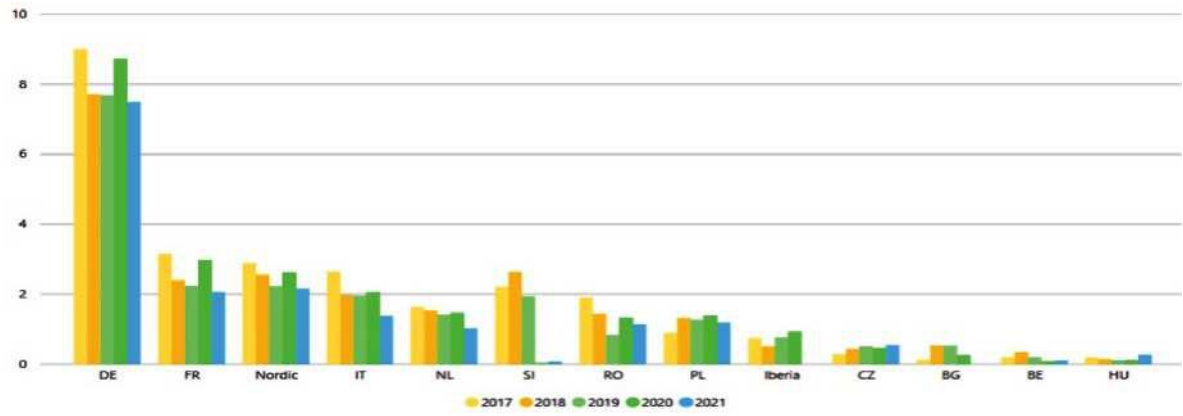
This section provides a better understanding of the functioning of energy markets in the Netherlands on the basis of quantitative data. Use was made of the annual reports prepared by the Agency for the Cooperation of Energy Regulators (ACER) on the results of the monitoring of the internal market in electricity and gas. ACER, in cooperation with national regulators, prepares reports on wholesale markets, retail markets and consumer protection in Europe.80 These reports cover, inter alia, developments in supply and demand, prices and liquidity of energy markets. For the sake of brevity, the liquidity of wholesale gas and electricity markets and some indicators of "market health" in wholesale gas are explained here. For detailed information on the availability of cross-border capacity and its efficient use, reference is made to the reports themselves.

The liquidity of the wholesale electricity market

Liquidity can be measured in different ways. The churn factor is the volume traded through exchanges and intermediaries relative to physical consumption. The higher this factor, the higher the liquidity.
In theNetherlands, churn factor decreased by around 30 % between 2017 and 2021 (see Figure 4.19). An explanation for the decrease could be that a correction was made for an increase caused by the COVID pandemic in 2020 and the focus on a shorter term horizon.

80 See www.ceer.eu/national-reporting-2022.

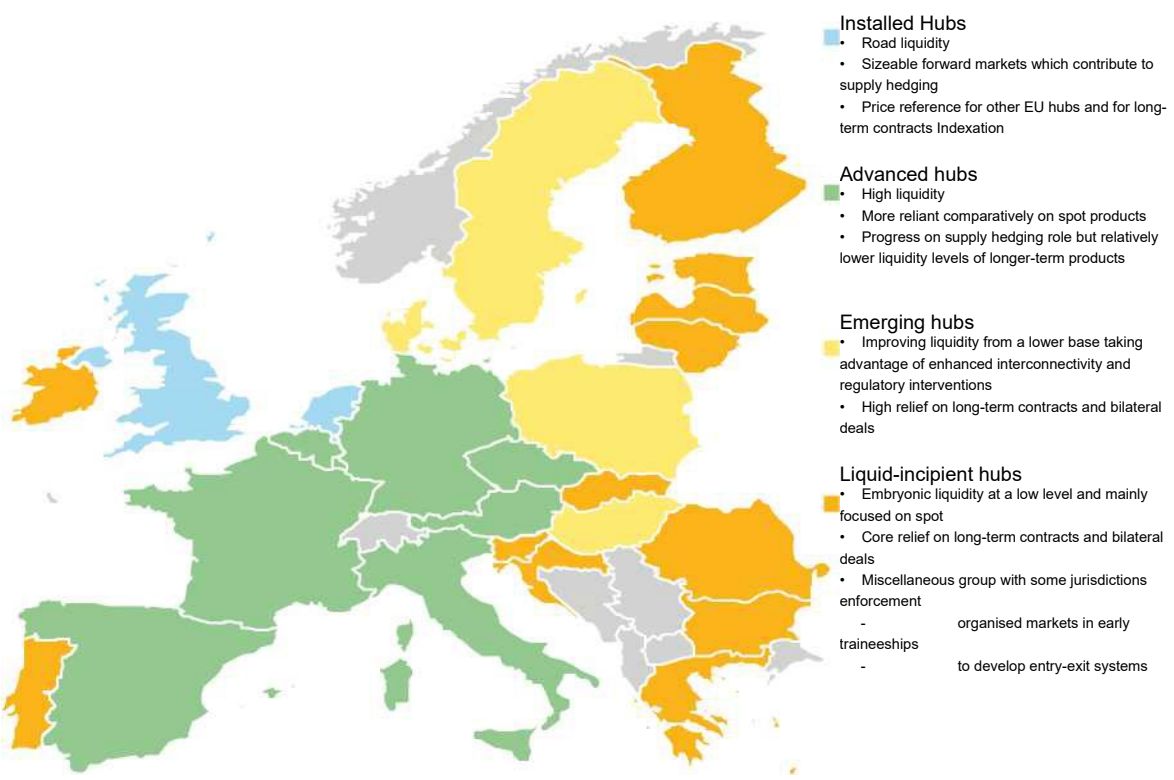
Figure 4.19 Churn factors in key European forward markets 2017-2021 (source: ACER/CESR, 2022a).



The liquidity of the wholesale market for natural gas

The Dutch gas market, as an established hub, ranks among the highest category of Hubs with broad liquidity, large forward markets contributing to the ability to hedge supply risks and serving as a reference price for other hubs in the European Union and for the indexation of long-term contracts (see Figure 4.20).

Figure 4.20 List of hubs in the EU based on 2021 monitoring data (Source: ACER/CESR, 2022b)



TheDutch market for Title Transfer Facilities (TTF) for day-ahead (DA) gas is the largest in the EU. In the period 2019-2021, the number of transactions increased by around 25 % on the spot market. TTF allows gas that is already on the Dutch network to be transferred without leaving the network, thereby promoting market liquidity. See Figures 4.21 and 4.22.

Figure 4.21 Spot of market transactions (Source: ACER/CESR, 2022b)

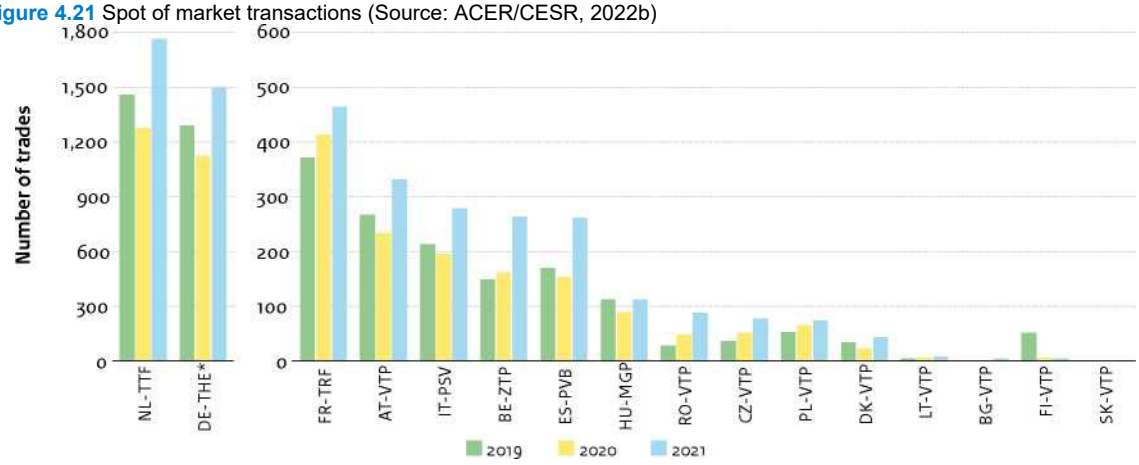
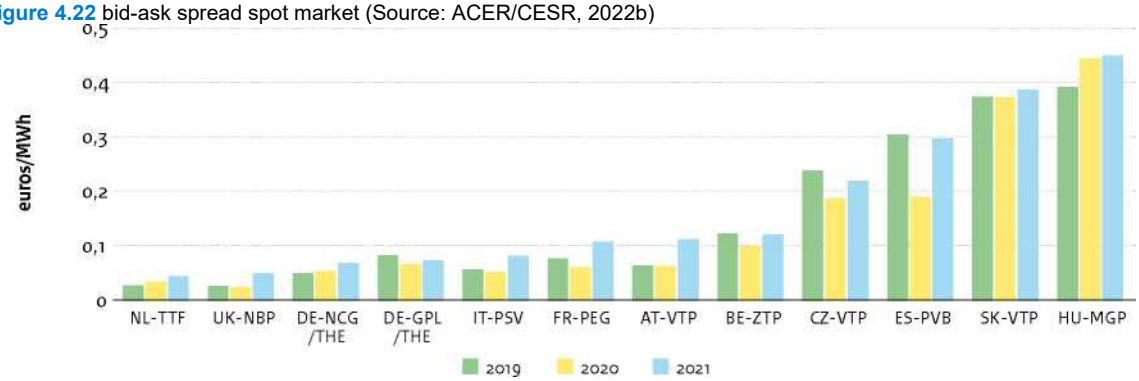


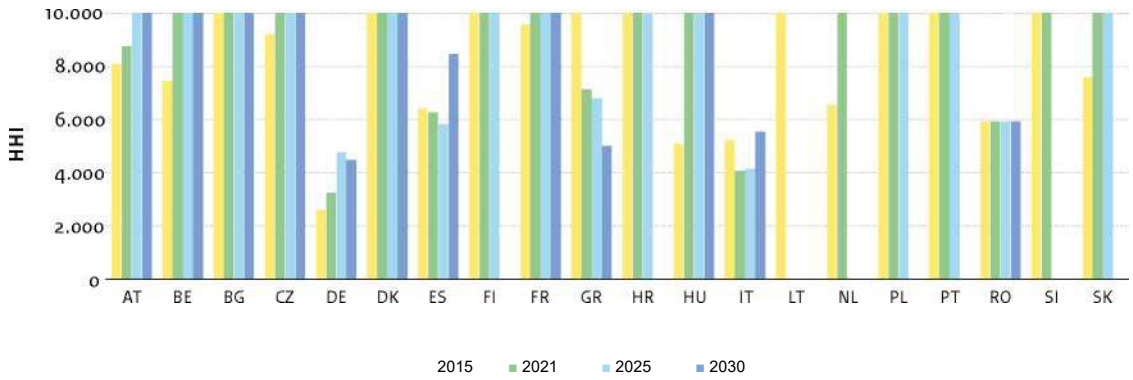
Figure 4.22 bid-ask spread spot market (Source: ACER/CESR, 2022b)



Figures 4.21 and 4.22: the average bid-ask spread of the day-ahead gas market in selected EUhubs in 2019 to 2021 (see Figure 4.22) and the number of trades executed daily average of day-ahead products in 2019 to 2021 (ACER/CEER, 2018b).

The aforementioned report on the wholesale gas market also includes indicators for the 'health market' (see Figure 4.23). By way of illustration, the Netherlands scores on the indicators (Herfindahl- Hirschmann Index (HHI)). The higher the HHI, the larger the market share of the largest suppliers.

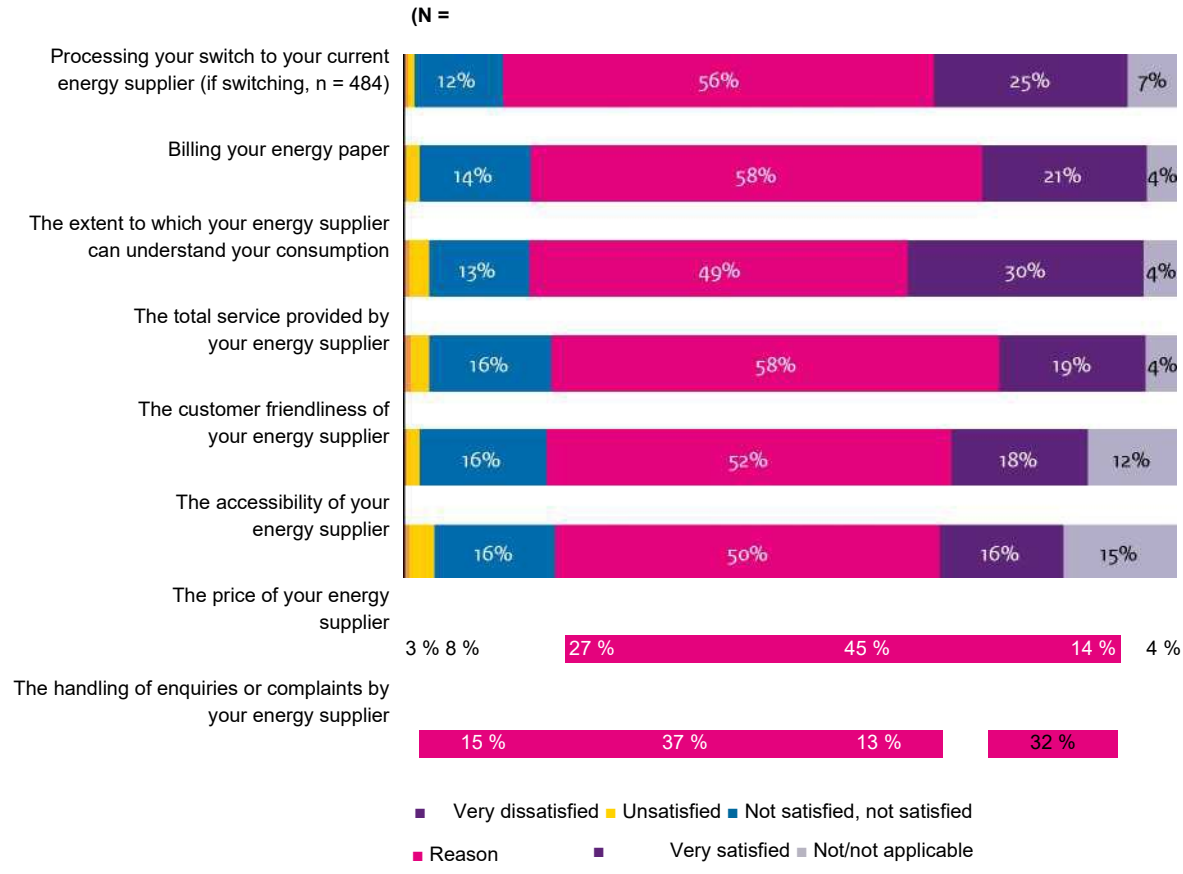
Figure 4.23 Overview of 'market health' indicators by EU Member State in 2021 (Source: ACER/CESR, 2022b)



Consumer satisfaction with energy suppliers

The Energy Monitor of the Authority for Consumers and Markets (ACM) pays attention to consumer satisfaction with their energy supplier. Satisfaction in 2022 is similar to previous years. Satisfaction with the processing of their switching supplier is high, 81 % are satisfied to very satisfied (see Figure 4.24).

Figure 4.24 Consumers satisfaction with energy suppliers (Source: ACM, 2022)



V. Energy poverty

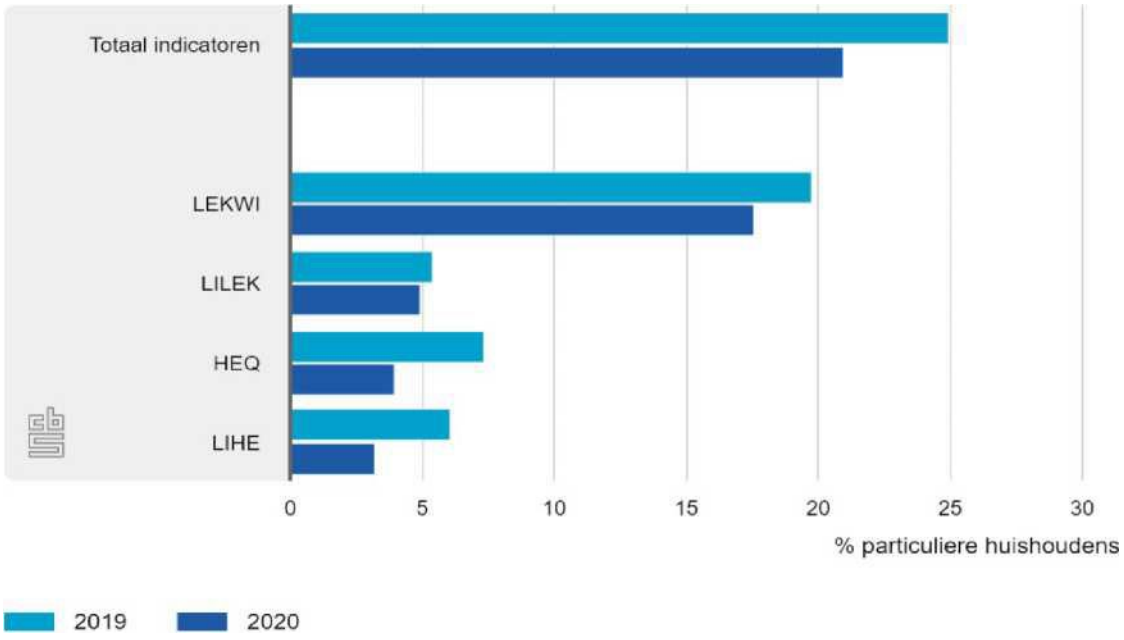
There is no uniform definition of energy poverty internationally, but in many EU Member States energy poverty is recognised as a major problem with negative effects on, for example, health (TNO, 2020). According to CBS research, over 450.000 households struggle to pay their energy bills in 2020 (CBS, 2023e). The increase in energy costs after 2020 will significantly increase this number. This applies not only in the Netherlands but also in other European Member States. For this reason, the European Commission wants to combat energy poverty (EC, 2021).

For the time being, the Netherlands does not have a specific policy on energy poverty (see Chapter3.4.IV). The development of targeted policies in the Netherlands requires data and knowledge about energy poverty in the Netherlands. TNO has been investigating energy poverty in the Netherlands since 2018. In cooperation with the Ministry of Economic Affairs and Climate Policy (EZK), the Ministry of the Interior and Kingdom Relations (BZK) and the Ministry of Social Affairs and Employment (SZW), TNO launched the National Energy Poverty Research Programme in 2022, with the aim of monitoring energy poverty on a national and local scale, exchanging knowledge and ultimately developing policies to combat energy poverty. In addition, in 2022, the Ministry of Economic Affairs and Climate Policy (EZK) mandated the Central Statistical Office (CBS) to develop an annual Energy Poverty Monitor, based on TNO (2021) as a basis (CBS, 2023e).

TNO uses a lack of access to affordable modern forms of energy at home as a definition of energy poverty (TNO, 2021). Energy poor households often have high energy costs compared to their income, as they tend to live in poorly isolated houses and do not have the (financial) possibility to renovate their homes, or do not do so because they rent the house. Energy poor households, for example, use the stove to save money on their energy bills. TNO uses four primary indicators of energy poverty, which are also used in the CBS Monitor:

- HEQ: a high energy equote. The energy equote is the part of the income spent on energy costs. Energy equals are considered high if a household pays more than 10 % of the income on energy costs.
- LIHE: low income combined with high energy bills. Low income is seen here as an income of up to 130 % of the low income threshold, excluding households with financial wealth among the highest 10 % in the Netherlands.
- LILEK: low income combined with low energy quality dwellings. Households covered by this indicator may experience problems in living comfort, for example due to dirty spaces or because the dwelling is difficult to heat. In addition, this group is vulnerable to increases in energy cost prices.
  As a complement to this indicator, a further distinction is made between households with very poor energy quality (LEK), where it is very difficult to make the home comfortable.
- LEKWI: low income combined with low energy quality housing and little investment space to improve the dwelling. A low-income household as defined by LIHE or a household whose total financial capacity and excess value of the dwelling is less than EUR 40,000 is considered to be a household with little investment space. Specifically, LEKWI shows how many households are financially unable to get their homes due to the energy transition.

Figure 4.25 Households with some form of energy poverty (Source: CBs, 2023e)



In the meantime, CBS has published the first Energy Poverty Monitor (2023e), based on the indicators referred to above (see Figure 4.25). According to CBS, out of a total of 7 million households in 2020, around 21 % had at least one of the four forms of energy poverty (CBS, 2023e). Among the various forms of energy poverty, the group of households with poor housing and low investment space (LEKWI) is the largest group. There are also households with multiple forms of energy poverty. 20 % of energy poor households were affected by two forms of energy poverty. The combination of LEKWI and LILEK was most common in these cases. More than 5 % of households met all four indicators in 2020 (CBS, 2023e).

The combination of low income and high energy costs (LIHE) and/or poor housing (LILEK) has been used as the main indicator for demonstrating energy poverty in the Netherlands in this report. According to TNO, this combination indicator gives the best estimate of the extent of energy poverty: it counts not only low-income households with high energy bills, but also low-income households with low energy quality, correcting for the (significant) overlap between these two groups. On the basis of these two indicators, 2020 6.4 % of households in the Netherlands are energy poor in 2020 (CBS, 2023e).

The data is based on the Woonbase and is therefore in line with recent and fully available housing market figures. The population in the monitor is based on the population of private households in the Woonbase at 1 January of the reporting year. The characteristics of households and dwellings, such as income and energy consumption, cover the whole reporting year. This monitor will be repeated annually by CBS in order to be able to follow the developments in the Netherlands properly, in line with the European Commission’s recommendations in the INEK.

4.6 dimension Research, Innovation and Competitiveness

I. Trends in the low-carbon technologies sector

Trends in the low carbon technology sector in the Netherlands

This section gives an overview of the economic importance of the Dutch energy sector in recent years with a focus on developments in the shift towards the development and deployment of low carbon energy saving and renewable energy technologies. This section distinguishes between energy exploitation and activities related to energy investments.81 Energy exploitation is generally capital intensive.

Investment activities, on the other hand, are often labour-intensive and thus important for employment potential in energy supply. However, the available data used in this chapter still mainly relate to energy-related activities. They provide one of the total energy-related sector and then the developments in the shares of renewable energy or energy-related low-carbon technologies in that total. Subsequent reports shall include, where possible, other non-energy related climate-relevant activities.

International position

Comparable definitions and data of low carbon technologies and related "sector" are still under development at international level. Many definitions and data are still not comparable and it is therefore difficult to provide official comparable data on the international position of low-carbon sectors of countries.

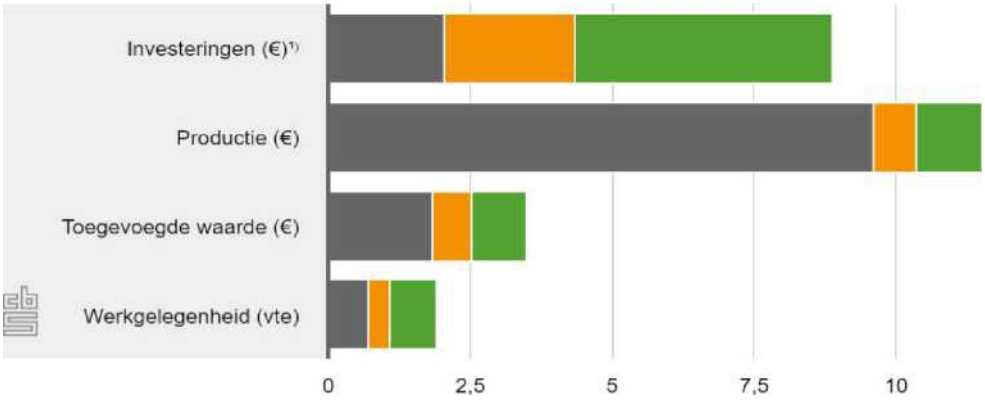
However, the available data used in this chapter still mainly relate to energy-related activities. They try to provide an overview of the total energy-related sector and then to indicate developments in the shares of renewable energy or energy-related low carbon technology in that total. Subsequent reports shall include, where possible, other non-energy related climate-relevant activities.

Key economic indicators of the energy sector

Thetotal contribution of the energy sector to gross domestic product is 3.5 % in 2019 (CBS, 2020). This sector is capital intensive; the share of investment (8.9 %) is four times higher than the share of employment (1.9 %). A first overview of the economic importance of the energy sector within the Dutch economy in 2019 is presented in Figure 4.26 using some key indicators.

81Energy exploitation consists of activities related to the extraction, production, transformation, trade, storage, transport and supply of energy (including refineries, oil and gas extraction, refuelling stations and renewable energy production). In order to ensure that these activities can remain at the same level or grow in line with final consumer demand, investments are made by the operating sectors. In addition, final consumers of energy themselves also make investments, for example in new energy-efficient industrial boilers or insulation. These investments by operating sectors and final consumers in turn lead to economic activities in other sectors, such as construction and installation companies, technology products, R &D, government, consultancy and other services, and are referred to as 'investment activities'. For more information on the delineation and definitions of energy-related activities and the distinction between conventional and sustainable activities, see background reports (CBS 2015, Van dril et al. 2016).

Figure 4.26 Share of energy activities in relation to the Dutch economy as a whole for different economic indicators in 2019. (source: CBS, 2020)



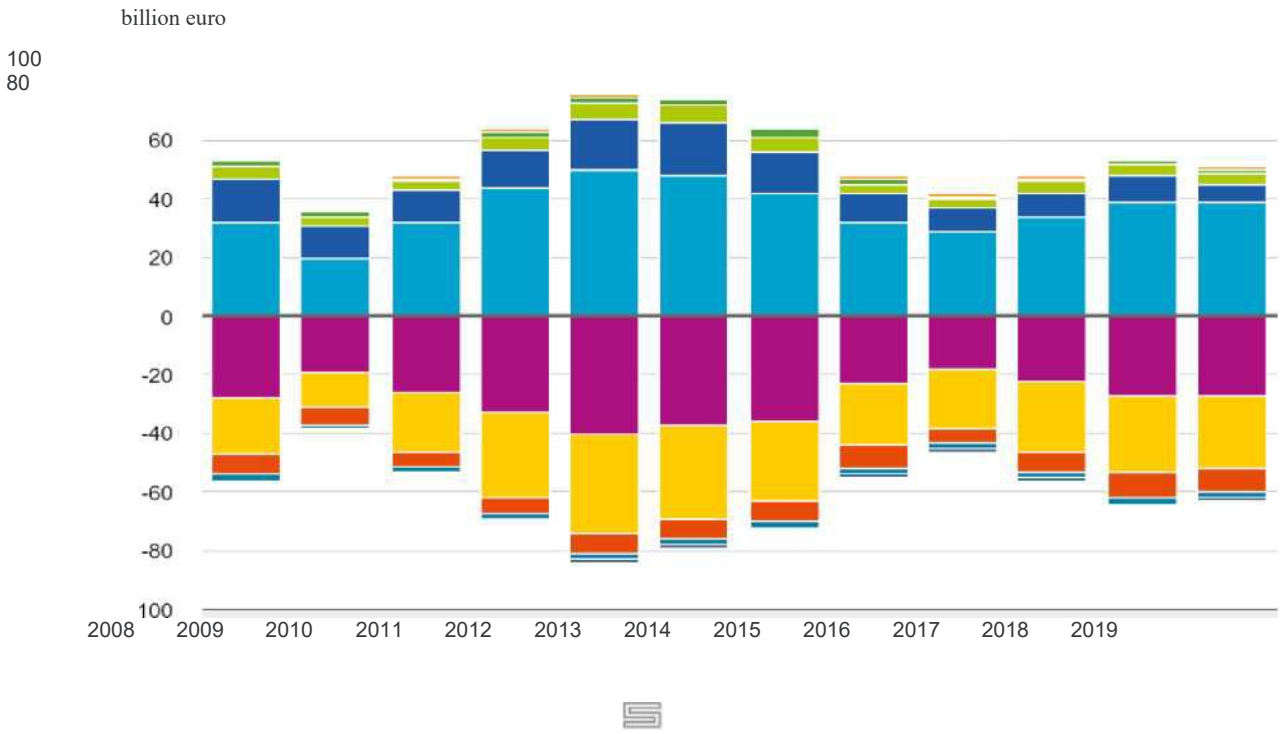
Conventional energy activities

Networks

Renewable energy activities and energy saving

(I) 2016-2018 average

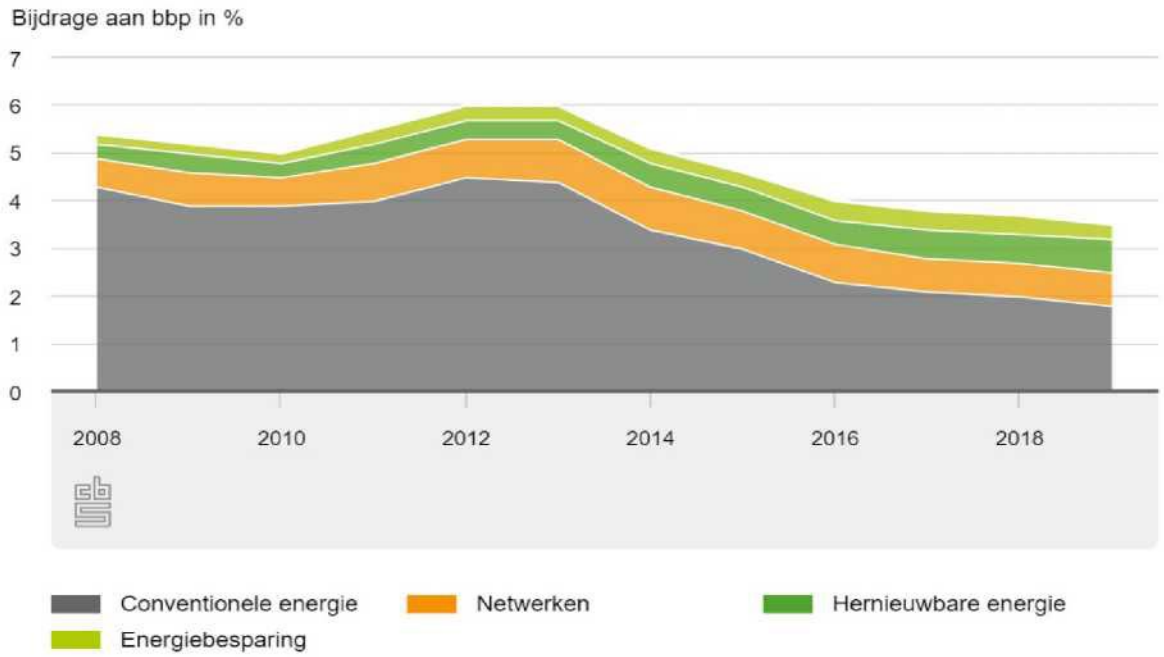
Figure 4.27 Import and export of energy products between 2008 and 2019, in current prices. (Source: CBS, 2020)



The period 2015-2019 shows a variation in the total import value from 45 billion to 66 billion and in export value from 40 billion to 54 billion (see Figure 4.27). This variation is explained by both price and volume fluctuations. In particular, oil prices fell sharply between 2014 and 2016, as reflected in the import and export value of energy products. Since 2016, energy prices have picked up again. The value of natural gas exports peaked in 2012, partly due to the high gas extraction in Groningen. In the following years, exports of natural gas decreased, partly as a result of reduced gas extraction in Groningen and a decrease in gas price.

The following sections describe in more detail turnover, investments and employment in the energy sector, addressing separately the shares of renewable energy and energy saving technologies relevant to the low carbon technology position.

Figure 4.28 Contribution of energy-related activities to the Dutch economy as a percentage of total GDP. (source: CBS, 2020)

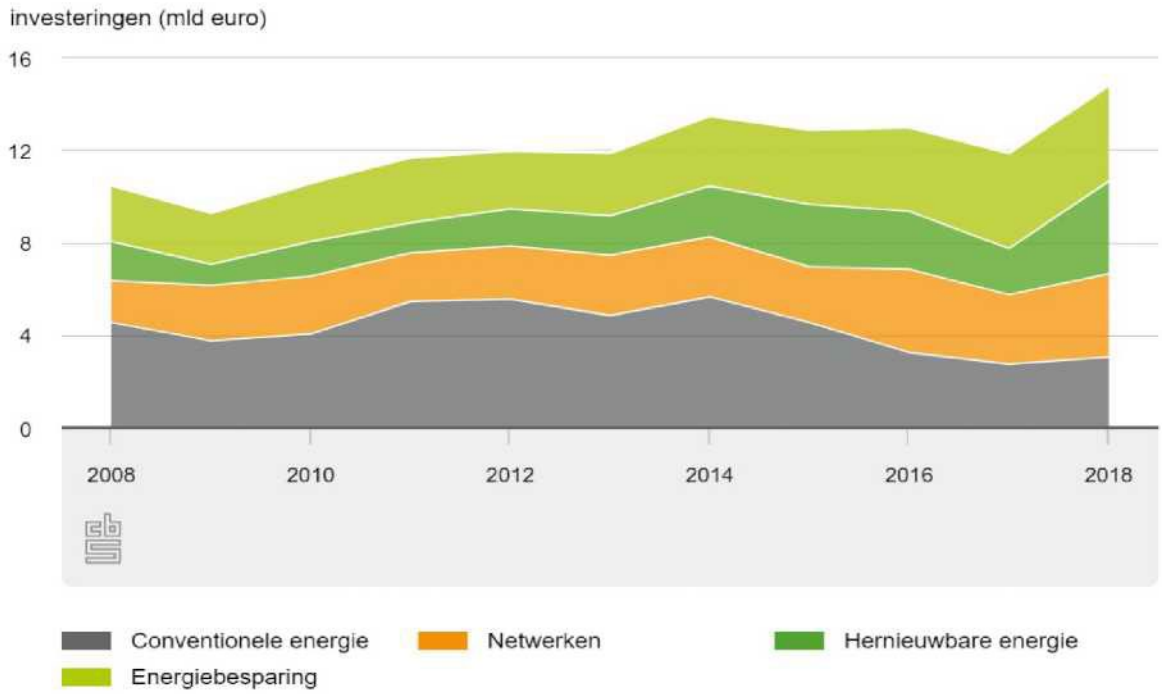


The contribution of energy-related conventional and renewable energy activities to the Dutch economy is outlined in Figure 4.28. The peak in the 2012s and 2013s was mainly related to a relatively high amount of natural gas extraction, investment in new coal-fired power plants and high energy prices, leading to a temporary increase in value added in conventional energy sectors. After this peak, no major investments have been made in conventional power plants and natural gas extraction has decreased. This is also reflected in the sharp fall in the value added of conventional sectors in recent years. The value added of renewable energy shows an upward trend from 2008 onwards, from 0.3 % in 2010 to 0.7 % in 2019.

Although the nominal value added of renewable energy is relatively small, it has grown steadily in recent years, from EUR 0,1 billion in 2000 to almost EUR 2,9 billion in 2019. As the GDP of the Dutch economy as a whole grew less sharply over this period, the share of renewable energy and energy saving in total GDP increased from 0.02 % in 2000 to 0.36 % in 2019.

Total investment in energy increased gradually until 2014, but declined slightly in the years 2015 to 2017 (see Figure 4.39). The decline in this period is the result of opposite trends in the underlying sectors. Investment in conventional sectors has fallen sharply since 2014, while investments in renewable energy and energy saving have increased. Investment in networks also increased slightly during this period.

Figure 4.29 Evolution of investment in energy installations and energy savings, in current prices. (Source: CBS, 2020)

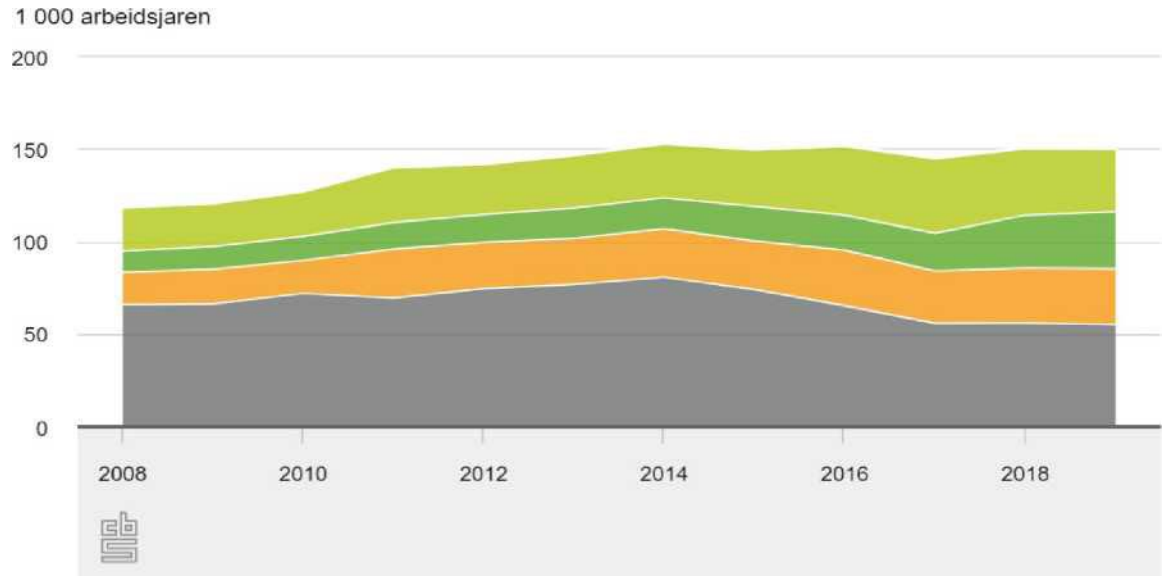


Total investment increased from over EUR 10 to almost EUR 15 billion between 2018 and 2008. While in 2008 there was even more investment in conventional energy (EUR 4,6 billion) than in renewable energy and energy savings combined (EUR 4,1 billion), in 2018 both renewable energy (EUR 4 billion) and energy saving (EUR 4,1 billion) were invested individually more than in conventional energy (EUR 3,1 billion). This has been reversed over the last decade. In addition, investment in energy networks, such as the electricity grid, has also increased. Investment in renewable energy increased sharply in 2018, after a thick in 2017. This is mainly due to solar and wind power, in particular off-shore wind farms, but other forms of renewable energy also show an increase.

Investment in the infrastructure needed to transport and distribute gas and electricity increased from EUR 2,6 billion in 2014 to EUR 3,6 billion in 2018.

The investments referred to above have led to an increase in employment (see Figure 3.30). Total employment in activities resulting from investments in energy-related activities increased until 2014 to 104 thousand full time equivalents (full-time jobs). Over the period 2008 to 2014, the largest increase in employment occurred, with investments in conventional energy (over 15 thousand full-time jobs), followed by those in networks (almost 7 thousand full-time jobs). After 2014, employment in conventional sectors fell sharply, while employment in renewable energy, grids and energy saving increased.

Figure 4.30 Evolution of energy-related gross employment (source: CBS, 2020)



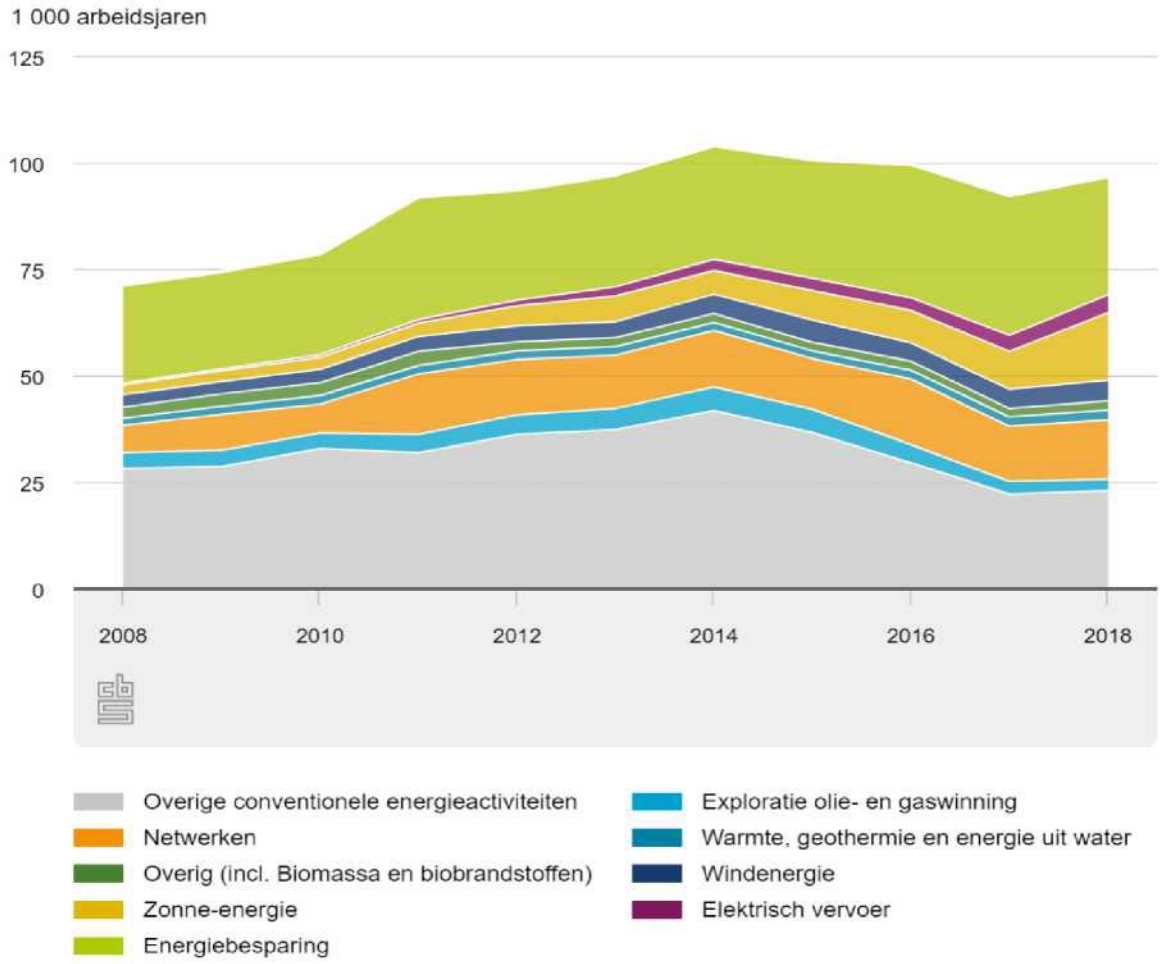
Employment in low carbon technology sectors through investment

About one third of total energy-related employment is related to energy exploitation and two thirds are related to investment. Developments in investment can be translated into economic activities resulting from them, i.e. the expected direct demand for investment labour. Whether this labour demand is also translated into employment depends on labour productivity and whether companies can find suitable workers.

Direct labour demand in the Netherlands differs for different technologies. A large part of the energy technology used is imported, so this does not result in labour demand in the Netherlands to produce this technology. The installation of the technology is usually done by Dutch companies. This has been included in the realisation of investment activities (dril, 2019) (see Figure 4.31).

In particular, the activities related to energy saving and solar energy result in relatively high labour demand within the Netherlands. These include activities such as housing insulation and the installation of solar panels. This is labour-intensive work. For solar energy, employment almost tripled between 2014 and 2018. Increase in investment in other technologies, such as wind energy and electric transport, generates additional labour demand. However, the work on these technologies has a higher import share and the higher cost per work year results in an equally high investment in fewer full-time jobs. The increase in wind energy investment in recent years has therefore not directly translated into an increase in employment in the wind energy sector. It is now back at the 2014 level.

Figure 4.31 Gross employment in investment activity in the period 2008-2018 and projected labour demand in the period 2019-2030 (PBL projections to 2030 in defined and planned policies; source: CBS, 2020)



In 2018, investments in electric transport accounted for over 4.200 years of employment in the Netherlands. This involved a variety of activities, such as the installation of charging stations, but also the development and production of batteries, software, propulsion technology and vehicles. Since 2008, Dutch employment in electric transport has increased.

II. Trends in spending, research and innovation on low-carbon technologies

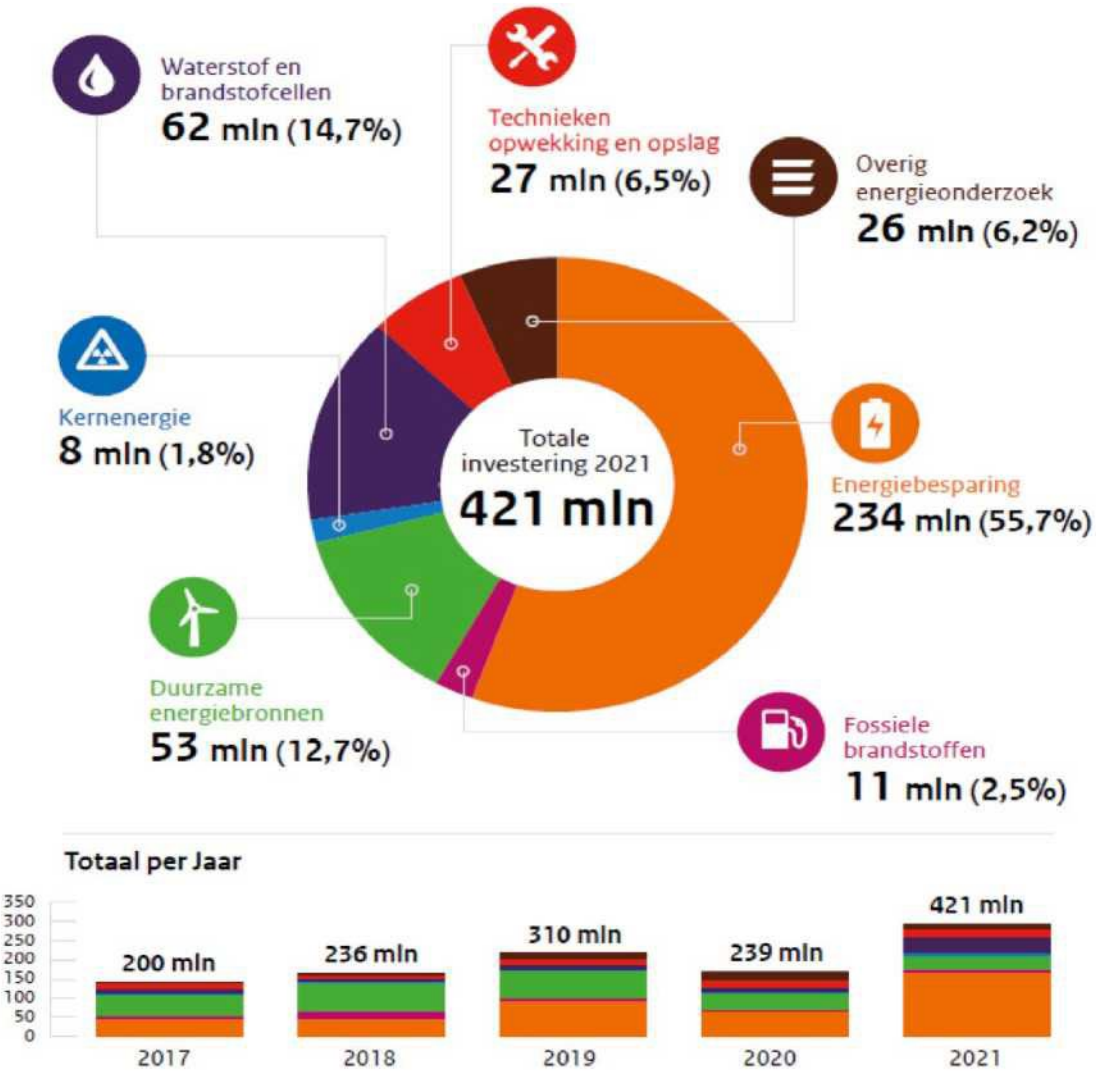
Each year, on behalf of the Ministry (EZK), RVO publishes the Public Funded Energy Research Monitor (RVO, 2022). This report is used for reporting to the IEA. This provides an overview of the Dutch government's expenditure on energy research by knowledge institutions, universities and businesses and its focus on underlying energy themes. Public investment in energy research through the fiscal instruments (WBSO), public credits (Innovation Fund for SMEs +) and direct payments by the Ministry of OC &W to universities are outside the scope of this monitor.

In 2021, the government invested EUR 421 million in public funds in energy research and development (RVO, 2022), a significant increase compared to previous years (see Figure 4.32). This is in particular a consequence of additional funds made available for energy saving research. In 2021, almost 13 % (EUR 53 million) of the funds were spent on renewable energy innovation projects and around EUR 234 million on research and development of energy-saving measures. Energy research on hydrogen and fuel cells has been growing for several

years. Investments in fossil fuel research (conventional energy) are limited and focus in particular on carbon capture and storage (CCS).

Figure 4.32 does not show companies' own (private) expenditure within energy innovation projects. In the Top-sector Energy approach, the size of this has been around EUR 100-150 million per year since the launch of the Topsector policy in 2012, which represents around 40 % of total investment. This does not capture all investments in energy innovation, as companies also invest in energy innovation themselves, but do not always make this information publicly available.

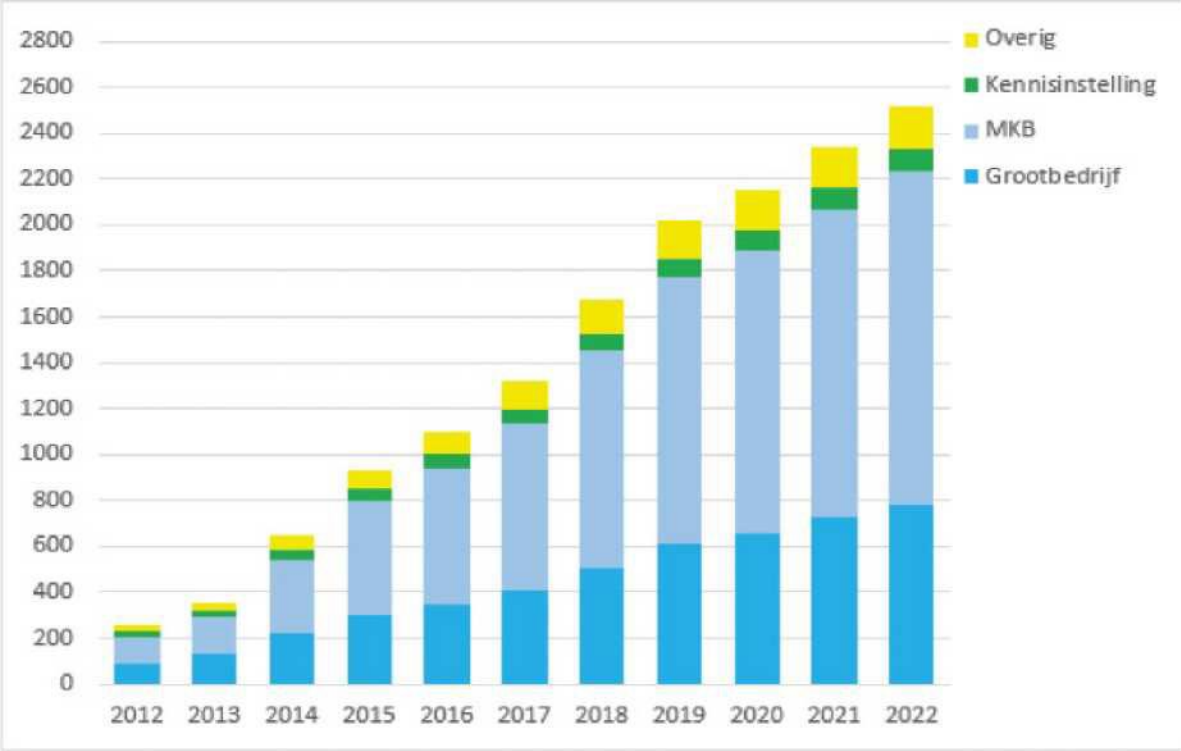
Figure 4.32 Public investment in energy research based on committed subsidy, in current prices. Source: RVO (2022)



Number of holdings

One of the objectives of the top sector policy is to improve cooperation between companies, including SMEs, with knowledge institutions. RVO also monitors the number and type of organisations involved in the energy innovation projects. Figure 4.33 shows how the energy innovation network of the Topic Energy sector grew between 2012 and 2018. It distinguishes between the participations of the different types of organisations.

Figure 4.33 Number of unique organisations involved in energy innovation projects Energy sector (Source: RVO, 2023)

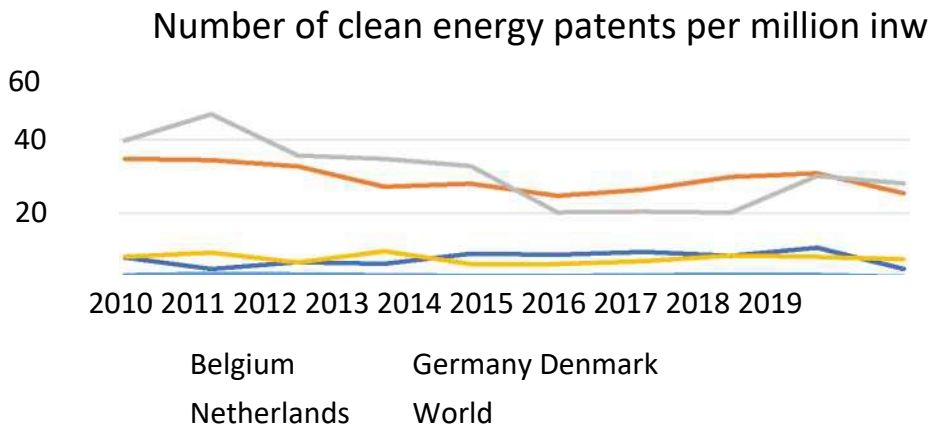


In total, more than 2.5400 unique organisations participate. On average, three participants work together in a project. The number of SMEs participating in the projects has increased significantly since 2012. This applies both in absolute numbers and relative to the other types of organisation. SMEs now account for more than 60 % of participants. The number of organisations in the 'Other' category is also still increasing. These include public organisations such as water boards.

Patent applications in renewable energy

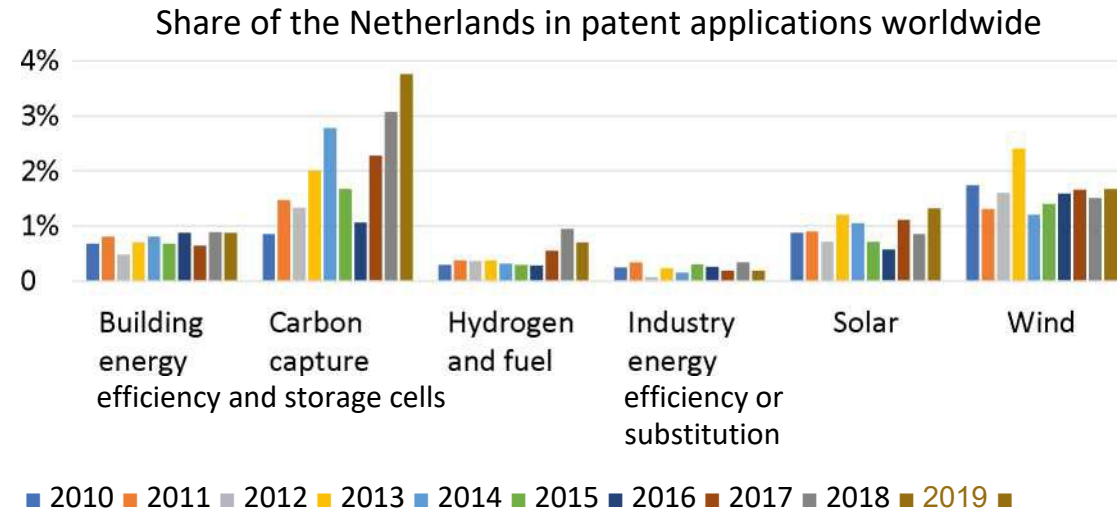
Figures on the number of patent applications show the results of innovation efforts. Figure 4.34 shows the number of international patent applications in the field of renewable energy filed with the European Patent Office (EPO) or the World Intellectual Property Organisation (WIPO) from the Netherlands and a number of other European countries. The number of patent applications per million inhabitants worldwide is also shown. Although the number of patent applications per million inhabitants from the Netherlands shows a slightly increasing trend, the numbers are still below the level of Denmark and Germany.

Figure 4.34 Number of clean energy patent per million inhabitants (Source: IEA, 2023; processed by RVO)



The IEA also looks at trends in patent applications for different sub-technologies for different countries and the world as a whole. Figure 4.35 shows the evolution of the Netherlands' share of patent applications worldwide for a number of sub-technologies. The share of the Netherlands is particularly high and also in 'Carbon capture and storage'. Strong growth is also visible. Since 2017, the Dutch share of hydrogen-related patent applications has also increased.

Figure 4.35 Evolution of Dutch patent applications in total worldwide for specific technologies (Source: IEA, 2023; processed by RVO)



Number of researchers in head count

As stated earlier in this section, energy related employment is increasing as a result of investments in renewable energy. CBs has estimated the distribution of employment in renewable energy and energy saving investments in the period 2008 to 2016, both by product profile (energy technology) and by process profile (type of work). According to this study, the number of working years for researchers through investments in renewable energy and energy saving has been over 3.200 since 2010 (CBS, 2018).82 No recent data are available on the total number of energy-related working years of researchers across the Netherlands.

111. Building up current energy prices and subsidies for (fossil) energy

This section looks at the different elements that currently determine energy prices for Dutch companies. Energy prices are divided into three main parts:

82 www.cbs.nl/nl-nl/achtergrond/2018/50/de-impact-van-de-energietransitie-op-de-werkgelegenheid.

- Energy (supply) costs themselves. World market prices are discussed in Section 4.1. End-user prices (consumers and businesses) are discussed in section 4.5.III;
- Network (management) and transport costs (detailed below);
- Taxes and surcharges (detailed below).

The distribution between these three components depends also on energy use, applicable tariff classes and type of energy.

Taxes and surcharges

In the Netherlands, there is a differentiated system of taxes and surcharges that affect energy consumption. In principle, energy tax should be paid on electricity or gas supplied through the distribution network, a direct line, purchased on the exchange or otherwise obtained. For consumers, value added tax is also added (currently 21 %).

The level of energy tax depends on the quantities of natural gas and electricity. The rates also vary by type of tax and per year. The rates are available in tables at the Tax Department.83 There is no obligation to pay an energy tax for the consumption of:

- Electricity self-generated from renewable energy sources;
- Electricity generated by an emergency installation in the event of disruption in the supply from the distribution system;
- Self-extracted landfill gas, sewage treatment gas or biogas;
- Electricity generated by a combined heat and power plant.

Natural gas used for heating in horticulture is subject to a reduced rate. The supply of electricity to shore-side electricity installations is also subject to a reduced rate. If a cooperative or 'association of owners' (CoE) produces renewable electricity, members are entitled to the reduced rate under conditions.

For households there is a reduction in energy tax (or: energy tax refund). This is a fixed amount that each household with an electricity connection receives back from the tax authorities. The amount is independent of how much energy was consumed. The amount in 2022 is EUR 824,77 (including 21 % VAT. In that case, the temporary reduced VAT rate from 1 July to 31 December 2022 has not yet been taken into account). The government temporarily increased the 2022 energy tax rebate to compensate for high energy prices. The amount in 2023 is EUR 596,86 (including 21 % VAT). The government sees part of the energy consumption as a basic need. No tax is therefore paid on that part.

Network management and transport costs

Network management costs are also referred to as network costs or capacity tariff. The costs consist of: fixed line network, capacity rate, periodic connection fee and meter rental. These differ from one system operator to another. Each region has its own network operator, which sets its own capacity tariffs. On average, network management costs in 2 023 559 amount to EUR 342 for electricity and EUR 217 for gas, including 21 % VAT (Environmental Centre, 2023).

The energy supplier charges fixed costs for the supply of gas and electricity (fixed charge). For example, suppliers pay their operating costs and administration. The energy company is free to determine these fixed costs. On average, a household paid EUR 72 for gas and EUR 73 for electricity. However, the differences between suppliers are large.

83 www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/overige_belastingen/ taxs_op_environmental base/rates of environmental taxes/tabulation_tarieven_environmental taxes? projectid

Overview of expenditure and revenue foregone related to fossil fuels and renewable energy generation. No subsidies exist in the Netherlands, which are exclusively aimed at promoting the consumption of energy from fossil sources. However, the exemptions from energy taxation and lower rates lead to missed taxes, which are classified as subsidies in accordance with the WTO definition. This "subsidy" may lead to higher consumption of both fossil and renewable energy in a broader sense.

Table 4.11 below gives an overview of government expenditure (both subsidies and tax schemes) on fossil fuels and subsidies to

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promote innovation and the use of various forms of renewable energy, thereby phasing out the use of fossil fuels. An important remark is that there is no clear distinction between fossil and green fuels. Some fuels and technologies are clearly fossil (e.g. coal and natural gas), but this is sometimes less obvious, for example in the case of bio-raw materials or electricity consumption. With the growth of renewable electricity production, its share of total electricity production is increasing in the coming years. In the case of CCS (carbon capture and storage), this is even more true: this is not a fossil fuel itself, but can be used to store CO_2emissions, for example from the use of fossil raw materials. This delimitation problem also applies to the extent to which the government grants a direct or indirect subsidy to the extraction and use of fuels. In case of doubt, this table is based on a broad definition, even if it sometimes involves measures or technologies that contribute or can contribute to reducing CO_2emissions.

Table 4.11 Overview of energy subsidies (source: EZK, 2023)

Policy measure	Sector	Energy carrier (s)	Type of instrument	2020	2021
Dei + Demonstration of Energy and Climate Innovation	Economic sectors	Renewable energy	Subsidy	EUR 95 million	EUR 71 million
DKTI Demonstration Scheme Climate technologies and innovations in transport	Transport Economic and non-economic	Renewable energy	Subsidy	N/A	EUR 37 million
EC scheme for investing in energy efficiency greenhouse horticulture	Farming	Renewable energy	Subsidy	EUR 10 million	EUR 45 million
EIA Energy investment deduction scheme	Economic sectors	All energy sources	Tax reduction	EUR 144 million	EUR 198 million
Compensation scheme Indirect emission costs ETS	Energy-intensive industry	All energy sources	Other	EUR 110 million	EUR 179 million
Renewable Energy Scheme (HER)	Economic and non-economic sectors	Renewable energy	Subsidy	EUR 38 million	EUR 32 million
ISDE Investment subsidy Sustainable Energy and Energy Savings (ISDE/ISDE-KA)	Households	Renewable energy	Subsidy	EUR 101 million	EUR 130 million
May Market introduction of energy innovations in greenhouse horticulture	Farming	Renewable energy	Subsidy	EUR 6 million	EUR 7 million
Mia Vamil Regelingen Milieu- Investment deduction for environmental investments	Economic and non-economic sectors	Renewable energy	Tax reduction	EUR 149 million	EUR 139 million
Beautiful (mission-driven scheme) Research, Development and Innovation)	Economic and non-economic sectors	Renewable energy	Subsidy	EUR 98 million	EUR 101 million
National Growth Fund	Economic and non-economic sectors	Renewable energy	Subsidy	NA	EUR 73 million
Public Private Cooperation (PPS)	Economic and non-economic sectors	Renewable energy	Subsidy	NA	EUR 8 million

Policy measure	Sector	Energy carrier (s)	Type of instrument	2020	2021
RVV Verdurzming (Scheme) Reduction in the rental tax Making sustainability more sustainable)	Households	Renewable energy	Tax reduction	NA	EUR 168 million
SAH Incentive scheme for natural gas-free rental dwellings (Start engine section)	Households	Renewable energy	Subsidy	EUR 29 million	EUR 21 million
Co-operative subsidy scheme Energy generation (SCE)	Economic and non-economic sectors	Renewable energy	Subsidy	0	EUR 0,4 million
SDE + + Stimulating Scheme for Sustainable Energy Production and Climate Transition	Economic and non-economic sectors	Renewable energy	Subsidy	EUR 1633 million	EUR 2341 million
Seba Subsidieregeling Emissieloos Bedrijfsauto	Transport	Renewable energy	Subsidy	0	EUR 13 million
SEPP Electrical Personal Vehicles Subsidy Scheme Private	Transport	Renewable energy	Subsidy	NA	EUR 42 million
Top Sector Energy Studies (TSE Studies)	Economic and non-economic sectors	Renewable energy	Subsidy	EUR 7 million	EUR 12 million
VEKI Accelerated climate investment in industry	Industry	Renewable energy	Subsidy	EUR 14 million	EUR 51 million
Exemptions for energy-intensive processes	Energy-intensive industry	All energy sources	Tax exemption	EUR 116 million	EUR 135 million
Reimbursement of energy-intensive industry	Energy-intensive industry	All energy sources	Tax refunds	EUR 9 million	EUR 0 million
Refunding of church buildings and non-profit	Non Profit	All energy sources	Tax refunds	EUR 37 million	EUR 37 million
Coal Duty Input Exemption for Dual Consumption	Economic and non-economic sectors	All energy sources	Tax exemption	EUR 25 million	EUR 26 million
Input tax exemption for electricity generation	Energy conversion/Electricity production	All energy sources	Tax exemption	EUR 86 million	EUR 86 million
Input tax exemption for electricity generation	Electricityproduction	All energy sources	Tax exemption	EUR 687 million	EUR 729 million
Reduced rate for greenhouse horticulture	Farming	All energy sources	Tax reduction	EUR 138 million	EUR 136 million
Exemption for use of kerosene in national and international air traffic	Air transport	Fossil fuels	Tax exemption	EUR 1335 million	NA
Exemption from the use of diesel and fuel oil for commercial navigation within and within Community waters	Water transport	Fossil fuels	Tax exemption	EUR 1612 million	EUR 1663 million
Other State measures relating to fossil fuels (non-fiscal)	Economic and non-economic sectors	Fossil fuels	Other	EUR 73 million	NA

Announced adjustments to energy taxation

At the end of April 2023, the government announced a new package of policy measures aimed at reducing emissions by at least 55 % by 2030 (see Room 32 813, No 23). This package also includes proposals to phase out tax incentives for fossil fuel and raw materials and to review energy taxation.

The Government shall abolish the coal tax for dual use of coal with effect from 1 January 2028. The current tax system in the Netherlands contains even more (indirect) advantages in the form of tax exemptions, rebates and adjusted tax rates that can (unintentionally) promote the use of fossil energy and fossil raw materials, thereby delaying the transition to a climate-neutral, circular industry. The Coalition Agreement agreed to explore the possibilities of reducing these financial incentives and then ending the financial stimulus where possible. We do this as much as possible with other countries, in view of our establishment climate.

In the next few years, tax advantages in energy taxes will be phased out: several exemptions and reduced rates are gradually being adjusted to reward investments and the shift from fossil to renewable energy. In addition, the tailor-made arrangements, the blending obligation for plastics and the strengthened requirements of the European Third Renewable Energy Directive (RED3) will further reduce fossil fuel and raw materials in the coming years. And the Dutch commitment to negotiating the European Energy Taxation Directive (ETD) aims at accelerating fiscal greening across the EU.

In recent times, there has been an increasing public debate on schemes that also promote the use of fossil energy carriers. The government has therefore already launched an inventory of all fossil exemptions, rebates and adjusted tax rates. The results are expected before the summer and will thus give the Lower House a better insight into the scale and effects. The government will then propose in the Million's note whether, and if so in what timeframe, the remaining tax exemptions for fossil fuels can be phased out. An impact analysis per measure is part of this inventory to ensure that companies have a sufficient trading perspective to free up the transition from fossil to CO_2.

Energy taxation is being adjusted to make more sustainable wages and lower energy costs for households. The Government therefore introduces a reduced rate to a certain gas consumption. At the same time, the degressivity of natural gas tariffs is being addressed by increasing tariffs above the new bracket. There will be a separate price for hydrogen that is lower than the one for gas, thus encouraging companies to make them more sustainable. Finally, electricity prices are reduced in the higher consumption bands. Several variants are being developed, for which a further impact analysis is carried out by the Finance Ministers and the EZK. This includes a level playing field and a trade perspective for companies to make them sustainable in a timely manner. On the basis of these results, a final path will be established. The exact customisation and sequencing will be decided in the August decision making.

5 impact assessment of planned PaMs

This chapter looks at the impacts of planned policies and measures as referred to in Chapter Three. A distinction is made between the planned and the policies on the agenda as reflected in the KEV 2022 and the announced policies and actions from the 2023 Spring Decision-making process (see Chapter 3).

5.1 Impact of planned policies and measures on the energy system and greenhouse gas emissions and removals

I. Impact of planned policies

In addition to the measures adopted, the KEV 2022 includes, in the variant 'planned policy', policy plans which were public on 1 May 2022, officially notified and sufficiently detailed. The proposed policy package is only limited in scope than the variant of only adopted policy. The main differences are listed in Table 5.1.

Table 5.1 Overview of key policy measures in the variant of planned policy in the KEV 2022 (Source: PBL, 2022a)

Sector	Policy measures in the proposed policy variant
In general	
	Tax slip 1nd tranche of gas and electricity
	National Growth Fund project (Sustainable Materials project on circular plastics, New Heat Nu!)
Electricity	Reconfiguring solar panels netting scheme from 2025
	Additional electrolysis may be granted, inter alia, through conditional allocation of the National Green Fund II Growth Fund Project
Built environment	Investment subsidy sustainable social real estate (DUMAVA)
	State financial support for implementation costs of municipalities for natural gas-free neighbourhoods
	Abolition of landlord levy
Mobility	Co_2 emission standards for new passenger and vans: tightening 2030 and 2035 (all zero emissions 2035)
	Accelerating (regional) deployment of charging infrastructure
	National car fleet zero-emission in 2028
	Decision CO_2 _reduction of work-related mobility
	Truck tax
	Increase in ATT
	ReFuelEU Aviation
	Strengthening the EU ETS for aviation
Industry	Reduce dispensation fees by about 4,85 megatons in industry in 2030
	Extension of the energy saving obligation under the Environmental Management Act to ETS companies and companies subject to a permit
Agriculture and land use	High-quality manure processing subsidy scheme (SMR)
	Reduced rate of taxation of the first two bands of natural gas for greenhouse horticulture
Sector	**Policy measures in the proposed policy variant**
	7th action Programme Nitrates Directive
	Increase carbon sequestration through existing forests, nature and landscape features through anti-drying measures in peatlands

The effects of these differences on greenhouse gas emissions and energy consumption/mix are discussed below. Detailed figures and parameters of this policy variant ("With additional measures") can be found in the Annex (Part B).

Greenhouse gas emissions

The differences in greenhouse gas emissions: In the period up to 2030, emissions with planned policies are almost at the same level as with adopted policies alone. The national total reaches a range of 122,2-127,6 megatonnes of CO_2equivalent to planned policies (including emissions from land use); with established policies, these are 122,5-127,9 megatons of CO_2equivalents. This difference is mainly due to the planned policy measures in the electricity and mobility sectors.

Emissions reductions in 2030 are set at 39-50 % below 1990 levels with planned policies, 5-16 percentage points below the 55 % target of the strengthened Climate Law. The estimated absolute emissions in 2030 are 114-139 megatonnes of CO_2equivalents.

The maximum cumulative non-ETS emissions (excluding LULUCF) allowed for the Netherlands for the period 2021-2030 are around 839 megatons of CO_2equivalents after strengthening the ESR Directive. Based on planned policies, cumulative estimated NETS emissions (excluding LULUCF) for 2021-2030 are 865 megatons of CO_2equivalents, which is about 2 megatonnes lower than set policies. For this period, this amounts to a deficit and thus a policy statement of 26 megatons of CO_2equivalents.

Renewable energy

The expected share of renewable energy varies little between the policy variants with established and planned policies. The forecast for 2030 with planned policies is 30.7 % (27,1-32.7 %). With adopted policies, the share at 30.5 % is slightly lower than planned. This small difference is due, inter alia, to a lower overall gross final consumption of planned policies combined with a lower use of biofuels for transport. The ambition of a 36 % share of renewable energy in 2030 (the Dutch share for the binding renewable energy target from RED II) is not expected to be met by the adopted and planned policy. Red III is still in the final phase, after which it will be translated into national targets.

Energy consumption and mix

In 2030, primary energy consumption will be between 2.085-2.447 petajoule and planned policy between 2.061 and 2.416 petajoule with only established policies. Final energy consumption is expected to be 1.872 petajoules by 2030 with only established policies; the planned policy is 1.850 [1.729-1.974] petajoule.

The energy mix in the variant of planned policies does not differ significantly from adopted policies alone. The expected consumption of oil products is slightly lower in 2030 with planned policy and renewable consumption is slightly lower due to a more efficient vehicle fleet, which also reduces biofuel consumption.

II. Effects of 'on the agenda' policy

Inaddition to the passed on emission effects of adopted (Chapter Four) and planned policies (Section 5.1.I), the KEV 2022 also provides an estimate of the conceivable emission effects in 2030 of the policy on the agenda. The main sources for this are the 2021 Coalition Agreement, the Draft Climate Policy Programme of June 2022 and the European proposals from the Fit for-55 package. Many of the policy measures announced therein proved to be insufficiently concrete on 1 May 2022 to be taken into account in the projections.

In the KEV, the policy on the agenda is divided into policies on the agenda for which a (quantitative) estimate could be made, and policies on the agenda for which this was not yet possible. For some measures, there appeared to be insufficient evidence to assess the impact of the measures. Table 5.2 provides an overview of the main climate and energy policy measures on the agenda for which an impact assessment has been made.

Table 5.2 The main climate and energy policy measures on the agenda with impact estimation for the year 2030 in the KEV 2022 (Source: PBL, 2022a)

Sector	Policy instrument on the basis of an impact assessment
In general	SDE + + according to the parliamentary letter of 1 July 2022 including gates, blending obligation for
Electricity	Obligation of solar panels on large roofs of non-residential construction.
Industry	Stimulating the production of high quality renewable energy carriers (indicatively 15 billion, including IPCEI green hydrogen). Binding commitments to achieve CO_2reduction in large (industrial) emitters (indicatively 3 billion). National Investment Scheme for Climate Projects Industry (NIKI). Abolish CCS subsidy ceiling SDE + +. REDIII obligation to apply green hydrogen in industry and production of transport fuels. Open 'refinery route' to green hydrogen until 2030. Purchase obligation for green hydrogen. $Co_{2\ minimum}$industrial price.
Built environment	Standardisation of hybrid heat pumps. Additional performance agreements for housing corporations following the abolition of the landlord levy. Building renovation obligation public institutions (Article 6 EED). Additional budget to make social real estate more sustainable from 2024. Revolving or social real estate guarantee fund. Standardisation aimed at phasing out bad labels of non-residential construction.
Agriculture – livestock and arable farming	Elements from the structural approach to nitrogen (National Closure Scheme for Livestock Sites (LBV) and promotion of full low-emission stables implementation, combined with tightening ammonia standard 2025).
Agriculture – energy (especially glasshouse horticulture)	None.
Use of land	Regional peat grazing strategy in other areas. Soil carbon via CAP NSP. Increase carbon sequestration through existing forests. Nature and landscape features.
Mobility	Abolish the BPM exemption of vans. Roadmap and Covenant on Clean and Zero Emission Building. Promote charging infrastructure for logistics. Promotion of zero-emission lorries 2025-2026. Co_2cap on departures. ETD: minimum excise duty kerosene. Shore-water obligation 2030.

If the part of the policy on the agenda for which an impact assessment could be made had been elaborated and implemented in a timely manner across all sectors, it is conceivable that total greenhouse gas emissions could be$_{reduced}$to 6 megatonnes of CO 2 equivalents by 2030 5 compared to the estimate of the adopted and planned policy (Table 5.3).

The combined effect of the adopted, planned and part of the policies on the agenda with estimates is a greenhouse gas emission reduction of 41 to 52 % by 2030 compared to 1990. Compared to the -55 % target, 125 megatonnes of reduction compared to 1990, a remaining policy challenge for 2030 is expected to remain from 6 to 31 megatonnes of $CO_{2\ equivalents}$(3 to 14 percentage points).

Table 5.3 Estimation of greenhouse gas emissions in 2030, including policies on the agenda, in relation to indicative residual missions from the Coalition Agreement (in megaton CO_2equivalents) (Source: PBL, 2022a)

Sector	Forecast adopted and planned policy, 2030	Bandwidth estimate of policies adopted and envisaged, 2030	Fire width estimation, including part of the estimated policy on the agenda, 2030	Indicative elections, 2030
Electricity	8-13	7-21	10-25	6,1-20,5
Industry	41	32-47	28-43	34,4-35,3
Built Environment[1]	18	15-21	13-19	10,0-11,2
Mobility[2]	28	26-31	25-30	23,7-24,9
Farming	23	21-24	21-24	18,9
Use of land	3,7	3,0-4,2	1,8-3,1	1,8-2,7
Total[1]	**122-128**	**114-139**	**108-133**	**94,9-113,5**
Reduction compared with 1990	**44 % – 46 %**	**39 % – 50 %**	**41 % – 52 %**	**50 % – 58 %**

[1] the reduction effects of the 'green gas blending obligation' are only included in the total for the estimation including an estimate of the contribution of policies on the agenda. This measure on the agenda cannot yet be attributed to the built environment.

[2] excluding international air and maritime transport.

The relatively largest emission reductions due to policies on the agenda are expected in industry and the built environment. In industry, this is the budget from the Climate Fund earmarked for tailor-made arrangements with large emitters and the promotion of the deployment of renewable hydrogen in industry and refining. In the built environment, these include, for example, the standardisation of hybrid heat pumps, performance agreements with housing corporations following the abolition of the landlord tax and the sustainability of social property.

The measure on the agenda "blending obligation for green gas in the built environment" has not been assigned to the built environment sector, but has been included in the national total bandwidth including estimated agenda policies. Green gas is incorporated into the natural gas grid and also leads to emission reductions in other sectors. Smaller contributions from the part of the policy on the agenda for which an impact assessment could be made are expected from the mobility, land use and agriculture sectors. These include, for example, measures such as the abolition of the BPM exemption for traders' vans, the Landelijk Termination Scheme for Livestock Sites (LBV), the peat grazing strategies and the measures contained in the forest strategy.

The policies on the agenda, the effects of which have been assessed, lead to additional electricity demand in a number of sectors. This is particularly visible in industry, the built environment and mobility. As a result, emissions from the electricity sector are increasing in 2030 compared to the forecast with adopted and planned policies. In the first years after 2030, emissions from the electricity sector are expected to decrease again due to the further increase in offshore wind energy.

The part of the measures on the agenda for 2030 for which no impact assessment could be made in this KEV would allow additional emission reductions to be achieved towards 2030 and beyond. Examples of measures on the agenda for 2030 without an impact assessment in this KEV are the National Programme for Landelijk Gebied (NPLG), Payments to Use (BNG) for passenger cars and vans, adjustments to energy taxes, the coherent package of sustainable greenhouse horticulture and the emissions trading system for the built environment and transport (ETS BRT). There are also examples of measures on the agenda without an impact assessment that focus more on the post-2030 period.

These include additional offshore wind energy (17 gigawatts), the construction of two new nuclear power plants, the extension of the nuclear power plant in Borssele and a subsidy scheme for CO_2free gas plants.

III. Impact of announced policies in Spring Decision-making Climate

In addition to the planned and on the agenda set out in the KEV2022, the government proposed a new package of policy measures in the Spring decision making in 2023. This package should implement the agreement in the Coalition Agreement to focus climate

policy on a higher target of around 60 % reduction so that the climate law target is more likely to be achieved. The package consists of grants, standardisation and pricing. This includes the (first) draft multiannual programme for the implementation of the Climate Fund. The policy measures in the package are being further developed by the government. Legislative proposals are still submitted to the Lower and Upper Chambers for decision. An assessment of the expected impacts is therefore still limited.

The announced package of policy measures will reduce some 22 megatons of CO_2equivalents in 2030, which, according to the IBO Climate Action, is84 needed to reduce emissions by at least 55 %.
The table below gives an overview of the government's objective of reducing emissions with this package, the distribution of the package by sectors and the adjustment of indicative residual targets on the basis of the package. The revenue from cross-sector measures has not yet been allocated to the individual sectors.85

Table 5.4 Estimated emissions in 2030 based on current IBO Climate policy and reduction by sector by additional measures. In megaton CO_2equivalents.86

Sector	Emissions in 2030 on the basis of IBO Climate Action Outcome in 2030 on the basis of IBO Climate Action	Supplementary measures	2030 elections
Electricity[1]	17	4,0	13
Industry + CE[1]	34,8	5,2	29,6
Mobility[2]	25,0	4,0	21,0
Farming	20,5		17,93[3]
Use of land	2,5		1,83[3]
Built Environment	**14,6**	1,4	**13,2**
Cross-sector	**—**	**3,2**	**— 3,2**
Sum of sectors	**114,4**		**93**
Total national estimate (IBO basic path)[4]	**113**	**Approx. 22**	**91**
Additional global reduction		**Approx. 2,5**	

[1] the size of the residual emissions is determined by the balance of positive and negative emissions.
[2] mobility: this excludes international aviation and maritime transport and is international inland waterway transport.
[3] the indicative residual agricultural output has been reinforced by an additional 1 Mt reduction in greenhouse horticulture compared to the Climate Policy Programme. The indicative statement has not been corrected for the additional animal husbandry and arable farming policy, as this does not change the NPLG (5 Mton) mission set out in the Coalition Agreement. For land use, the government maintains the residual objective of the Climate Policy Programme.
[4] the PBL and IBO-Climate have taken into account inter-sectoral interactions in the estimates. As a result, the sum of emissions figures by sector is slightly higher for the projected emissions than is shown in this table as a national total.

With Prinsjesdag this autumn, calculations from the PBL – in anticipation of the annual climate and energy survey – show the range of emission reduction in 2030. In the years to come, we will continue to review policy in terms of target and equity and adjust it where necessary.

5.2 Effects of planned policies and measures on the economy

This section deals with the impact of climate and energy policies on macro-economy, income and employment. The impact of climate and energy policies on safety, health and nature is discussed in point 5.3.

Economic considerations of the European Fit-for-55 package

In 2022, the Central Planning Bureau (CPB) gave an economic assessment of the Fit-for-55 package proposed by the European Commission on 14 July 2021 (CPB, 2022b). The economic analysis looks qualitatively at the extent to which the CO_2reduction package can deliver cost-effectively and the potential impact on the Netherlands. Attention will be paid to the main elements of

84Parliamentary paper 32813, No 1230.
85The PBL and IBO-Climate have taken into account inter-sectoral interactions in the estimates. As a result, the sum of emissions figures by sector is slightly higher for the projected emissions than is shown in this table as a national total.
86Parliamentary paper 32813, No 1230.

the package and to the package as a whole. At that time, it was not possible to pass on the public finance package and to increase the burden on businesses and households. This is due, inter alia, to the fact that the package sets out objectives and obligations that still need to be specified, in particular through national measures. Thus, the economic perspective does not (explicitly) take into account (new) national policies designed to meet the higher ambitions, both national and European, for 2030. However, the economic analysis gives a (qualitative) indication of the potential economic impact of a strengthened European climate and energy policy on the Netherlands.

The package contributes to cost efficient CO2 reduction

Overall, the package is a step towards achieving CO_2reduction more cost-effectively. Fit-for-55 broadly promotes pricing of CO_2emissions, thus incentivising companies and households to better take into account the negative externalities of CO_2emissions. The package will reduce the risks of a worsening competitiveness of European companies and a leakage of CO_2emissions to countries outside the EU with an EU border levy (CBAM).

The macroeconomic impact of the package is expected to remain limited

The macroeconomic impact of the package is expected to remain limited. The Commission's impact assessment report shows model estimates between -0.4 % and + 0.5 % for EU GDP in 2030 (EC, 2020).
The competitiveness of companies is largely preserved through the provision of free allowances and the introduction of CBAM. For households, the purchasing power effects of a higher CO_2price are not necessarily equally distributed. There may also be significant differences between countries and sectors. Countries that are relatively hard hit by the increased CO_2prices are compensated through funds, which are filled by ETS revenues. In addition, part of the ETS revenues accrues to Member States. For the Netherlands, these revenues can be increased to around EUR 3,4 billion in 2030. This is significantly more than the yield of EUR 0,9 billion in 2021. This is mainly due to the higher CO_2price and the revenues from the new ETS GRT.

Energy intensive industry in the Netherlands will have to make more sustainable as a result of higher ETS prices. Companies without cheap abatement opportunities will be subject to an increased burden. As described in Chapter 2.2, carbon leakage, production losses and employment effects at macro level appear to be limited. The industry in the Netherlands is also supported by, inter alia, the SDE + + subsidy scheme. However, for specific sectors and companies, impacts may be much greater. On the other hand, with a higher ETS price, the unprofitable top of $CO_{2\ reducing}$projects is smaller and therefore the subsidy amount per project is smaller.

The introduction of emissions trading for buildings and road transport will increase the burden on households and businesses. How much depends on the CO_2price, but also to what extent excise duties and energy taxes will be adjusted in response to these price increases. The tight labour market in the Netherlands makes rapid sustainability in the built environment difficult. Sufficient professionals and fitters are needed to insulate all houses and install heat pumps. This is a challenge at present due to the tight labour market in the Netherlands. In 2022, the PBL investigated labour market bottlenecks in implementing climate policies to reduce national greenhouse gas emissions by (at least) 55 % by 2030. It shows that the main bottlenecks to implementing climate policy are expected for engineering professions at higher educational level such as engineers and architects and, to a slightly lesser extent, for engineering and craft occupations at MBO level, such as machine technicians, metal workers and construction workers (PBL, 2022c).

The increased minimum rates in the proposed amendment to the Energy Taxation Directive do not lead to substantial changes for the Netherlands. In the Netherlands, the current rates are already above the proposed minima. According to the proposal, electricity will have to be taxed at a lower level than natural gas. This therefore calls for a significant review of the current ratio of tariffs and has implications for costs for end-users. Adapting the energy taxation structure has the potential to have significant effects on public budgets, households and businesses. An indicative calculation example shows that adjusting the level of tariffs could have a significant budgetary impact, in the order of -10 to + EUR 6 billion per year.

5.3 Impacts of planned policies and measures on safety, health and nature

Policies in national climate and energy policies reduce the use of fossil resources, which tend to deliver benefits for health, safety and nature.

Air pollutant emissions

PBL gives a biennial picture of the expected future evolution of national emissions of air pollutants, complementing the 2022 Climate and Energy Outlook. The CO2 emission reductions expected in the$_{KEV}$are translated into emission reductions of NOx, NH_3, SO_2 and particulate matter (PM2,5) and NMVOC. These substances have an impact on air quality and thus on nature and health.

European emission targets for air pollution in sight

Emissions of air pollutants have fallen significantly in recent decades and are likely to continue in the coming years (PBL, 2023). As a result, the European emission targets for air pollutants by 2030 are within reach (see Table 5.5). The European targets do not require major changes and will be largely met by European emission requirements for new vehicles, vessels and industrial installations. In addition, climate policy reduces the use of fossil fuels in reducing emissions. The effects of the planned policy (as a difference to the variant with adopted policies only) are listed in Table 5.6. Differences with only established policies are limited.

Table 5.5 Estimates of NOx, NH_3, particulate matter, SO_2 and NMVOC emissions in defined and planned policies and compared to European reduction targets; in kilotonnes (source: PBL, 2023)

	2005	2020	2030 estimate	
		EU-NEC target 2020		EU-NEC target 2030
No_x	396	180	218	154
			138-140 [125-157]	
NH_3	153	124	133	121
			116 [108-122]	
Fine particulate matter (PM2,5)	27,8	14,6	17,5	15,3
			12,9 [12,3-13,7]	
RU2	67	20	49	32
			20 [15-22]	
NMVOC	209	186	192	177
			149 [141-159]	

Table 5.6 Reduction impact of planned policies on emissions of air pollutants according to the NEC Directive; in kilotonnes (Source: PBL, 2023)

1	2025	2030	2035	2040
No_x	3	4,5	4,5	5
NH_3	0	0	1	1
Fine particulate matter (PM2,5)	0,05	0	0,1	0,2
RU2	0	0,1	0,1	0,1
NMVOC	1	2	3	4

In addition to the pass-through effects of adopted and planned policies, an estimate has also been made of the conceivable emission effects of policies on the agenda in 2030 (see Table 5.7). In the KEV, the policy on the agenda is divided into policies on the agenda for which a (quantitative) estimate could be made, and policies on the agenda for which there was insufficient evidence for quantification (see also paragraph 4.1).

Table 5.7 Reduction effect of policies on the agenda on air pollutant emissions according to the NEC Directive; in kilotonnes (Source: PBL, 2023)

1	2030	Comment
No_x	8	As a result of national policies to accelerate the deployment of zero-emission construction machinery and a European shore-side electricity obligation for seagoing vessels
NH_3	7	Excluding the transition programme for sustainable agriculture (NLPG) on the agenda
Fine particulate matter (PM2,5)	0,215	Excluding industrial policy on the agenda
RU2	—	Policies put on the agenda are not sufficiently concrete
NMVOC	0,8	As a result of the National Termination Order on Livestock Sites

5.4 Overview of investment needs

The figures presented in this section give an indicative and preliminary picture of the expected and necessary investments.

1. Existing investment flows and forward investment assumptions with regards to the planned policies and measures

Every year, the Government reports on climate policy with the Climate Note. A financial overview of the achieved public funding per policy measure for the previous year, the (preliminary) financing for the current year and the expected funding for the next five years is also included as an annex to the Climate Note (see Annex 1 in the Climate Note 2022 for the latest overview).87 This overview is updated annually by the responsible ministries and is broken down by (upcoming) climate measure by sectors of electricity, industry, built environment, agriculture and land use, mobility and cross-cutting measures. This overview provides insight into the realised and expected public investments resulting from climate policy with a time horizon of five years. However, no specific analysis is available on the investments needed to reach the 2030 targets.

Indicative picture of national costs of policy measures by 49 % reduction

The previous internalisation of the (draft) Climate Agreement by PBL (2019a &2019b) provided insight into the national costs88 and investments expected at that time to achieve the then climate target of 49 % reduction by 2030. It showed that national costs in 2030 1,6 billion to EUR 1,9 billion. DThe cumulative investments from 2 019 to 2030 amount to EUR 56 billion to EUR 75 billion. The above figures related to the increase in national costs and investments in 2030 compared to the projections of 2017 (the PBL's "NEV2017" based on the policy variant "defined and planned policies without new SDE + openings after 2019"). The difference between the lower and upper limits was due to uncertainty in the design of the policy toolbox proposed in the draft Climate Agreement and the response of actors. Environment uncertainties were in principle not included in the ranges presented, but uncertainty in other external developments (such as developments in energy prices) was high, resulting in the overall uncertainty bandwidth around costs being larger than the bandwidth constrained by design and behavioural uncertainty.

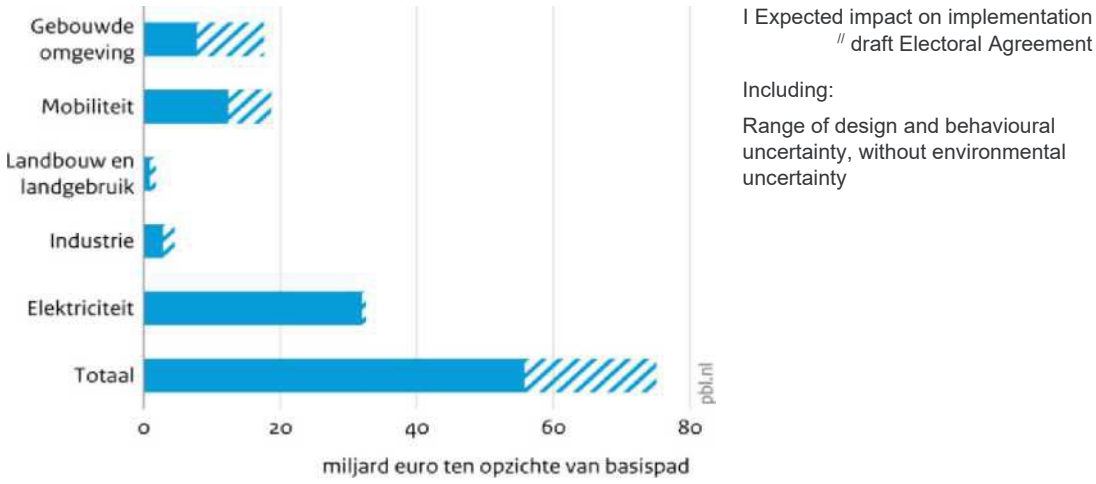
National costs can also be broken down into capital costs (interest and depreciation on investments), energy costs and other operating costs. It illustrates that the energy transition leads to a more capital intensive energy system with lower costs of purchasing energy carriers (in particular coal, oil, gas). In the previous internalisation of the Climate Agreement by PBL (2019a), the cost of capital increases by EUR 4,0 to 4,9 billion per year. Energy costs decrease by EUR 3,0-3,4 billion per year. Other operational costs increase by EUR 0,6 to 1,4 billion per year. National costs are the balance of these large items in absolute terms, and are therefore relatively sensitive to other assumptions about exogenous developments affecting capital costs and energy prices.

At the time, thecumulative additional investment over the period 2 019 to 2030 (additional to the investments in the reference) was estimated at around 56 to 75 billion euro (see Figure 5.1) (PBL, 2019a). In this estimate, investments in the electricity sector contribute about half of this. In the electricity sector, uncertainties due to design and behavioural uncertainty are small but high due to environmental factors (such as the cost development of renewable electricity generation and grid costs).

87Climate Note 2022, Parliamentary Document 32813, No 112.

88National costs are the annual additional costs for the Netherlands as a whole (compared to a baseline path) and show the aggregated financial impact of climate policy in a single figure representing the balance of capital costs, savings and revenues (PBL & ampCPB, 2020); or 'the sum of annual national CAPEX and OPEX, excluding taxes and subsidies but including savings' (Kalavasta met Berenschot, 2021). Indeed, from these national approaches, internal taxes and subsidies are not costs or benefits, but are only considered as transfers between government and other parties (the national balance remains zero).
The capital costs are annual depreciation on investments over the lifetime of the installations invested in.

Figure 5.1 Investments in implementation of the draft Climate Agreement compared to baseline, 2019-2030 (source: PBL, 2019a)



Source:

The above-mentioned PBL was based on the draft Climate Agreement, but in view of the additional task since then (from 49 % to 55 % reduction in 2030) and the government's target of 60 % reduction, these earlier findings need to be supplemented. However, it should be noted that the additional estimation of national costs cannot be easily compared with the previous pass-through because both the policy content and the baseline have changed.

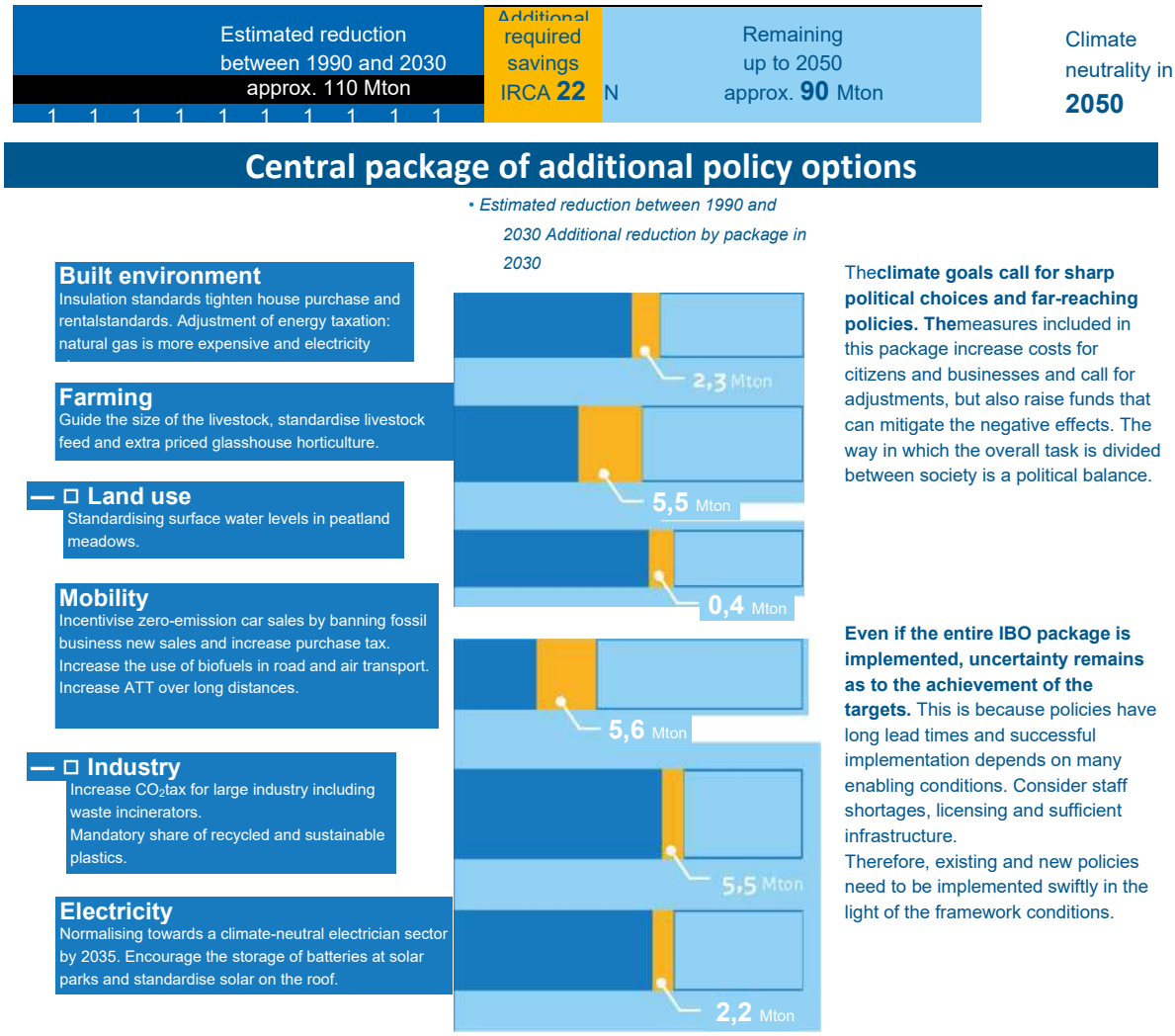
Indicative picture of national costs additional policy package of 55 % reduction

The national costs of the policy package announced in the Spring Climate Policy Decision-making to reduce greenhouse gas emissions by at least 55 % by 2030 are based on the inter-service policy surveys (IBOs)89 'Financing Energy Transition: Policy choices in terms of costs, incentives and distribution' (2021) and 'sharp goals, sharp choices: additional standard-setting and priced national climate policies for 2030 and 2050' (2023); and the accompanying annexes 'Essay on the financing of the energy transition between 2020 and 2050' (Kalavasta & ampBerenschot, 2021) and 'Cost passing-on central package' (CE Delft en Berenschot, 2023). These studies, while consistent with each other, provide an indicative picture of national climate policy costs that reduce emissions by 55 %. Due to the different choices made by the government in the Spring Decision on Climate Action to achieve the 55 % reduction compared to what IBOs assumed, the national costs (and the sectoral breakdown) will be different. As a result, for the time being, the necessary investments presented below provide only an indication of what can be expected in terms of national costs.

The IBO Climate Action (2023) identifies a policy gap of 22 Mton CO_2equivalent emission reductions to achieve the strengthened climate target of 60 % reduction by 2030. The estimate of 22 Mton (in addition to the expected reduction of already agreed policies) is based on an updated version of the estimate of the policy on the agenda in KEV2022. The IBO Working Group provides a central package of additional policy options to reduce CO_2emissions by 60 % in order to meet the 55 % target in line with the mandate and the Coalition Agreement (see Figure 5.2). In addition, two illustrative variants outline political choices for certain measures and the sectoral distribution. However, only the central policy package has been further developed in the cost accounting of CE Delft and Berenschot (2023).

89IBOs develop policy options for key policy areas. Such policy research is carried out on behalf of the Cabinet and is carried out by interdepartmental working groups. IBOs are administrative investigations conducted independently of politics.

Figure 5.2 Central package of additional policy options (source: IBO, 2023)



The calculation of national costs by CE Delft and Berenschot is largely based on the Energy Transition Model (ETM).90 The ETM is an open source calculation model that includes the Dutch energy system and can calculate the total investments for a given scenario and associated national costs. ETM has previously also been used by Kalavasta and Berenschot for the annex to the IBO Energy Transition (2021), 'Essay on the financing of the energy transition between 2020 and 2050' and the climate-neutral scenarios developed by them in the 'Integrated Infrastructure Outlook 2030-2050' (2021) commissioned by the network operators.

As described in the cost note, the costs of the measures in the central energy system policy package are calculated by sector. The costs per sector were then divided by the CO_2reduction in Mton to arrive at the estimated national costs per Mton of CO_2reduction for the different sectors. It is explicitly stated that this is not entirely equivalent to national costs, but merely gives an indication of national costs (CE Delft & ampBerenschot 2023). In addition, measures targeting non-energy emissions (e.g. land use and agriculture) fall outside the scope of the model used and for such measures the costs are approximated with a weighted average per Mton from other sectors.

90energytransition model.com/

The passing-on uses two scenarios to arrive at an indicative range of national costs. The lower value is based on the KEV 2022 (46 % reduction). This is most likely to underestimate the costs, given that the CO2 reduction$_{target}$(in Mtons) according to the KEV is lower than would be achieved with the IBO package. It is assumed that additional CO_2reduction usually results in the application of more expensive measures per tonne of CO_2 avoided, after the cheaper options have already been applied. The upper value is based on the 'IP Climate Agreement' scneario in the Energy Transition Model. In the IP scenario, the CO_2reduction in 2030 is between 91 – 96 Mt (58-60 % compared to 1990), thus achieving the 55 % emission reduction target and the 60 % target being within reach (CE Delft trough Berenschot 2023). The estimated additional costs per additional Mton of CO_2reduction achieved (compared to a baseline scenario without implementing additional CO_2reduction measures) are presented in the table below for both scenarios.

Table 5.8 Estimated additional costs per additional Mton of CO2 reduction in the IBO policy package (source: CE Delft en Berenschot, 2023)

Sector	Cost per Mton of KEV 2022	Cost per Mton IP Climate Agreement
Industry	257	346
Transport	241	250
Households	378	581
Built Environment	348	461
Greenhouse horticulture	435	280
Energy	241	250
Weighted average	304	385

On the basis of the above additional costs per Mton CO_2reduction, the national costs of the central package of additional policy options from the IBO Climate Action are estimated (see Table 5.9), resulting in total costs from 5,9 to the Subsidieregeling Verdurzaming Mkb (SVM) 7,2 billion euro for the additional CO_2reduction of 22 Mton in 2030 (in addition to the KEV2022 measures). This estimate is not exhaustive in view of the national costs of the energy system alone and may be an underestimation of the actual total national costs. As described in the note, the cost data in the table below include the annual costs of the technical measures, both investment costs and operating costs, and give an indication of how the costs of the policy package will evolve. Costs are gradually increasing from the introduction of the policy measures, but no interim calculations have been made on the path to them (CE Delft & ampBerenschot, 2023).

Table 5.9 Indicative costs of the IBO policy package in 2030 (source: CE Delft en Berenschot, 2023)

Sector	Co_2reduction in Mton	Lower value (EUR mld/y)	Upper value (EUR mld/y)
Built Environment	2,3	EUR 0,8	EUR 1,1
Farming	5,7	EUR 1,7	EUR 2,2
Use of land	0,4	EUR 0,1	EUR 0,2
Mobility[1]	5,6	EUR 1,4	EUR 1,4
Industry	5,4	EUR 1,4	EUR 1,9
Electricity	2,2	EUR 0,5	EUR 0,6
Overall	**22**	**EUR 5,9**	**EUR 7,2**

[1] *excluding international air and maritime transport*

II. Sector or market risk factors or barriers in the national or regional context

Several factors have a significant impact on the emission reductions and investments that can be expected from the package of policy measures announced by the government.[91] In general, these factors are as follows:

- Uncertainty of shape. Political choices on policy measures still need to be made, leaving the design of policy instruments open. This may lead to different outcomes. The choices still to be made in the further design determine whether more or less emission reductions can be achieved.
- Uncertainty of conduct. The extent to which policy instruments will change the behaviour of actors is uncertain. For example, by agreeing in their neighbourhoods, households could react quickly to tax incentives, but they might also wait for options to become cheaper. In many cases, it is not possible to dissociate the design and behavioural uncertainty, inter alia because the behavioural uncertainty is partly linked to the design of the instruments.
- Environmental uncertainty. Exogenous developments are uncertain, such as the development of international energy markets, European emissions trading or policies in neighbouring countries. Technological developments are also uncertain. These uncertain environmental factors contribute to uncertainty through prices, markets and technology. The effects of many policy instruments depend heavily on how prices will evolve. Decision-making and further development of agreements on additional policies needed to achieve the strengthened climate targets will reduce the uncertainty of design and thus indirectly reduce behavioural uncertainty. The environmental uncertainty relates to the dynamic context in which the Dutch climate policy is developed. The Dutch policy has only a limited impact on this.

III. Analysis of additional public finance support or resources to fill identified gaps identified under point ii

The additional investments needed to achieve the increased climate target of 55-60 % reduction by 2030 should be mobilised through the mobilisation of policy measures. Most emission reductions and investments are achieved through subsidies, standardisation and pricing. The SDE + + plays an important role in the growth of renewable electricity and plays a major role in the expected reductions and investments by industry. Also in agriculture and the built environment, the SDE + + contributes to the reductions and investments by, for example, further opening up SDE categories to glasshouse horticulture.

A combination of standardisation, pricing, subsidy and facilitation encourages industry to become more sustainable. Tailor-made arrangements with the largest industrial emitters are being stepped up. In order to avoid the displacement of emissions, the dispensation rights free from the customised arrangements will no longer be available. The rate of the CO_2lift as of 2025 is also increased on the basis of a tariff study by the PBL. In addition, a ban on the use of fossil fuels for heating processes by expansion, new construction and replacement of industrial production facilities is being developed.

In the built environment, subsidies for property owners play an important role in combination with pricing and the aforementioned neighbourhood approach. Additional investments will be made to make vulnerable neighbourhoods and villages affected by a high share of energy poverty more sustainable. Through the Heat Fund, more low-quality funding is made available for low and (low) middle-income earners by increasing the 0 % interest rate. In addition, additional funds are available in the Investment Subsidy Sustainable Energy and Energy Savings (ISDE) to support investment in, inter alia, insulation and heat pumps. To finance the unprofitable top of heat networks, the Warmte Infrastructures Subsidieregeling (WIS) has been published. In the case of mobility, the tax incentive and subsidy package makes the most important contribution to the rollout of electric passenger cars, while the government is investing in additional charging infrastructure for electric vehicles.

The Government maintains the climate challenge for livestock and arable farming at 5 Mt of greenhouse gas reduction in 2030 through the National Programme for Rural Areas (NPLG). Buy-back schemes are expected to deliver around 1 Mt of reduction. The remaining 4 Mton climate challenge is subject to normative and price-setting policies.

> The Minister for Agriculture, Nature and Food Quality agrees in the Agriculture Agreement on the practical implementation of the normative and price-setting policy.
>
> Pricing also plays a role in reducing emissions and stimulating investment. The Government shall abolish the coal tax for dual use of coal with effect from 1 January 2028. The current tax system in the Netherlands contains even more (indirect) advantages in the form of tax exemptions, rebates and adjusted tax rates that can (unintentionally) promote the use of fossil energy and fossil raw materials, thereby delaying the transition to a climate-neutral, circular industry. Energy taxation is being adjusted to make more sustainable wages and lower energy costs for households. The Government therefore introduces a reduced rate to a certain gas consumption. At the same time, the degressivity of natural gas tariffs is being addressed by increasing tariffs above the new bracket. There will be a separate price for hydrogen that is lower than the one for gas, thus encouraging companies to make them

[91] parliamentary document 32813, No 1230.

more sustainable. Finally, electricity prices are reduced in the higher consumption bands.

5.5 impacts of planned policies and measures on other Member States and regional cooperation

No sources that could be used for the INEK update are yet known. This is being taken up for the final version (June 2024).

Annex 1 Sources

Primary sources of policy: Chapter 1-3

The primary sources for this draft INEK update are:

- Integrated Energy and Climate Plan 2021-230 (INEK), Parliamentary Document 32813, No 406.
- Climate Policy Programme, Parliamentary Document 32813, No 1049.
- Spring decision-making on Climate Action April 2023, Parliamentary Document 32813, No 1230.
- PBL (2022a). Climate and Energy Outlook 2022. The Hague; PBL Planning Bureau for the Environment, see also Parliamentary Document 32813, No 1112.

Other sources for (mainly factual background to) this draft INEK update are presented below, in three categories: parliamentary documents, official journal, other documents and websites.

Parliamentary documents on policy: Chapter 1-3

Parliamentary Document 22112, No 2860 Parliamentary Letter New Commission proposals and initiatives by the Member States of the European Union

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Annex 2 Overview and description of policy measures

Attached as a document

Annex 3 Method document Energy savings

Attached as a document

Annex 4 Reporting of parameters and variables

Attached as a document

Annex 5 Projects of greenhouse gas emissions

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