

# Carbon storage under the North Sea

On profits under water

2024



Netherlands  
Court of Audit

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# 1. Executive summary

## **2030 climate goal a step towards 2050 climate neutrality**

To combat climate change and fulfil international climate agreements, the Netherlands has set itself the goals of reducing atmospheric greenhouse gas emissions significantly by 2030 and of achieving net zero by 2050. A raft of measures are available to reduce greenhouse gas emissions.

This report looks at the expected efficiency of the use of public money for carbon capture and storage (CCS) and more specifically at the cost efficiency of the Porthos project to store carbon dioxide (CO<sub>2</sub>) in a depleted gas field under the North Sea. The audit was prompted by Porthos's pivotal role to achieve the 2030 climate goal. The Minister for Climate and Energy (K&E) believes the 2030 goal will not be met without Porthos. In our opinion, dependence on this project means there is a real risk that the government will be tempted to increase its exposure to financial risks.

## **Porthos: carbon storage under the North Sea**

Porthos is an infrastructure project in the Port of Rotterdam and the North Sea for the transport and storage of carbon dioxide. The project is in public hands and is financed by 3 state-owned enterprises: Energie Beheer Nederland (EBN), Gasunie and the Port of Rotterdam. The infrastructure, requiring an investment of €1.2 billion, will consist of a collector pipeline running through the port area, a compressor station to pressurise the CO<sub>2</sub> and a pipeline from the coast to a platform in the North Sea. At the platform the CO<sub>2</sub> will be pumped into a depleted natural gas field deep below the seabed for storage. Porthos has 4 customers. They are all international industrial companies active in the port area: Air Liquide, Air Products, ExxonMobil and Shell. They will capture the CO<sub>2</sub> produced in their industrial processes and

supply it to Porthos. The first CO<sub>2</sub> is expected to be stored underground in 2026 and the former gas field will be completely filled by 2042, when it will be permanently sealed.

The Dutch government is represented at several levels in decision-making on Porthos. The Minister of Economic Affairs and Climate Policy (EZK) is the sole shareholder in EBN and the Minister of Finance is a shareholder in Gasunie and the Port of Rotterdam. The State Secretary for EZK awarded Porthos a permit to store CO<sub>2</sub> permanently under the North Sea and the Minister for K&E decided that Porthos's customers qualified for grant funding of up to €2.1 billion.

### **Porthos's contribution to the 2030 climate goal**

By having Porthos store their CO<sub>2</sub>, the 4 customers will not release it into the atmosphere. This will help the Netherlands achieve its climate goal for 2030. The former gas field is expected to be completely filled by 2042. In the meantime, the government, businesses and society will need to take further steps to achieve net zero by 2050. Porthos's customers must therefore have found a solution for their CO<sub>2</sub> emissions by 2050. The solution might be further carbon capture and storage or an alternative means to prevent atmospheric CO<sub>2</sub> emissions. The Porthos CCS project is a temporary solution; it is buying the government and industry time to find a permanent solution to become climate neutral by 2050.

### **The Porthos CCS project is economical for the government...**

On the basis of current expectations, our calculations indicate that Porthos's storage of CO<sub>2</sub> will not require public money. The project will probably be a source of government income through the taxes that Porthos and its customers pay. We conclude that CCS funding through the SDE++ Sustainable Energy Production and Climate Transition Incentive Scheme is expected to be an exceedingly efficient means to reduce atmospheric CO<sub>2</sub> emissions. The cost per tonne of CO<sub>2</sub> avoided will be comfortably below the efficiency standard of €300 per tonne of CO<sub>2</sub> avoided.

The government will assume full responsibility for the CO<sub>2</sub> storage in 2062. The long-term risk of CO<sub>2</sub> storage, the risk of leaks and the monitoring costs will then be for the account of the State. The risk of leaks, according to experts, is very low but the timeframe is never-ending. The financial cost of potential risks has not been reliably calculated, but we estimate that the Porthos CCS project will still be profitable for the government if future setbacks remain under €1 billion (2023 prices) after 2062. However, there is another perspective to the potential costs. As noted above, the

government applies an efficiency standard of €300 per tonne of CO<sub>2</sub> avoided. On this basis, costs of €30 billion (2023 prices) still fall within the efficiency standard.

**... but the government should do even better for itself**

In our opinion, the outcome of the Porthos CCS project should be even more favourable for the government. This is on account of the EU emissions trading system, in which Porthos's customers are obliged to participate. Porthos's CO<sub>2</sub> storage will reduce the customers' atmospheric emissions and the customers will accordingly need to surrender fewer CO<sub>2</sub> emission allowances. They can then sell surplus allowances they hold and will not need to buy additional ones.

The price of CO<sub>2</sub> allowances has risen sharply in recent years. Our calculations indicate that CO<sub>2</sub> storage will be very profitable for Porthos's customers, with an estimated return of 34.2%. This is in stark contrast to the projected financial result of Porthos, the owner of the infrastructure. With a projected return of 2.2%. Porthos, which is publicly owned and funded through taxation, is not expected to realise its target return. In light of the risks, the investment in Porthos will simply not earn enough money. As the government will ultimately assume the long-term risks of CO<sub>2</sub> storage, in our opinion it should profit more from the Porthos CCS project.

Our conclusions on the efficiency of the Porthos CCS project for the government and the projected financial results of Porthos and its customers are based on *estimated* efficiency, as there are uncertainties in the underlying calculations. Future financial results may therefore develop differently than projected.

**Our recommendations**

Porthos is the first large-scale CCS project to be undertaken in the Netherlands and the agreements among the parties involved in the project have already been signed. Given its pioneering character, Porthos will inevitably encounter unforeseen windfalls and setbacks. We expect the government to learn from the experience and apply the lessons in future CCS projects. The Minister for K&E's predecessor in office had likewise assumed that the lessons learned from Porthos would reduce the cost of future CCS projects.

We recommend that the ministers and state secretary involved in future CCS projects carefully map out all the State's expected costs (such as grants and tax concessions) and benefits (such as profits and energy taxes). Having this information is a precondition to weigh up the importance of public money and other public interests correctly when decisions are taken on the projects.

The ministers and state secretary must make better use of the opportunities offered by the Mining Act and the SDE++ grant scheme to ensure that more of the benefits of CCS accrue to the public purse. In anticipation of future CCS projects, we recommend that the Minister for K&E and the State Secretary for EZK study opportunities:

- to adapt the SDE++ grant scheme in order to cap the profits earned by grant recipients and enable the government to benefit from high CO<sub>2</sub> prices, too;
- to include, based on the Mining Act, an annual charge in the storage permit and introduce a contribution to offset other foreseeable costs to the government when it assumes responsibility for the CO<sub>2</sub> storage.

## Summary of conclusions and recommendations

Conclusions	Recommendations	Response
Porthos is an efficient means to achieve the 2030 climate goal.		The minister sees the conclusions as important support for current CCS policy.
The government's share in the benefits of the Porthos CCS project are disproportionate to its risk exposure and expected CO <sub>2</sub> price movements	<p><b>Minister for K&amp;E and State Secretary for EZK</b></p> <p>In future CCS projects, study the use of opportunities offered by the Mining Act and the SDE++ scheme to have more revenue accrue to the government. Also assess the consequences of a scenario in which the carbon capture companies or the operator of the transport and storage infrastructure enjoys a disproportionately high benefit from CCS given their risk exposure.</p>	The minister does not respond specifically to the conclusion regarding Porthos. The minister undertakes to study the opportunities offered by the Mining Act and the SDE++ scheme to have more of the benefits of CCS accrue to the government.
The government's support for the Porthos CCS project is expected to be a very efficient means to achieve the 2030 climate goal.		The minister sees the conclusions as important support for current CCS policy
On purely financial grounds, the expected return on the investment in Porthos's infrastructure is too low given the risks the shareholders are running.		The minister agrees with the Court of Audit's conclusion that the Porthos project does not yet meet the return indicators set for this type of project for state-owned enterprises.
Investments in Porthos are expected to be very profitable for Porthos's customers.		The minister does not specifically consider the expected return. She notes that she does not think the high avoided EU ETS costs are a problem.



Conclusions	Recommendations	Response
<p>The ministers and state secretary did not have a full understanding of Porthos's financial consequences for the public purse at important decision points.</p>	<p><b>Minister of EZK and Minister of Finance</b>  As shareholders, in conjunction with the policy-making ministry analyse all costs and benefits of investments made by state-owned enterprises in CCS projects in advance. The analysis could take the form of a social cost-benefit analysis (SCBA). Carry out the analysis preferably well before the final investment decision is taken. The policy-making ministry can use the outcomes when deciding on the grant award and the storage permit.</p>	<p>The minister undertakes to study how the other ministries can improve cooperation between shareholders and policy-making ministries.</p>
<p>It is uncertain whether EBN's participation in Porthos meets the Mining Act's requirements and a legal analysis to dispel the uncertainty has not been made.</p>	<p><b>State Secretary for EZK</b>  Analyse the extent to which EBN's participation in Porthos complies with the requirements of the Mining Act. Consider what amendments of the Mining Act or of the participation are necessary for EBN's participation in future CCS projects.</p>	<p>The minister makes no concrete undertaking. She will check, however, whether EBN's participation meets the requirements of the Mining Act and will consider whether the Mining Act should be amended in the future.</p>

# 2.

## About this audit

### 2.1 Background

The Netherlands has set the goal of reducing its annual atmospheric greenhouse gas emissions by 55% by 2030 relative to 1990. According to the Minister for Climate and Energy (K&E), carbon capture and storage (CCS) is the key to achieving this goal (EZK, 2023a).

Coming on stream in 2026, the Porthos project in the Port of Rotterdam will be the first large-scale project in the Netherlands to capture CO<sub>2</sub> and store it in a depleted gas field in the North Sea. The previous Minister for K&E had assumed that lessons learned from the Porthos project would lower the cost of future projects (EZK, 2021a). Porthos is not expected to be the last CCS project to store CO<sub>2</sub> under the North Sea. In our opinion, the benefits and financial risks of CCS should therefore be recognised at an early stage – even before construction of the Porthos infrastructure is completed – and recommendations should be made for future CCS policy.

The Porthos project has consequences for the public purse. Porthos is a joint venture of 3 state-owned enterprises: Energie Beheer Nederland (EBN), Gasunie and the Port of Rotterdam. Through these companies, the government is an investor in Porthos. Furthermore, Porthos's customers – the companies whose CO<sub>2</sub> emissions will be stored by Porthos – can potentially receive grant funding of up to €2.1 billion. As from 2062, moreover, the government itself, not Porthos, will be responsible for the safety of carbon storage.

## 2.2 Audit design

We audited whether the government could invest public money in CCS more efficiently. We also examined whether the Minister of Economic Affairs and Climate Policy (EZK) as the shareholder in EBN and the Minister of Finance as a shareholder in Gasunie and the Port of Rotterdam could have taken better decisions when approving the state-owned enterprises' CCS investment proposals.

The main sources we drew on for our audit were:

- the Porthos business case, an Excel file containing all Porthos's cost and revenue projections;
- the feasibility studies containing expected costs, revenues and returns that Porthos's customers prepared for the Netherlands Enterprise Agency (RVO) as part of their SDE++ grant applications;
- the contracts between Porthos and its customers.

We supplemented this information with economic data from other sources. They included CO<sub>2</sub> price projections made by the Netherlands Environmental Assessment Agency (PBL) in its Climate and Energy Outlook 2022 (PBL, 2022). We applied a range of scenarios to determine the impact of high and low price levels on both the government and Porthos's customers' financial results. More information on the scenarios is presented in appendix 2.

We used this information to calculate the expected efficiency of the public money invested in Porthos. Both parliament and the government need information on the efficiency of the use of public funds. Our calculations of the expected efficiency is consistent with the methodology applied by the Minister for K&E to award SDE++ grants. The calculations are based on the cost per tonne of atmospheric CO<sub>2</sub> avoided and the return expected by the parties concerned. Our calculations did not consider Porthos's impact on the business climate or the competitiveness of the Port of Rotterdam.

## 2.3 Structure of this report

Chapter 3 outlines the Porthos project and EU and Dutch CCS policy. Chapter 4 looks at Porthos's contribution to the 2030 climate goal and the effectiveness of its CCS. Chapter 5 considers the risk exposures of the government, Porthos and Porthos's customers. Chapter 6 provides an insight into the funds flows expected between the parties. It also considers the expected efficiency of the Porthos CCS project for the government and the return foreseen by Porthos and its customers. We present our findings on the government's main decision points relating to Porthos in chapter 7 and our conclusions and recommendations in chapter 8. Chapter 9 closes with the response of the ministers and state secretary and our afterword.

# 3.

## Porthos: carbon storage under the North Sea

The Minister for K&E wants to reach the national climate goal for 2030 by means of carbon capture and storage (CCS).

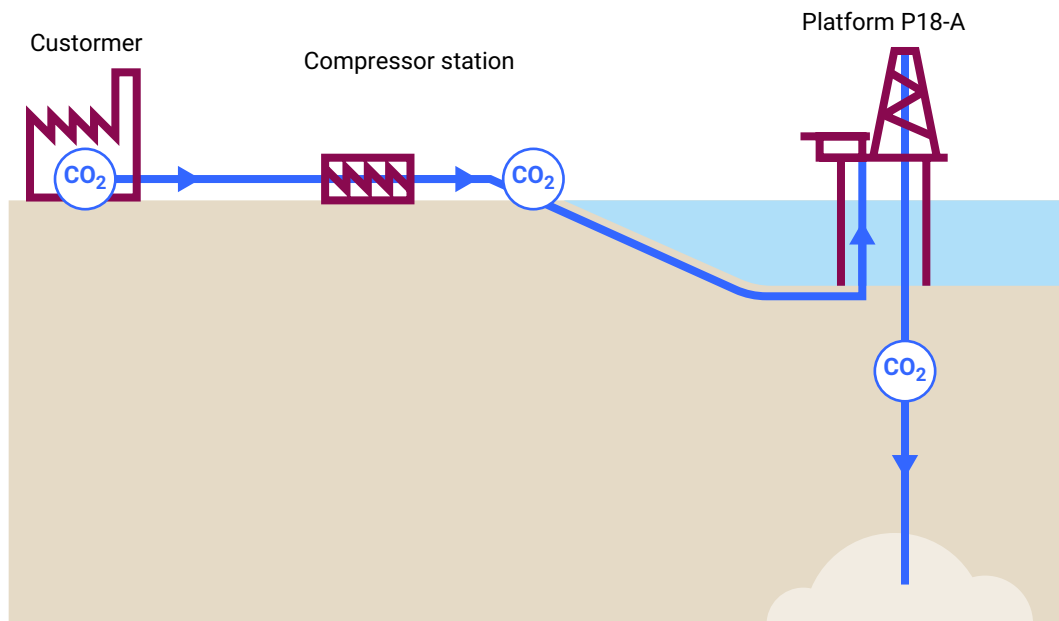
This chapter outlines the Porthos CCS project and its history. It then looks at the government ministers involved in the project and the role of CCS in European and Dutch climate policy. We discuss the EU emissions trading system (EU ETS), the SDE++ Sustainable Energy Production and Climate Transition Incentive Scheme and the relationship between CO<sub>2</sub> prices and the SDE++ grants awarded for CCS.

### 3.1 Porthos and its customers

Porthos was established jointly by 3 state-owned enterprises, EBN, Gasunie and the Port of Rotterdam. The name Porthos stands for Port of Rotterdam CO<sub>2</sub> Transport Hub and Offshore Storage. The Porthos infrastructure consists of a 30-kilometre collector pipeline running through the Port of Rotterdam, a compressor station and a pipeline from the coast to platform P18-A in the North Sea. The platform will then inject the CO<sub>2</sub> into a depleted natural gas field with several reservoirs (see figure 1).

**Figure 1** *The Porthos CCS project infrastructure*

**Captured CO<sub>2</sub> is piped to platform P18-A and injected into a depleted gas field**



Porthos will transport and store CO<sub>2</sub> in a series of steps:

- CO<sub>2</sub> capture: Porthos's 4 customers capture the CO<sub>2</sub> emitted as a by-product in their industrial processes. They then feed it into Porthos's collector pipeline. The collector pipeline runs past the 4 customers' sites in the Botlek area of the port.
- Transport and compression: Porthos transports the CO<sub>2</sub> through the collector pipeline to the compressor station on the Second Maasvlakte, where it is pressurised. The CO<sub>2</sub> is then transported from the compressor station about 23 kilometres through a subsea pipeline to platform P18-A.
- Injection and storage: the platform injects the CO<sub>2</sub> into a depleted gas field operated by oil and gas company TAQA.
- Sealing: When the CO<sub>2</sub> storage is completely full, expected in 2042, Porthos will permanently seal the injection wells.

Porthos's 4 customers are:

- Air Liquide Industrie B.V., a producer of industrial and medical gases and related services. It is a member of the listed French group, Air Liquide S.A.
- Air Products Nederland B.V., an industrial gas company that supplies gases and related equipment to a raft of industries including refinery and chemical sectors. Air Products Nederland B.V. is a subsidiary of Air Products and Chemicals Inc., a listed US company.

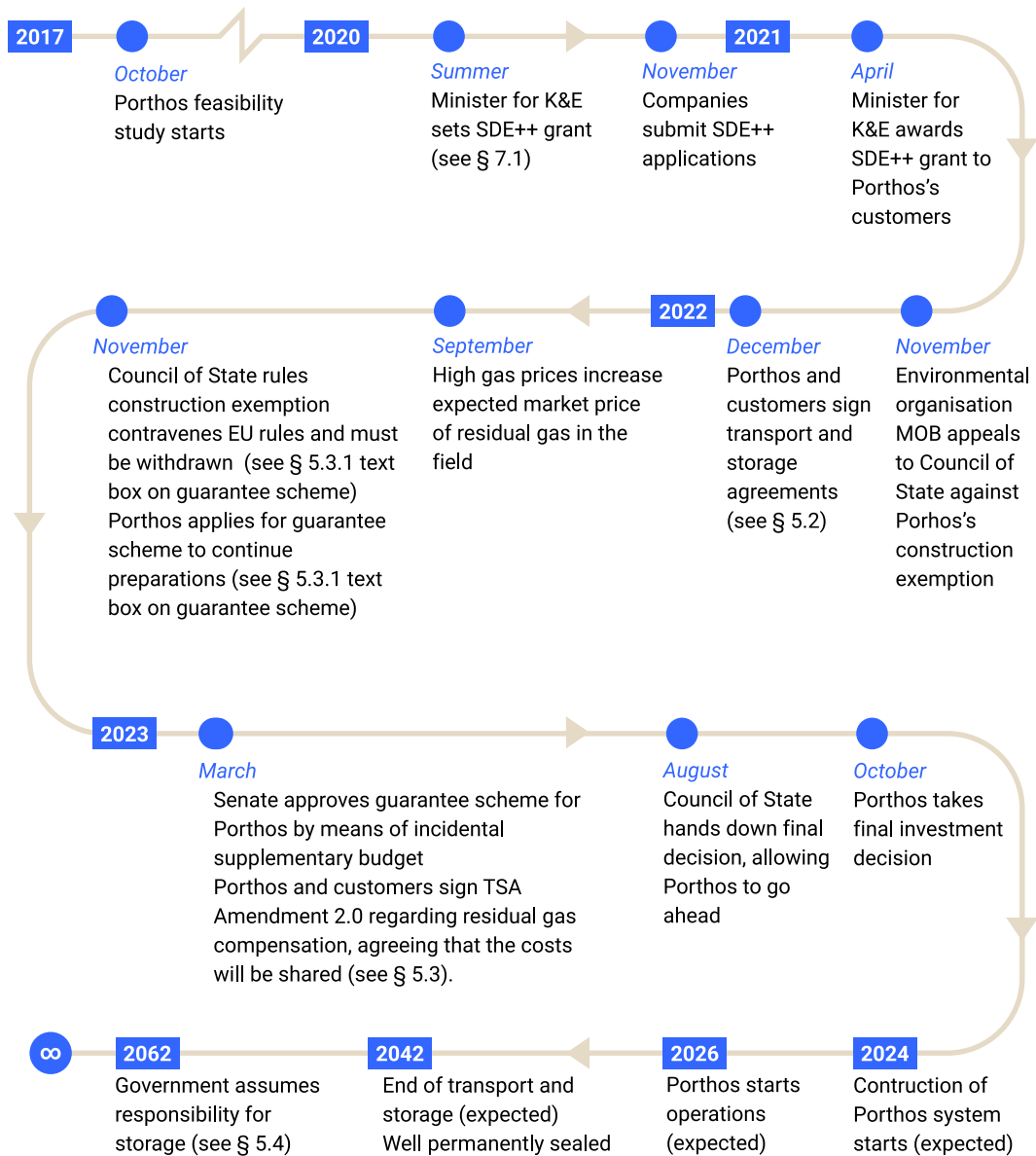
- Esso Nederland B.V., a refiner of oil products, is a wholly-owned subsidiary of the US listed company ExxonMobil Corporation.
- Shell Nederland Raffinaderij B.V., a refiner of petroleum into oil products and basic chemicals. Shell Nederland Raffinaderij B.V., is a wholly-owned subsidiary of Shell Nederland B.V., which in turn is a wholly-owned subsidiary of Shell plc, a listed company in the United Kingdom.

## 3.2 Porthos timeline

Figure 2 shows the Porthos timeline from the initial feasibility study in October 2017 to the Porthos shareholders' final investment decision in October 2023. Where points on the timeline are discussed in this report, a reference to the relevant section is provided.

**Figure 2** Porthos timeline

**CO<sub>2</sub> will be stored as from 2026, the wells will be permanently sealed in 2042**



### 3.3 The ministries concerned

The government is participating in the Porthos project through the Ministry of EZK and the Ministry of Finance. Figure 3 shows the roles they play.

On behalf of the State, the Minister of Finance is a shareholder in Gasunie and the Port of Rotterdam. The Minister of EZK is the sole shareholder in EBN. Gasunie, the Port of Rotterdam and EBN are in turn shareholders in Porthos.

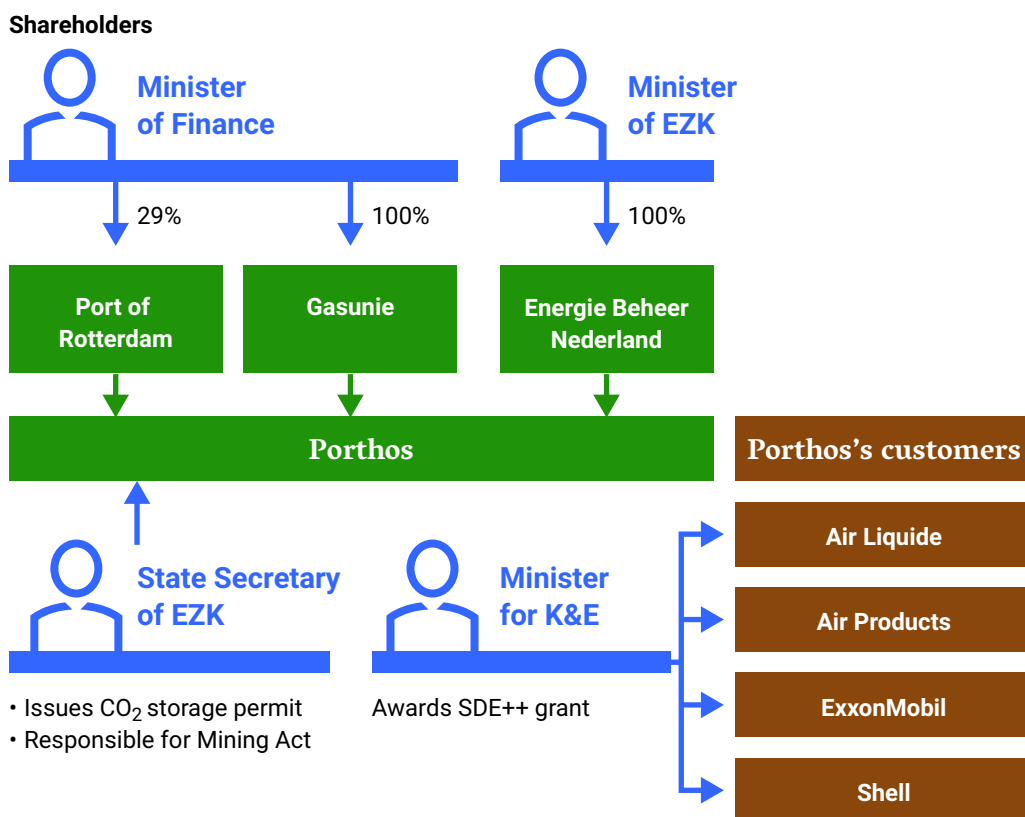


The State Secretary for EZK granted Porthos a permit for the permanent storage of CO<sub>2</sub> under the North Sea. The state secretary is also responsible for implementation of the Mining Act.

The Minister for K&E, who falls under the Ministry of EZK, decides on the maximum amount of SDE++ grant funding Porthos's customers can receive and is responsible for the grants' disbursement.

**Figure 3** The role of the ministers and state secretary in Porthos

**Ministers and state secretary involved in Porthos as shareholders, awarder of grants and issuer of storage permit**



### 3.4 CCS in climate policy

Atmospheric greenhouse gas emissions are generally acknowledged as the main cause of global warming. Policies are therefore being developed at global, European and national level to halt climate change. This section briefly considers the role of European and Dutch climate policy and CCS. The policy will largely determine the expected efficiency of the Porthos CCS project for the government.

### **3.4.1 European climate policy: EU ETS and CCS**

The EU emissions trading system (EU ETS) regulates the greenhouse gas emissions of a range of energy intensive industries in 30 European countries, including the Netherlands. Porthos's 4 customers are required by law to take part in the EU ETS. The European Commission sets a cap on the amount of CO<sub>2</sub> that ETS companies may emit each year. The cap is reduced annually in line with the EU's climate target. The number of tonnes of CO<sub>2</sub> that can be emitted is equal to the number of emission allowances (CO<sub>2</sub> allowances) available on the market each year.

A company must surrender a CO<sub>2</sub> allowance for every tonne of CO<sub>2</sub> it emits. Companies can obtain CO<sub>2</sub> allowances in several ways. In certain circumstances they can receive them free of charge from the government, and they can buy them from auctions and trading platforms or from other companies. The price of CO<sub>2</sub> allowances has risen steeply in recent years. This is a stimulus for companies to reduce their emissions, otherwise they will have to buy expensive allowances on the market.

The EU ETS is also an incentive to invest in CCS. Companies that permanently store their CO<sub>2</sub> underground do not need to surrender CO<sub>2</sub> allowances. This is because their CO<sub>2</sub> is not released into the atmosphere. Higher CO<sub>2</sub> allowance prices increase the attraction of investing in CCS.

### **3.4.2 SDE++ grant scheme supports CCS projects**

The government is promoting CCS by awarding grants through the SDE++ Sustainable Energy Production and Climate Transition Incentive Scheme. This is laid down in the Climate Agreement (2019) and the Coalition Agreement of the fourth Rutte government (2021). The Minister for K&E has set a limit of €300 per tonne of CO<sub>2</sub> avoided. This limit plays an important role in assessing the expected efficiency of the SDE++ scheme.

Porthos's customers will qualify for SDE++ grant funding for every tonne of CO<sub>2</sub> they capture and Porthos stores under the North Sea during the project's 15 year life. The grants will not be paid to Porthos but to its customers. Below, we explain the constituent parts of the SDE++ scheme for the 4 customers and how the CO<sub>2</sub> price influences the grant.

### The unprofitable component

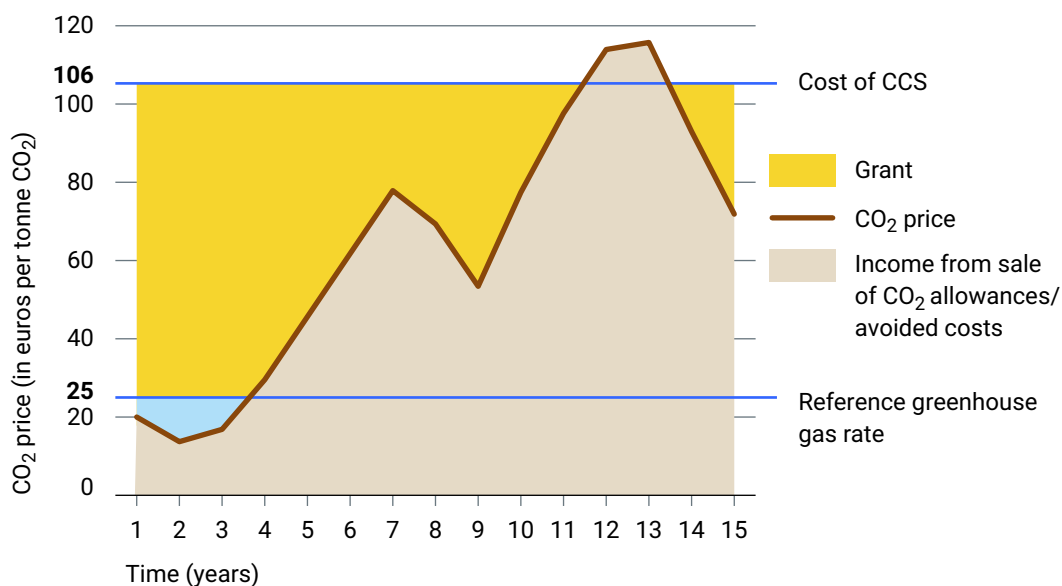
The SDE++ scheme awards operating grants. In the case of CCS, companies qualify for a grant if they capture and store their CO<sub>2</sub>. Porthos's customers could apply for a grant in 2020 for the carbon they captured and stored via Porthos. The grant covered the financial gap in the CCS project between:

- the expected cost of CO<sub>2</sub> capture, transport and storage,<sup>1</sup> including a reasonable return on investment, and
- the revenue from the sale of CO<sub>2</sub> allowances or the avoided cost of having to buy additional CO<sub>2</sub> allowances.

The SDE++ scheme guarantees Porthos's customers that they will earn a reasonable return on their investment as the grant will cover the gap between costs and revenues. This is shown in figure 4.

**Figure 4** Notional example of how the SDE++ works

**The amount of Porthos's customers' annual SDE++ grant depends on the CO<sub>2</sub> price**



The Minister for K&E calculates the expected cost of CCS, including a reasonable return, based on a recommendation by the Netherlands Environmental Assessment Agency (PBL). In figure 4, the expected cost is €106 per tonne of CO<sub>2</sub> (PBL, 220). The CO<sub>2</sub> price is a major influence on Porthos's expected efficiency for the government as it will determine the amount of the SDE++ grants that the Minister for K&E will actually award. The minister awards grants to Porthos's customers as long as the CO<sub>2</sub> price remains below the expected cost of CCS. If it exceeds the strike price,

there is no financial gap and the minister does not award grants (see year 12 in figure 4). If the CO<sub>2</sub> price falls below the reference or base price for greenhouse gases, the minister does not award grants to cover the difference between the reference price and the strike price (see year 2 in figure 4). This limits the amount payable from the SDE++ scheme. The reference price is based on two-thirds of the expected long-term price over the course of the SDE++ scheme.

### **CO<sub>2</sub> price**

The CO<sub>2</sub> price also influences the overall costs to Porthos's customers'. They benefit from rising CO<sub>2</sub> prices even though they will receive less from the SDE++ scheme. They can sell their unused CO<sub>2</sub> allowances at higher prices and will not need to buy additional expensive CO<sub>2</sub> allowances.

For Porthos's customers this is currently a realistic scenario. CO<sub>2</sub> prices have risen from €22 per tonne in January 2019 to more than €100 per tonne in February 2023. The PBL's annual Climate and Energy Outlook predicts a further increase in CO<sub>2</sub> allowance prices to €110 per tonne in 2030 and €179 per tonne in 2040 (PBL, 2022). CO<sub>2</sub> price movements, however, are uncertain as they are subject to market conditions and EU ETS policy. The CO<sub>2</sub> price is part of the highly regulated EU ETS market (Trinomics, 2022). At some point in the future, the EU could decide to revise the regulations.

# 4.

## 2030 climate goal and the efficiency of Porthos

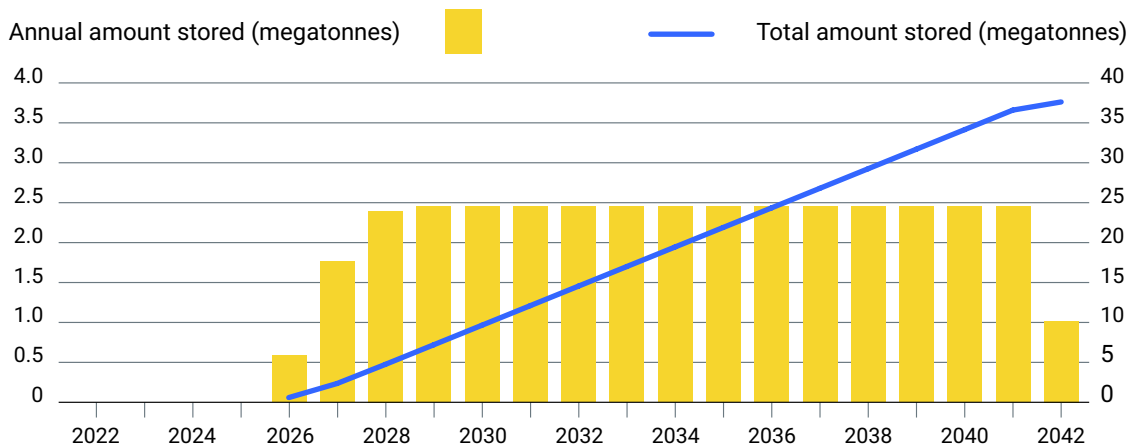
To draw a conclusion on Porthos's expected efficiency (cost effectiveness) for the government, we first asked whether Porthos was effective. In this chapter we show that it will be: Porthos will contribute to the 2030 climate goal by storing carbon under the North Sea. The amount of carbon Porthos stores is not equal to the amount of CO<sub>2</sub> emissions avoided as carbon capture and storage itself will consume energy. Our calculation of the expected amount of CO<sub>2</sub> avoided reveals Porthos's expected contribution to the 2030 climate goal.

### 4.1 Expected CO<sub>2</sub> storage by Porthos

Figure 5 shows how much CO<sub>2</sub> Porthos is expected to store each year. Over the project's lifetime, it will store 37.6 megatonnes in total, slightly more than the 37.5 megatonnes for which the customers can be awarded SDE++ grants.

**Figure 5** Annual amount of CO<sub>2</sub> Porthos is expected to store

**Porthos expects to store 37.6 megatonnes of captured CO<sub>2</sub> in total**



Source: Porthos

Porthos's storage of CO<sub>2</sub> will begin with a start-up phase of nearly 18 months from September 2026 to January 2028. In the subsequent 14-year commercial phase, Porthos will store some 2.45 megatonnes of captured CO<sub>2</sub> every year until the well is completely full in May 2042.

## 4.2 Avoided CO<sub>2</sub> emissions due to Porthos

The amount of CO<sub>2</sub> that Porthos stores will be not equal to the CO<sub>2</sub> emissions avoided. There are 2 reasons for this. Firstly, the energy consumed for CCS produces its own emissions. Secondly, the CO<sub>2</sub> avoided will not be 100% pure; it will contain nitrogen oxides, sulphur compounds and other impurities.

The energy consumed to capture, purify and pressurise the CO<sub>2</sub> will also be a source of emissions. The facilities that consume the most energy will be the customers' carbon capture and compressor plants and Porthos's compressor on Maasvlakte. Using data from the PBL, we calculated the net CO<sub>2</sub> avoided after allowing for these additional emissions and correction for the expected percentage of impurities, we come to a 'return' of 92% for Porthos. Our estimate of the net CO<sub>2</sub> avoided by the Porthos CCS project is 37.6 megatonnes x 92% = 34.6 megatonnes.

### 4.3 Porthos's contribution to the 2030 climate goal

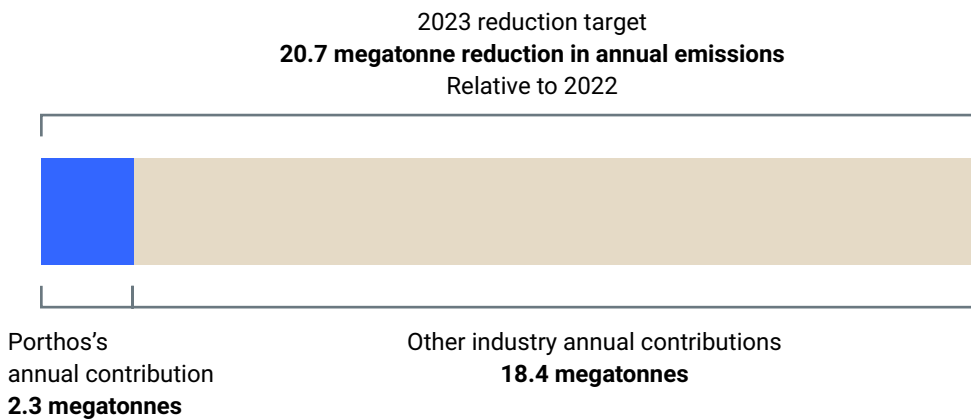
The Netherlands is aiming for climate neutrality by 2050. To achieve this goal, the Climate Act lays down that the Netherlands must reduce its annual atmospheric greenhouse gas emissions by 55% by 2030 relative to 1990. Industry is playing its part by reducing CO<sub>2</sub> emissions by 20.7 megatonnes by 2030 relative to 2022 (EZK, 2023b).

We conclude that the government and industry are taking a significant step towards the 2030 goal through Porthos. This is a positive development. We base this conclusion on 2 important points:

1. With avoided CO<sub>2</sub> emissions of 2.3 megatonnes<sup>2</sup> per annum, Porthos will make a significant contribution to industry's 2030 climate goal. This is shown in figure 6. The Porthos CCS project is therefore effective.
2. Future CCS projects can make use of the annual overcapacity of approximately 7 megatonnes in the Porthos's landside pipeline and compressor station. Future projects will thus also contribute to the climate goals for 2030 and beyond.

**Figure 6** Porthos's contribution to the 2030 climate goal

#### Porthos will make a significant contribution to the 2030 climate goal



The conclusion on Porthos's effectiveness is not without a caveat. The storage field is expected to be full by 2042. Porthos will then no longer contribute to the 2050 goal of climate neutrality. Overcapacity in Porthos's landside pipeline and compressor station may contribute to the 2050 climate goal, however, if it is used in future CCS projects.

There is another side to Porthos's contribution to the 2030 climate goal. The Minister for K&E thinks the 2030 goal will be beyond reach without Porthos (EZK, 2022a). Porthos's customers also informed us that there was no alternative route to the 2030 goal if Porthos did not go ahead. We cannot say whether there is no alternative. Given the 2030 climate goal's reliance on Porthos, there is a realistic risk that the government will be tempted to take more financial risks than strictly necessary for the project's success. We consider this in more detail in § 8.1.

## 4.4 Conclusion

We conclude that the Porthos project is expected to reduce atmospheric CO<sub>2</sub> emissions by 34.6 megatonnes. Its expected contribution to the 2030 climate goal is 2.3 megatonnes per annum. It will thus make a direct contribution towards the goal and is therefore effective. This is positive.

To achieve climate neutrality by 2050, Porthos's customers will have to find another solution for their carbon emissions. That could be another CCS project or an alternative technique that prevents atmospheric emissions. A solution will have to be found if industry is to achieve net zero by 2050.



# 5.

## Allocation of risks and benefits

For this audit, we investigated the allocation of risks between the government, Porthos and Porthos's customers. Knowing what costs and benefits would arise from the allocation of risks would help us put our conclusions on Porthos's expected efficiency into perspective.

Porthos's risks arise from 3 types of agreement:

- the SDE++ grant conditions set by government;
- the agreements in the transportation and storage contract between Porthos and its customers, including the addendum on compensation for residual gas in the field;
- government regulations on Porthos's storage permit.

We conclude that the allocation of risks will lead to the government not sharing proportionally in the benefits of the Porthos CCS project if CO<sub>2</sub> prices are high.

### 5.1 SDE++ grants

In April 2021, the Minister for K&E decided to award SDE++ grants to Porthos's customers to mitigate the risk of CCS being more expensive than the alternative: the surrender or purchase of CO<sub>2</sub> allowances.

### **5.1.1 Risk allocation in the SDE++ grants**

The Minister for K&E has factored many of the risks to the government into the SDE++ grant conditions. The expenditure risk in EZK's budget, for instance, is limited by upper and lower limits on the amount awarded per tonne of CO<sub>2</sub> stored. They were calculated using the expected cost of CO<sub>2</sub> and the reference greenhouse gas rate (see § 3.4.2). The maximum amount of SDE++ grants that will be awarded to Porthos's customers is capped at €2.1 billion (EZK, 2021b).

The Minister for K&E has also limited the risk of grant awards being higher than strictly necessary. One of the grant conditions is that RVO<sup>3</sup> will assess whether Porthos's customers have received excessive grant funding. A year after the carbon capture plants come on stream, RVO will check whether the grant recipients are receiving too much support, for example because the actual cost of CCS is lower than the expected cost on which the SDE++ grant was based. The SDE++ grant conditions allow recipients to earn a reasonable return. RVO defines a reasonable return as the profit margin recommended to the Minister for K&E by the PBL (PBL, 2020). If Porthos's customers are awarded SDE++ grants and their profits exceed the reasonable return, i.e. if they are over-incentivised, RVO will reduce the grant they receive during the remainder of the funding term.

The customers will receive grant funding only for the CO<sub>2</sub> that Porthos actually stores after correction for impurities. They will not receive grant funding for CO<sub>2</sub> that they supply to Porthos but Porthos is unable to store because of leaks, pipeline maintenance, etc.

Finally, the Minister for K&E has limited the risk of Porthos's customers, for whatever reason, withdrawing from the project. The customers have signed an implementation agreement with the State. Furthermore, all customers were required to provide a bank guarantee equal to 2% of the maximum grant award. If a customer does not take its carbon capture plant into use, the State can collect the entire amount of the bank guarantee.

### **5.1.2 Consequences for the allocation of risks and benefits**

#### **CO<sub>2</sub> price movements will determine the return earned by Porthos's customers**

SDE++ grants will cover only the financial gap between the expected cost of CCS and the CO<sub>2</sub> price. The CO<sub>2</sub> price, however, is underpinned by a minimum price level known as the reference greenhouse gas rate. If the CO<sub>2</sub> price falls below the reference price, the government funds the difference between the reference price

and the expected cost of CCS. The return earned by Porthos's customers will then be less than the reasonable return the PBL recommended to the Minister for K&E.

It is to the customers' advantage if the CO<sub>2</sub> price is higher than the expected cost of CCS. They will then not need to buy expensive CO<sub>2</sub> allowances and will be able to sell surplus allowances.

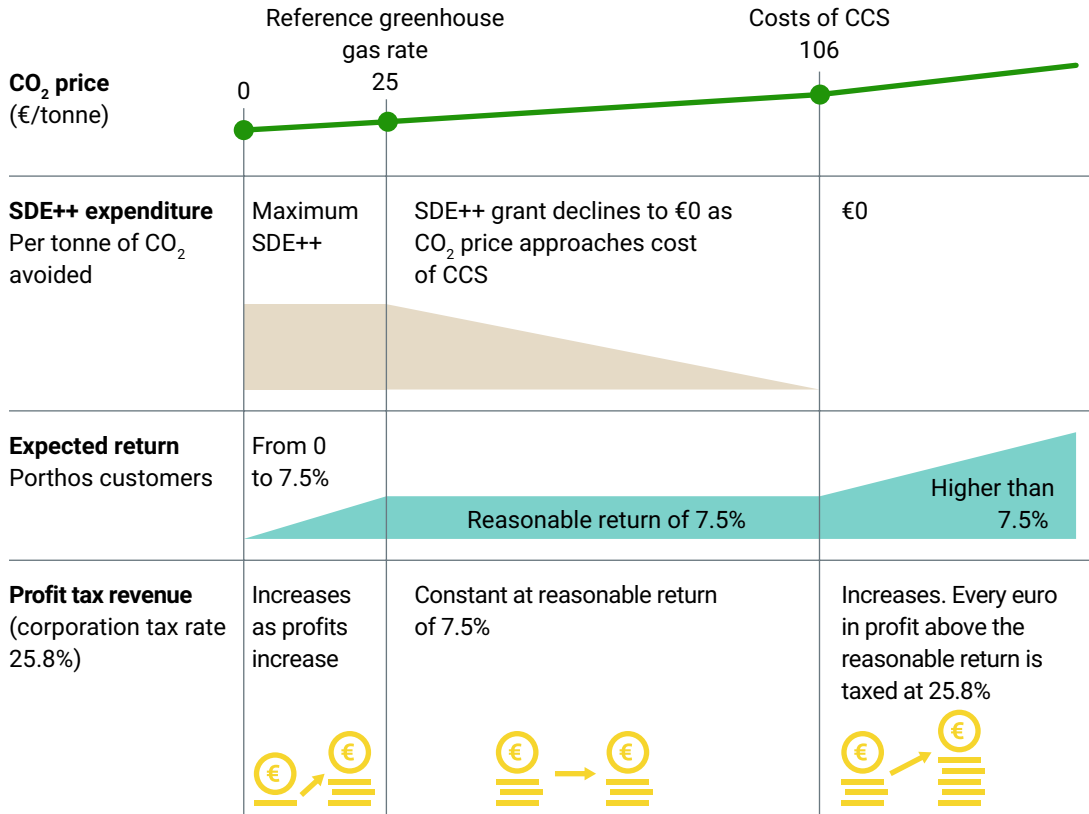
### **Movements in the CO<sub>2</sub> price determine the government's SDE++ costs**

Figure 7 shows that the government, too, will benefit from a high CO<sub>2</sub> price. If the CO<sub>2</sub> price is equal to or higher than the expected cost of CCS, the government need not award an SDE++ grant. The CO<sub>2</sub> price in figure 7 is €106 per tonne. It is currently thought that the government will not need to award SDE++ grants to Porthos's customers.

The government will not profit directly from the additional profit the customers earn if the CO<sub>2</sub> price continues to rise above the expected cost of CCS. Indirectly, however, it will benefit from the additional tax that Porthos's customers pay on the higher profits they earn. For the purpose of our audit, we assume that circumstances will remain unchanged.

**Figure 7** Notional example of the influence of CO<sub>2</sub> prices on SDE++ expenditure and profit tax revenue

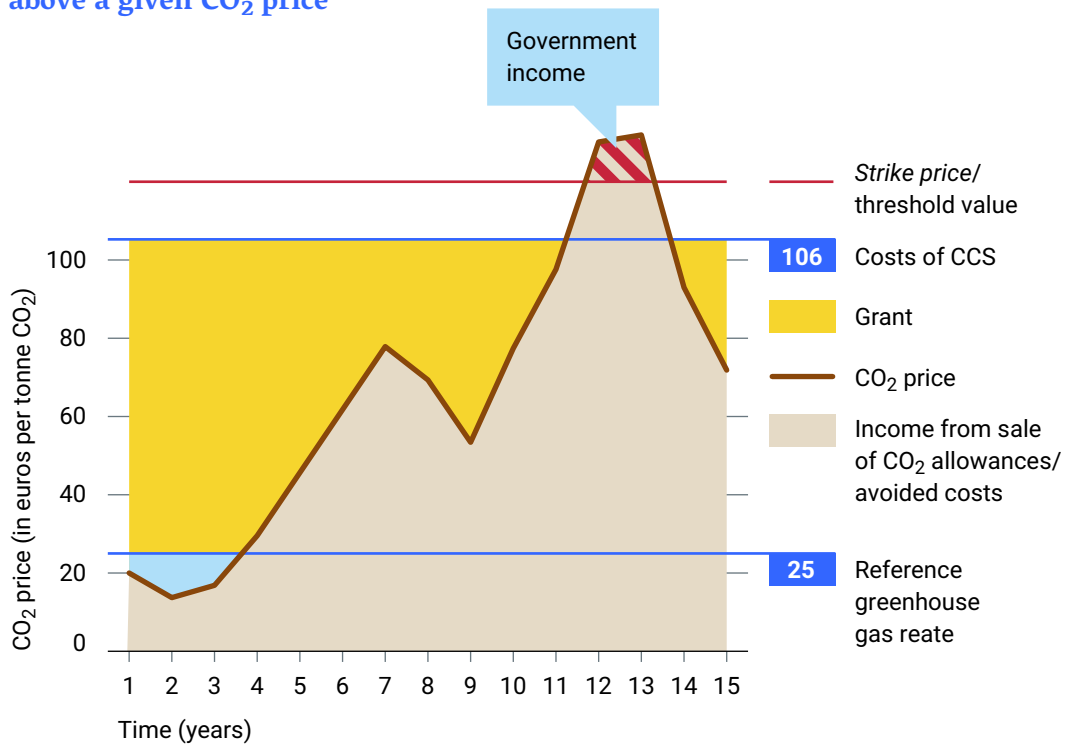
**The CO<sub>2</sub> price determines the amount of SDE++ grant, the return and profit tax revenue**



Examples outside the Netherlands show that it need not be this way. Germany and the United Kingdom, for instance, apply Contracts for Difference to support CCS and offshore wind energy. Contracts for Difference compensate the government if the grant recipient realises a profit above an agreed energy price (see figure 8 for an example). A CCS project could agree a CO<sub>2</sub> threshold price in advance. The strike price in figure 8 is the agreed threshold price. The level of the strike price is a political decision.

**Figure 8** Example of a Contract for Difference

**Under a Contract for Difference, the government receives money above a given CO<sub>2</sub> price**



We work out the financial consequences of various CO<sub>2</sub> price scenarios for the government, Porthos and Porthos's customers in chapter 6.

## 5.2 Contract between Porthos and its customers

In December 2021, Porthos and its customers signed a Transport Capacity and Storage Agreement (TSA) (Porthos, 2021). It lays down agreements on the allocation of risks arising from Porthos's CO<sub>2</sub> transport and storage activities. It also includes agreements on the transport and storage fees that the customers will pay Porthos.

The fees largely determine Porthos and its customers' exposure to transport and storage risks. All risks included in the fee are borne by the customers. Porthos is exposed to all risks that it keeps outside the fee unless otherwise stated in the TSA.

The following section considers the risk exposures arising from the TSA and the risks and benefits for the government, Porthos and Porthos's customers.

## 5.2.1 Risk allocation in the TSA

### **Risks in the transport and storage fee**

Porthos engaged the Deloitte consultancy in 2019 to calculate a reasonable return on the project given the risks Porthos runs. Deloitte identified the main project risks and Porthos factored many of them into the transport and storage fee or took other mitigation measures. The customers contribute through the fee to the insurance package taken out by Porthos to cover the risk of CO<sub>2</sub> leaks from the well up to 20 years after the storage activities have ended. Porthos has made separate agreements in the TSA with its customers to mitigate other risks identified by Deloitte, including the risk that customers make less use of the Porthos CCS project than expected, which would increase Porthos's costs.

### **Residual risk to Porthos**

Some risks will not be passed on to the customers. One is the storage capacity risk. If the capacity is lower than expected, Porthos will stop storing CO<sub>2</sub> earlier than planned. It will therefore lose storage fees. If the lack of storage capacity is significant, Porthos will have to find additional capacity for its customers, if possible, which could run into tens of millions of euros.<sup>4</sup>

Moreover, Porthos has assumed a risk by agreeing a maximum transport and storage fee in the TSA. Porthos could not increase the fee and so pass on setbacks in the run-up to the final investment decision to its customers. Any setbacks, including future hold-ups in the construction and operation of the infrastructure, will therefore reduce Porthos's return on investment.

The risk of lower storage capacity and of new setbacks can have far-reaching financial consequences for Porthos. A study by the XODUS engineering consultancy for the Ministry of EZK concluded that Porthos's expected return was particularly sensitive to CO<sub>2</sub> storage capacity and to cost overruns during the construction and operation of the infrastructure (XODUS, 2020). This was confirmed in a document that Porthos prepared for the investment decision in September 2023 (Porthos, 2023a).

It is not unfeasible that Porthos will have to contend with these or similar setbacks in the future. XODUS's report highlights the fact that CCS is still in its infancy, and has more risks and uncertainties than tried and tested techniques. If Porthos's budget is inadequate, EBN, Gasunie and the Port of Rotterdam have to provide tens of millions

of euros in additional capital.<sup>5</sup> Porthos and its customers have not made agreements to find a solution should the additional capital prove inadequate.

### **Residual risk to Porthos's customers**

Porthos's customers' main risk exposure is that they will, perhaps temporarily, be able to store less CO<sub>2</sub> than expected if, for instance, the infrastructure is out of service or the storage capacity is less than expected. Having to surrender CO<sub>2</sub> allowances for the additional CO<sub>2</sub> emissions would reduce the customers' return. Porthos's customers also run the risk of cost overruns on their carbon capture plants. This, however, is outside the scope of the TSA.

## **5.2.2 Consequences for the allocation of risks and benefits**

### **Cost increases reduce Porthos's return**

Porthos and its customers agreed in the TSA that the transport and storage fee would not increase.<sup>6</sup> This agreement significantly influences the allocation of risks and benefits between Porthos and its customers. Porthos cannot increase the fee and so pass on any setbacks in the preparation or construction of the infrastructure. Porthos has allowed for setbacks by including a risk surcharge in the transport and storage fee for unforeseen costs. But if the risk budget is exhausted, any additional costs will reduce Porthos's return. Furthermore, Porthos will not automatically benefit from any windfalls. It has agreed to reduce the fee if certain risks do not arise and if it realises its target return.

The latter is currently unlikely given current expectations regarding the return and the fact that the risk budget is already exhausted even though construction work has not yet begun. This is a result of several setbacks during preparation, including high residual gas compensation costs (see § 5.3), increased equipment costs and delays due to a legal case before the Council of State.

The impact of these setbacks on Porthos's financial results are explained in chapter 6.

### **Porthos's return affects the public purse through dividend payments**

The risk allocation arising from the transport and storage agreements has no direct consequences for the government. As a shareholder in EBN, Gasunie and the Port of Rotterdam, however, it is exposed to an indirect risk. A disappointing financial result would eventually affect the dividend that EBN, Gasunie and the Port of Rotterdam pay to the State. If Porthos reduces the dividend it pays to EBN, Gasunie and the Port

of Rotterdam, these state-owned enterprises would in turn reduce the dividend they pay to the State.

We do not know what effect Porthos's dividend is expected to have. Our audit found that neither the Ministry of EZK nor the Ministry of Finance had quantified the dividend receivable on EBN, Gasunie and the Port of Rotterdam's investment in Porthos.

## 5.3 Residual gas compensation – a contract addendum

On 8 March 2023 Porthos and its customers signed an addendum to the TSA to compensate TAQA for the gas remaining in the field that Porthos will use for CO<sub>2</sub> storage (Porthos, 2023b). TAQA, an oil and gas company, is the current operator of the field.

This section explains the nature of the addendum, the allocation of costs and the consequences for Porthos, its customers and the government.

### 5.3.1 Residual gas compensation

The government's aim is to store CO<sub>2</sub> in depleted or unproductive gas fields. To reduce the Netherlands' reliance on gas imports, it also wants oil and gas companies to maximise their North Sea gas production (EZK, 2023c).

The former gas field in which Porthos will store the CO<sub>2</sub>, however, is not completely empty. Owing to the sharp rise in gas prices, it is still commercially attractive for TAQA to extract the residual gas but the development of Porthos prevents it from doing so. Porthos had agreed to compensate TAQA for the residual gas but the sharp rise in gas prices has been problematic. The compensation paid for the gas is based on current prices. Porthos had estimated in April 2021 that the compensation would amount to several million euros. In November 2022, the estimate had risen to several hundred million based on the prices prevailing at the time.<sup>7</sup> The transport and storage agreement makes no allowance for residual gas compensation. Under pressure from the Ministry of EZK and the Ministry of Finance, Porthos and its customers eventually agreed to cover the massive increase in costs.

#### **Provision of information to parliament**

The provision of information regarding Porthos to parliament is outside our audit scope. The audit nevertheless, made several important findings about the information provided on residual gas compensation. The responsible ministers and



state secretary at the Ministry of EZK did not inform parliament that the former gas field in which Porthos would store CO<sub>2</sub> was neither not empty nor not unproductive. The financial consequences of compensation for the residual gas were not reported, either. This is remarkable. Parliament did not know that carbon storage could frustrate the government's ambition of maximising North Sea gas production. Furthermore, it was not aware of the relationship between the compensation agreements and a guarantee scheme provided by the Minister for K&E to Porthos (see box below).

#### Guarantee scheme

The Porthos project was delayed by a legal case before the Council of State regarding Porthos's use of the construction exemption. The exemption meant Porthos did not need be issued with a permit for its nitrogen emissions during construction of the infrastructure. In an interim ruling the Council of State ruled that Porthos could no longer benefit from the construction exemption. It would later deliver a final ruling on whether Porthos could start construction work without the necessary nitrogen emission permit.

To prevent further delays or abandonment, Porthos successfully applied to the government for a guarantee before the Council of State delivered its final ruling. As the climate goal cannot be met without Porthos, the government guaranteed 80% of the pre-investments that Porthos wanted to make. The guarantee was worth €175.6 million (EZK, 2022a). The premium Porthos paid for the guarantee will reduce its return. The Ministry of EZK provided the guarantee on condition that Porthos's customers contributed towards the residual gas compensation (EZK, 2022b). Parliament approved the guarantee without being informed of this condition.

The Minister for K&E completed the assessment framework for high risk government schemes before parliament approved the guarantee. We note that the assessment framework worked out the financial consequences of the guarantee for the public purse better than it did for the Porthos project as a whole (see chapter 7).

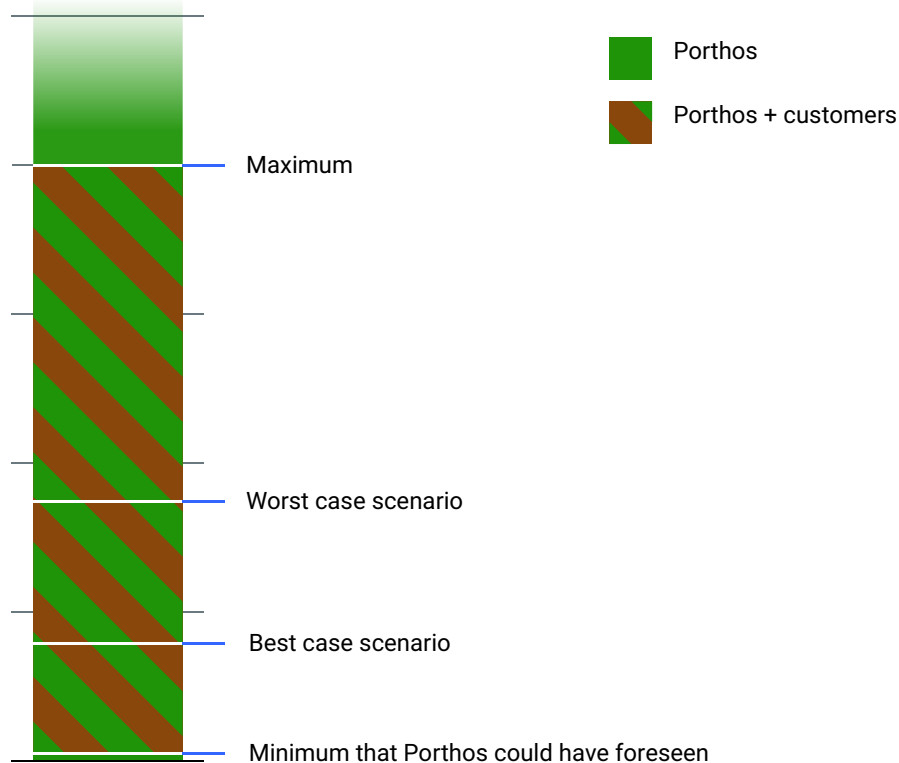
The guarantee lapsed when the Council of State delivered its final ruling on 16 August 2023. The guarantee could lapse only if the Council of State did not find for Porthos. The guarantee's lapse had no effect on the residual gas compensation agreements.

### 5.3.2. Residual gas compensation risk allocation

In the addendum to the TSA, Porthos and its customers agreed that the gas compensation would be shared proportionally. Porthos would bear several million euros entirely for its own account. Porthos and its customers also capped the compensation at several hundred million euros.<sup>8</sup> If the compensation exceeds the ceiling, only Porthos will bear the additional costs. Porthos's latest estimates, in September 2023, indicate that the compensation will be about half the amount expected in November 2022.

**Figure 9** Allocation of residual gas compensation costs

**Porthos and its customer share nearly all the residual gas compensation costs up to an agreed maximum**



### 5.3.3 Consequences for the allocation of risks and benefits

The compensation paid for the residual gas is at the expense of Porthos and its customers' financial return. Its impact on the return will depend on gas price movements, the amount is uncertain.

A lower return at Porthos can ultimately lead to EBN, Gasunie and the Port of Rotterdam reducing their dividend to the State.<sup>9</sup>

## 5.4 Storage permit

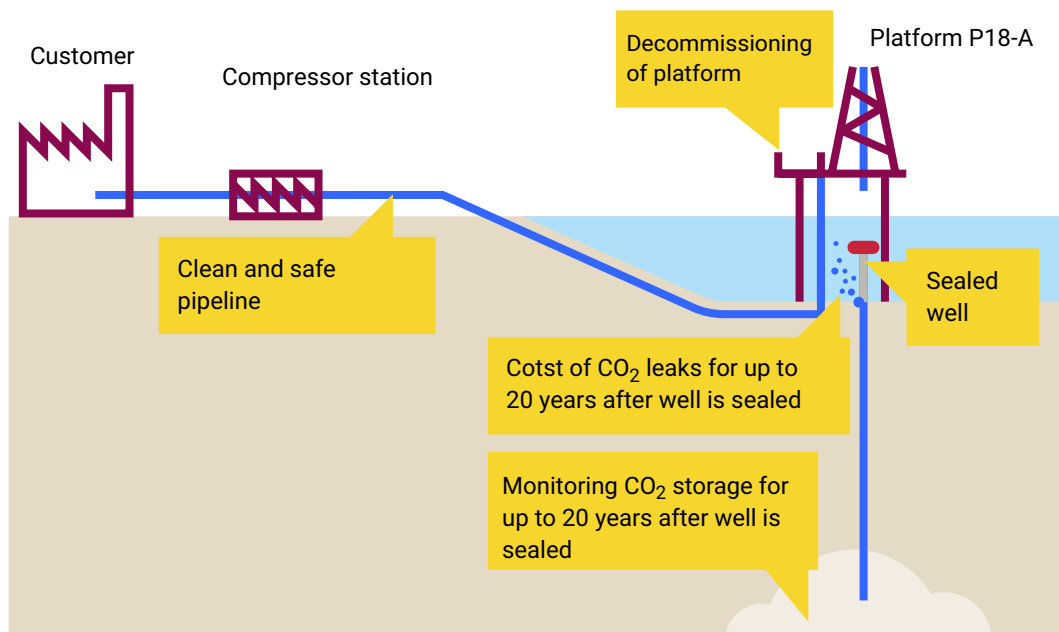
The State Secretary for EZK issued a permit for Porthos to store CO<sub>2</sub> underground.<sup>10</sup> As the permit authority, the state secretary can stipulate what measures Porthos has to take in order to meet the permit conditions in all circumstances, including Porthos's insolvency and other setbacks. The measures must prevent the cost of non-compliance with the conditions being borne by the government.

- The conditions Porthos must meet include:
- sealing the well and decommissioning the platform when Porthos stops storing CO<sub>2</sub>;
- monitoring the storage location for leaks and earth tremors for at least 20 years after the storage activities have ended; and
- paying remediation costs of a CO<sub>2</sub> leak or other incident during that timeframe.

This section considers the allocation of risks arising from the storage conditions and the consequences for the allocation of risks and benefits to the government, Porthos and its customers.

**Figure 10** *Conditions after CO<sub>2</sub> injection ends*

**Porthos must satisfy certain conditions when CO<sub>2</sub> storage ends**



### 5.4.1 CO<sub>2</sub> storage risk allocation

The storage permit includes estimates of the financial securities that Porthos must provide to meet the storage conditions in all circumstances, for instance by means of insurance. Porthos has also formed a provision to meet the conditions.

The Ministry of EZK informed us that it was still uncertain whether the financial securities would be adequate because there was too little experience of carbon storage. It is important for the public purse to have a better understanding. Under the Mining Act, responsibility for carbon storage will pass from Porthos to the State at least 20 years after the storage activities end.<sup>11</sup> The government will receive a financial contribution from Porthos to cover the monitoring costs for a period of 30 years.<sup>12</sup> At present, it is uncertain how long and how intensively the government must monitor carbon storage after those 30 years, and thus how much financial security Porthos must provide.

The State Secretary for EZK can require the permit holder to contribute to foreseeable costs, including the cost of a CO<sub>2</sub> leak or other incident after responsibility for carbon storage has transferred to the government. Porthos does not have to contribute to such costs at present. Porthos, moreover, has not allowed for a contribution in the financial provision it has formed. In its advisory report on the storage permit, the State Supervision of the Mines (SodM, the national inspectorate of the extractive industries) estimated that the risk of leaks to Porthos was very low. However, according to SodM it is uncertain how CO<sub>2</sub> will behave in the storage field. The model used to calculate the risk of leaks also contains uncertainties (SodM, 2021).

Although Porthos's carbon storage can entail additional long-term costs to the government, the State Secretary for EZK deliberately did not require Porthos to pay an annual fee, as permitted by law. Payment of a fee, which is customary in the oil and gas industry, would have been at the expense of Porthos's return. Under the Mining Act, the state secretary has wide discretionary powers to work out a suitable fee. The state secretary did not insist on a fee because Porthos, the first large-scale permanent CO<sub>2</sub> storage project in the Netherlands, is being developed to stimulate the market (EZK, 2022c).

## 5.4.2 Consequences for risks and benefits

The storage conditions apply solely to Porthos as the permit holder. They have no direct consequences for Porthos's customers. Through the transport and storage fee, however, the customers contribute to the storage conditions and the related financial securities. Only Porthos will bear the consequences of cost overruns or underruns because it has agreed a maximum fee with its customers.

Porthos's storage requirements do not have any financial consequences for the government. In certain scenarios, however, the government will incur additional costs for Porthos's CO<sub>2</sub> storage. For example:

- if Porthos becomes insolvent and the financial securities fail to meet all requirements;
- in the event of a CO<sub>2</sub> leak or other incident when the government is responsible for CO<sub>2</sub> storage; and
- if Porthos's contribution to the government's monitoring costs is inadequate.

The government will not be able to recover these additional costs from Porthos. The Ministry of EZK has not estimated the monitoring costs for the government or the cost of a CO<sub>2</sub> leak. In 2020, the Ministry of Finance estimated the cost of a CO<sub>2</sub> leak at several hundred million euros.

## 5.5 Conclusion

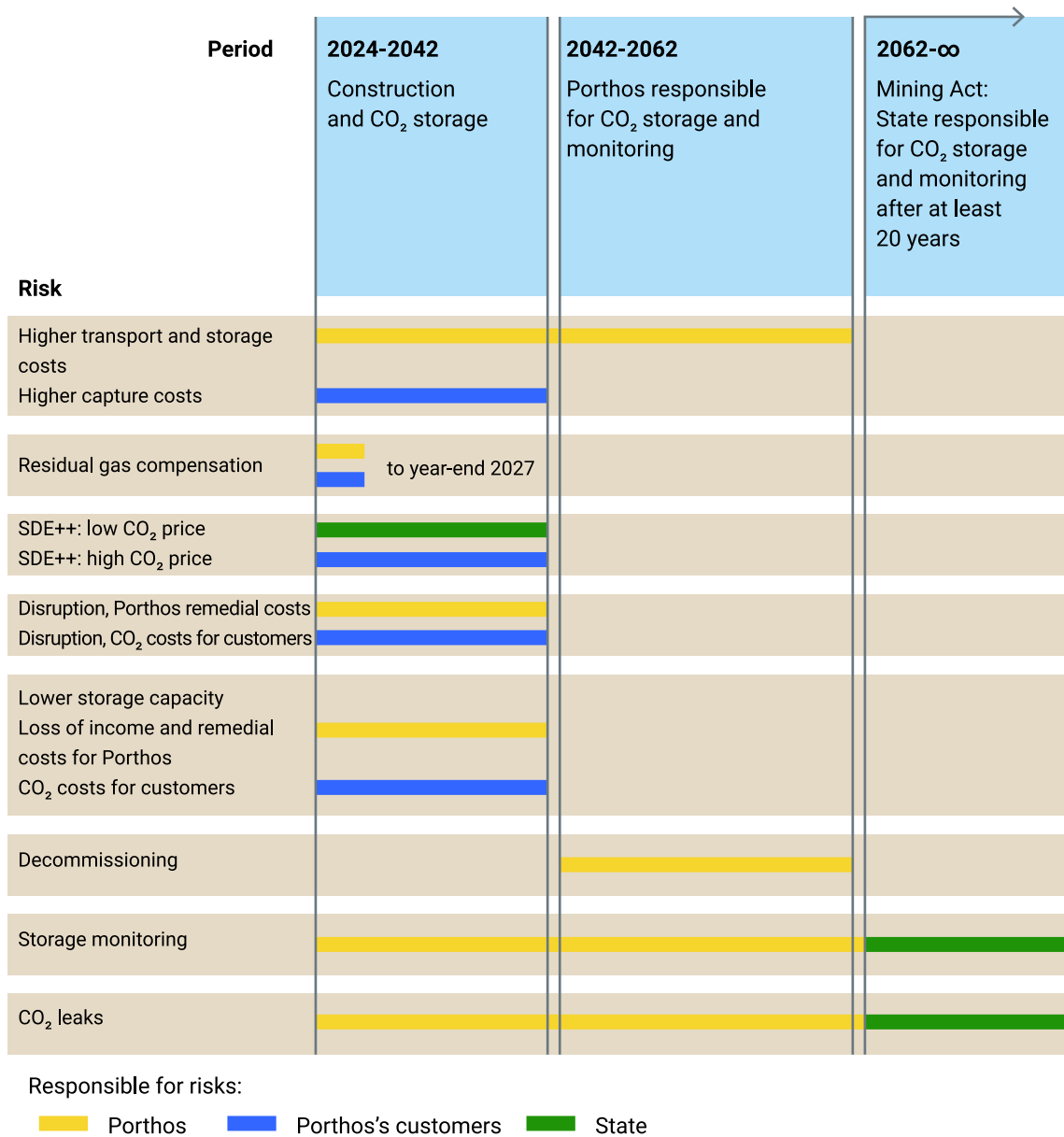
The government, Porthos and its customers have allocated risks by means of contracts, grant decisions and the storage permit.

Porthos has factored many construction, transport, storage and decommissioning risks into the transport and storage fee payable by its customers. The customers will contribute almost proportionally to the compensation paid for residual gas in the field. The Minister for K&E has limited the cost to the SDE++ grant scheme and Porthos has provided financial securities as a condition for the storage permit issued by the state secretary.

Nevertheless, Porthos and the government are still exposed to a number of medium and long-term risks (figure 11).

**Figure 11** Allocation of risks across the various phases of Porthos

The government and Porthos are responsible for risks when CO<sub>2</sub> storage ends



In practice, Porthos remains exposed to short-term risks. Cost overruns due to setbacks during the start-up, for instance, have already had a significant impact on its expected return.

**CO<sub>2</sub> price is significant influence on risks**

A high CO<sub>2</sub> price benefits the government as it will reduce the amount of the SDE++ grant awards. If the CO<sub>2</sub> price is equal to the expected cost of CCS, the government will not need to award grants. A further increase in the CO<sub>2</sub> price would increase Porthos's customers' return but would not lead to additional income for the government or Porthos.

If the CO<sub>2</sub> price rises further, the risk allocation would result in the government not sharing proportionally in the benefits. The government should do better for itself in this scenario because:

- the customers' return on investment will be *higher* than the reasonable return based on the SDE++ scheme;
- the government will not benefit directly; and
- the government is exposed to all long-term risks of CCS as it will eventually take responsibility for the CO<sub>2</sub> storage.

Our audit found two ways for the government to profit in a scenario of high prices that it is not exploiting in the Porthos case:

- a Contract for Difference, under which the government receives compensation from the companies that capture CO<sub>2</sub> when the CO<sub>2</sub> price rises above a certain level;
- under the Mining Act, an annual storage fee could be charged and a contribution required towards other foreseeable costs of CO<sub>2</sub> storage that the government will eventually bear. The holder of the storage permit could pass on these charges to its customers.

# 6.

## Costs and benefits

For our audit, we investigated the expected costs and benefits of the Porthos CCS project to Porthos, its customers and the government. This chapter presents the expected costs and benefits until the end of the Porthos project in 2042.

We conclude that the Porthos CCS project is expected to be an exceedingly efficient means for the government to achieve its 2030 climate goal. We also provide an insight into the financial return Porthos and its customers will earn on their investment.

Our conclusion on the expected efficiency and our opinion on the expected financial return of Porthos and its customers are based on calculations made with the aid of available data and expectations of future developments. There are uncertainties in the data and developments. It is important to recognise that the future can turn out differently and this report cannot present definitive conclusions on the Porthos CCS project.

In this chapter, we successively look at:

- the main funds flows between the government, Porthos and Porthos's customers;
- the expected financial return and the expected efficiency for the government;
- the expected financial return for Porthos and its customers.

Caution must be exercised when interpreting the expected financial returns as the calculations include assumptions. The calculations are based on CO<sub>2</sub> price projections in the PBL's middle scenario. We also assume that if the Porthos project is abandoned the customers will maintain their current production volumes in the



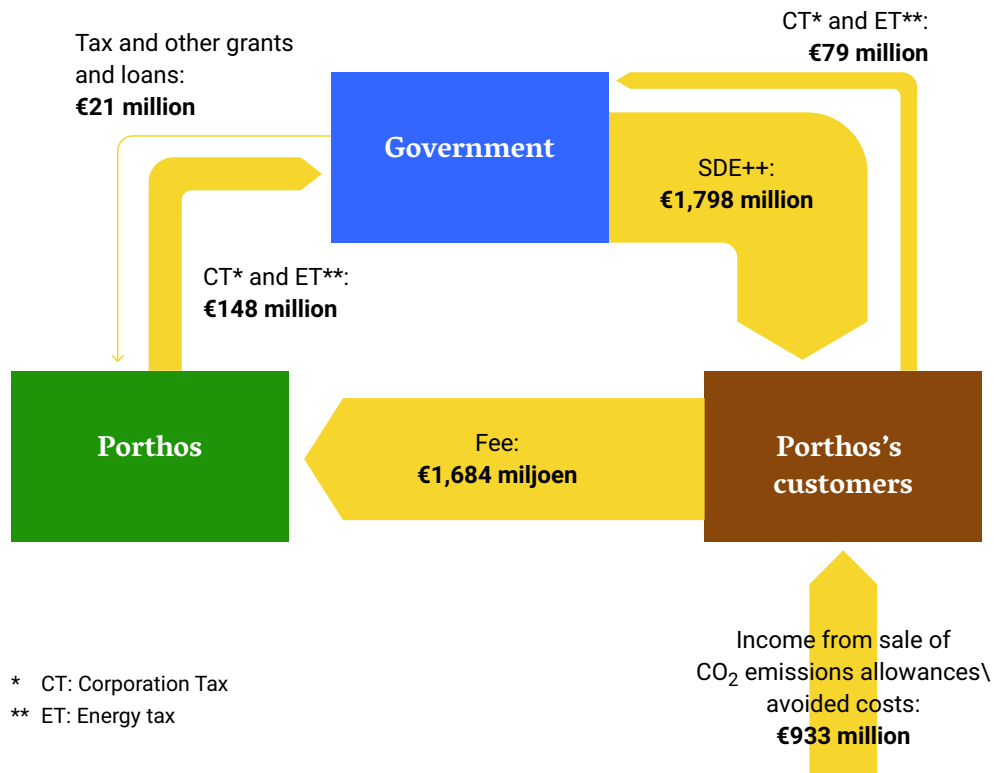
port area without taking alternative carbon reduction measures during the 15 years that the project would have been active. These and our other assumptions are consistent with the methods applied by the Minister of EZK and RVO to calculate the SDE++ grants and by the Ministers of EZK and Finance to assess investment proposals in their capacity as shareholders. More details on the assumptions, the data used and our analyses are presented in appendix 2.

## 6.1 Funds flows between the government, Porthos and its customers

Figure 12 shows the main funds flows between the government, Porthos and its customers, as foreseen in June 2020 when the Minister for K&E decided on SDE++ grant funding for the Porthos CCS project. The funds flows provide an insight into the relationships between the parties. We used them to calculate the financial results of the government, Porthos and Porthos's customers. Figure 12 does not include the investments and operating costs of Porthos and its customers that we used to calculate the expected financial return.

**Figure 12** Expected funds flows between the government, Porthos and its customers, in millions of euros (2023 prices)

### Funds flows as expected in June 2020



## 6.2 Costs, benefits and efficiency for the government

We open this section with the expected financial results for the government until 2042. We then present our conclusions on the expected efficiency of the Porthos CCS project for the government.

### 6.2.1 Expected financial results for the government

Table 1 shows the costs and benefits to the government during the period that Porthos injects CO<sub>2</sub> into the depleted gas field, and the expected financial results at 2 moments:

- June 2020: when the Minister for K&E decided on the award of SDE++ grants to Porthos's customers, including the grant rate for Porthos's CO<sub>2</sub> transport and storage;
- September 2023: when the Ministers of Finance and EZK approved the investments in Porthos by the state-owned enterprises EBN, Gasunie and the Port of Rotterdam.

**Table 1** Expected costs and benefits to the government, 2026-2042, in millions of euros (2023 prices)

Expected costs and benefits		SDE++ grant decision, June 2020	Final investment decision, September 2023
<b>Costs</b>	SDE++ expenditure	1,798	0
	Other expenditure	-	63
<b>Benefits</b>	Profit tax revenue	200	1,337
	Energy tax revenue	28	31
	Other tax revenue	-	74
<b>Result (benefits less costs)</b>		<b>-1,577</b>	<b>1,380</b>

Source: RVO business cases, Porthos business case and our own calculations

### Costs

In June 2020, the SDE++ grants for Porthos's customers were by far the largest cost item to the government. Our calculations suggest they amounted to €1,798 million, spread over 15 years.

It follows from our calculations for the situation in September 2023, however, that the Minister for K&E will no longer award SDE++ grants to Porthos's customers owing to the expected increase in CO<sub>2</sub> prices. At higher CO<sub>2</sub> prices, Porthos's customers will earn a profit on the CCS and the government will no longer need to award grants. This will be a significant windfall for the government. The other expenditure includes a loan from the government to EBN and lost tax revenue owing to the energy investment allowance (EIA), a tax concession. The regressive energy tax rate is another tax facility relevant to the Porthos CCS project. The text box below explains how it works and how we included it in our calculations.

#### Regressive energy tax rate

Since the 2023 Budget Memorandum, the regressive energy tax rate has been classified as a tax facility. In this regressive tax system, the higher a company's electricity consumption, the lower the energy tax rate. The facility is designed to prevent Dutch wholesale customers being at a competitive disadvantage against foreign wholesales customers, many of whom benefit from comparable tax facilities. Our calculations indicate that this facility is worth approximately €850 million (2023 prices) to the Porthos CCS project. This is nearly €25 per tonne of CO<sub>2</sub> avoided.

We did not include this amount in our calculation of costs and benefits to the government. The amount is uncertain because:

- firstly, we did not have a full insight into the additional energy consumption due to the Porthos CCS project. Our calculation is based on the expected additional energy consumption of Porthos and 3 of its 4 customers;
- secondly, if the facility were applied in full its net effect would be to reduce the government's profit tax revenue. We did not calculate the size of this effect.

Two methodological points are also relevant:

- the calculations must be comparable. Our June 2020 statement of the costs and benefits (SDE++ grant decision) did not include this effect because the regressive energy tax rate was not classified as a tax facility at the time.
- like the other calculations in this report, the figure makes no allowance for fiscal drag at Porthos's customers.

Finally, we note that the financial importance of the tax facility is not equal to the financial importance of the fossil subsidy. To calculate the fossil subsidy, potential lost revenue from electricity tax is corrected for the proportion of electricity that is generated from non-fossil energy. The 2024 Budget Memorandum puts the proportion of renewable electricity at 46%. The financial importance of the fossil subsidy then comes to approximately €400 million (2023 prices), equal to about €12 per tonne of CO<sub>2</sub> avoided.

## **Benefits**

In June 2020, the expected benefits to the government consisted of the profit and energy tax paid by Porthos and its customers for the electricity they consume during carbon capture, compression, transport and storage. The expected profit tax rose sharply in September 2023 and at €1.3 billion is the largest benefit item to the government. The increase was triggered by the higher expected CO<sub>2</sub> price boosting the customers' profits. The profits are the outcome of the avoided cost of carbon allowances and the sale of CO<sub>2</sub> allowances. The higher profit tax is due to Porthos's delayed start and a different correction for inflation. Other government revenue consists of EBN's repayment of the loan with interest and the premium Porthos paid for the guarantee.

## Result

Taken together, the government's costs and benefits were expected to produce a loss of €1.6 billion in June 2020 and a profit of €1.4 billion in September 2023. This turnaround will be prompted by the higher expected CO<sub>2</sub> price. The government will then need not award SDE++ grants and will receive more profit tax from Porthos's customers.

### 6.2.2 Expected efficiency for the government

To determine Porthos's expected efficiency for the government, we calculated the net present value (NPV) of all government costs and benefits. NPV is an important project appraisal method. It is the sum of all future costs and benefits over a project's lifetime, discounted to present value. It is explained further in appendix 4. NPV indicates whether or not a project will be profitable. On purely financial grounds, a positive investment decision will be taken if it will be. With the aid of NPV we can draw a conclusion on the expected efficiency of the Porthos CCS project for the government.

Table 2 shows the government's expected result (benefits less costs) with the NPV of the result and the NPV per tonne of CO<sub>2</sub> avoided in both June 2020 and September 2023.

**Table 2** *Expected financial result of the government, in millions of euros, (2023 prices)*

Result	SDE++ grant decision, juni 2020	Final investment decision, september 2023
Result (benefits less costs)	-1,577	1,380
NPV*	-1,205	951
NPV per tonne CO <sub>2</sub>	-35	28

Source: RVO business cases, Porthos business case and our own calculations

\* NPV is calculated using the real discount rate of 2,25%. See definitions in appendix 4.

The table shows that the expected cost to the government in June 2020 amounted to €35 per tonne of CO<sub>2</sub> avoided. In September 2023, every tonne of CO<sub>2</sub> avoided was expected to earn the government €28.

### Conclusion on efficiency

We conclude that the Porthos CCS project is expected to be exceedingly efficient for the government. We base this conclusion on the expectation that:

- the government comfortably meets the SDE++ efficiency standard of €300 per tonne of CO<sub>2</sub> avoided in June 2020 and September 2023;

- when the final investment decision was taken in September 2023, it was thought that Porthos's customers would not need SDE++ grant funding;
- the government will profit from the Porthos CCS project, chiefly through profit taxation. In September 2023 every tonne of CO<sub>2</sub> avoided thanks to Porthos was expected to earn the government €28.

It should be borne in mind when considering this conclusion on Porthos's efficiency for the government that, as described in chapter 5, the government will assume long-term responsibility for carbon storage in 2062. Although experts think there is only a very low risk of leakages, the risk is never-ending. As there is no reliably underpinned estimate of the cost of remediation measures, our calculations indicate that the Porthos CCS project will remain profitable for the government, provided setbacks after 2062 cost less than €1 billion (2023 prices). However, there is another perspective to the potential costs. Costs of €30 billion (2023 prices) after 2062 would still fall within the government's efficiency standard of €300 per tonne of CO<sub>2</sub> avoided.

Furthermore, the government's short-term (to 2042) financial outlook is incomplete. The Ministry of EZK and the Ministry of Finance have taken no account of the likely impact of dividend distributions on the public purse. The profits that the state-owned enterprises EBN, Gasunie and the Port of Rotterdam earn on the Porthos project will impact the dividends they distribute to the shareholders, the Minister of EZK and the Minister of Finance (see also § 7.2). The scale of the impact is unknown but it does not alter our conclusion on the expected efficiency for the government.

### 6.3 Expected financial result for Porthos

This section looks at the expected financial result for Porthos at 2 moments, in June 2020 (SDE++ grant decision) and September 2023 (EBN, Gasunie and Port of Rotterdam's final investment decision).

Table 3 shows that in June 2020 Porthos expected to invest €664 million and incur operating costs of €359 million over the project's lifetime. In addition to these costs, Porthos is forming a provision to meet the storage conditions laid down in the Mining Act (see also § 5.4). The provision will cover decommissioning costs and a contribution to the government's monitoring costs. The benefits comprise expected fee income of €1,684 million. Given these costs and benefits, Porthos was expected to earn precisely its target return of 6.6%.

**Table 3** Expected costs and benefits to Porthos, in millions of euros, and return

Expected costs and benefits	SDE++ grant decision, June 2020	Final investment decision, September 2023
Investment costs (2023 prices)	664	1,213
Operating costs (2023 prices)	359	356
Fee income (2023 prices)	1,684	1,758
Return ( <i>internal rate of return</i> )	6,6%	2,2%
Total NPV*	0	-355

Source: Porthos business cases, RVO business cases and our own calculations

\* NPV is calculated using the nominal discount rate of 6,6%. See definitions in appendix 4.

The table shows that expected investment costs rose sharply between June 2020 and September 2023. The increase was due to higher equipment costs, project delays owing to the legal case before the Council of State and unforeseen costs for residual gas compensation. As expected costs rose faster than expected benefits, Porthos would no longer earn its target return of 6.6% The expected return had fallen to 2.2% by September 2023 and Porthos was no longer sufficiently profitable for the shareholders. The negative NPV meant Porthos's shareholders would not take a positive investment decision on purely financial grounds.

We conclude, on purely financial grounds, that the expected return is too low for the shareholders in light of the risks Porthos presents. The Minister of EZK as the shareholder in EBN and the Minister of Finance as a shareholder in Gasunie and the Port of Rotterdam, nevertheless approved the investment. We consider the ministers' decision further in § 7.2.

## 6.4 Expected financial results of Porthos's customers

This section presents the expected financial results of Porthos's customers. For reasons of commercial confidentiality, we do not present the costs, benefits and financial results of each customer separately but in aggregate. The return each customer expects on Porthos can therefore differ from our aggregate return.

### Costs

In June 2020, the expected transport and storage costs to Porthos's customers amounted to €1,684 and were by far the largest cost item. The customers also incurred investment costs and operating costs for their carbon capture plants and paid profit and energy taxes.

Table 4 shows the expected investment costs, operating costs and transport and storage costs. The costs rose between June 2020 and September 2023 on account of high inflation, which also fed into the transport and storage fee payable to Porthos. Furthermore, the customers incurred unforeseen gas compensation costs.

**Table 4** *Expected costs to Porthos’s customers, in millions of euros (2023 prices)*

Costs	SDE++ grant decision, June 2020	Final investment decision, September 2023
Investment costs	230	309
Operating costs	683	766
Transport and storage costs	1,684	1,758
Residual gas compensation costs	-	Tens of millions*

Source: RVO business cases and our own calculations

\* For reasons of commercial confidentiality, we have not given the exact amount in the table.

### Benefits

In June 2020 the main source of income for Porthos’s customers was expected to be SDE++ grant funding. The customers also benefited from the sale of CO<sub>2</sub> allowances or from having to buy fewer CO<sub>2</sub> allowances.

Table 5 shows the income earned by Porthos’s customers. Our calculations for September 2023 indicate that they will not be awarded SDE++ grants. The expected income from movements in CO<sub>2</sub> prices rose sharply between June 2020 and September 2023.

Income from CO<sub>2</sub> price movements is due to the fact that Porthos’s customers will not need to surrender CO<sub>2</sub> allowances for the carbon they capture. They will not need to buy expensive CO<sub>2</sub> allowances and can sell surplus allowances at a good price. The €933 million increase to €5.4 billion is the result of higher CO<sub>2</sub> price expectations. The SDE++ grant applications in 2020 were based on a price of €26 per tonne of CO<sub>2</sub> in 2026. The PBL’s 2022 Climate and Energy Outlook puts the CO<sub>2</sub> price in 2026 at €90 (PBL, 2022, see appendix 3 for the data).



**Table 5** *Expected benefits to Porthos's customers, in millions of euros (2023 prices)*

Benefits	SDE++ grant decision, June 2020	
SDE++ income	1,798	-
CO <sub>2</sub> price income	933	5,491

Source: RVO business cases and our own calculations

### Financial results

Table 6 presents the aggregate expected financial results of Porthos's customers. Owing to the expected higher CO<sub>2</sub> price, in September 2023 the aggregate return was expected to increase to 34.2% and NPV to €1,093 million.

**Table 6** *Expected results of Porthos's customers*

Result	SDE++ grant decision, June 2020	Final investment decision, September 2023
Return ( <i>internal rate of return</i> )	9.7%	34.2%
NPV in millions of euros*	25	1,093
NPV in euros per tonne of CO <sub>2</sub> avoided (discount rate 7.5%)	0.7	29.1

Source: RVO business cases and our own calculations

\* NPV is calculated using the real discount rate of 7,5%. See definitions in appendix 4.

The positive NPV in June 2020 and September 2023 show that the expected financial return for Porthos's customers was high enough at both moments to take a positive investment decision. In June 2020, the expected return, underpinned by SDE++ grants, was close to the reasonable return of 7.5% applied by the Minister for K&E. The calculated €25 million will probably be returned to the public purse if more financial support is provided than allowed. The Minister for K&E included an over-incentivisation assessment as an SDE++ condition. It can lead to a reduction in the grants awarded to Porthos's customers if their profits exceed the reasonable return.

The situation in September 2023 differed significantly from that in June 2020. Not only was the expected return on investment at 34.2% comfortably above the reasonable return but no benefits were returned to the government via the over-incentivisation assessment. In this situation, the government will not award SDE++ grants and therefore cannot recover excessive grant funding. The calculated return of more than €1 billion is entirely for the benefit of the customers.

## 6.5 Outcome of the sensitivity analysis

The expected financial results of the government, Porthos and Porthos's customers is sensitive to movements in CO<sub>2</sub> prices. This is due to the SDE++ grant system, as explained in § 3.4.2. We carried out a sensitivity analysis to map out the effect of a lower CO<sub>2</sub> price on expected financial results. The scenarios are explained in appendix 3.

The effect of a lower CO<sub>2</sub> price on the expected financial results of the government and Porthos's customers is shown in the middle column of table 7. For comparison, the right hand column shows the expected results of the middle CO<sub>2</sub> price scenario discussed in the previous chapter.

**Table 7** Results of the sensitivity analysis, final investment decision, September 2023 (2023 prices)

Actor	Financial result	Low CO <sub>2</sub> price scenario	Middle CO <sub>2</sub> price scenario
<b>Government</b>	SDE++ expenditure	€6 million	-
	NPV	€357 million	€951 million
	NPV per tonne of CO <sub>2</sub> avoided	€10	€28
<b>Porthos's customers</b>	NPV	€529 million	€1,093 million
	Return (internal rate of return)	22.3%	34.2%

In the low CO<sub>2</sub> price scenario, the SDE++ expenditure is €6 million higher than in the middle CO<sub>2</sub> price scenario. The positive NPV indicates that the government will still be earning money on the Porthos CCS project. In the low CO<sub>2</sub> price scenario, however, Porthos's customers' expected return falls to 22.3%. The positive NPV shows that this expected return was still high enough to take a positive investment decision.

A notable outcome in the low CO<sub>2</sub> price scenario is that the government will still award €6 million in SDE++ grants even though the customers' return is higher than the reasonable return of 7.5%. This is a result of the SDE++ system. SDE++ grants are awarded annually. If a project incurs a loss in its initial years, the SDE++ grant awarded in those years is not corrected for higher profits in subsequent years.

## 6.6 Conclusion

In this chapter, we calculated the expected financial results of the Porthos CCS project for the government, Porthos and Porthos's customers at 2 moments:

June 2020: when the Minister for K&E decided on the SDE++ grant.

September 2023: when the Ministers of EZK and Finance approved the 3 state-owned enterprises' investments in Porthos.

In this final section, we present a conclusion on each party's expected financial result.

### **Government**

For the government we conclude that the Porthos CCS project is expected to be a very efficient means to achieve the 2030 climate goal. The sensitivity analysis shows that this will remain the case even at a low CO<sub>2</sub> price.

It should be borne in mind, however, that the government is exposed to the long-term risks. The risk of leaks is said to be very low but it is never-ending. No reliably underpinned estimate of the cost of possible remediation measures has been made, but we have calculated that the Porthos CCS project will still be profitable to the government provided future setbacks after 2062 cost less than €1 billion (2023 prices). However, there is another perspective to the potential costs. Costs of €30 billion (2023 prices) in 2062 would still meet the government's efficiency standard of €300 per tonne of CO<sub>2</sub> avoided.

### **Porthos**

We conclude that the expected return for the shareholders in Porthos, EBN, Gasunie and the Port of Rotterdam, is too low on purely financial grounds in view of the risks they are taking. The expected return of 2.2% is less than the target return of 6.6%.

### **Porthos's customers**

We conclude that the investments in Porthos will be very profitable for Porthos's customers. The expected return on the investment is comfortably above the reasonable return of 7.5% that the minister for K&E applies for the SDE++ scheme. The sensitivity analysis shows that this will remain the case even in the low CO<sub>2</sub> price scenario.

**Regressive energy tax rate**

The 2023 Budget Memorandum classified the regressive energy tax rate as a tax facility and therefore a cost item to the government. We calculated that the financial importance of this scheme to the government when applied to the Porthos CCS project is approximately €850 million, of which about €400 million is a fossil subsidy (2023 prices) over the project's lifetime. In view of the uncertainties in this amount, we did not include it as a cost to the government.

# 7.

# Decision-making on Porthos

This audit looked specifically at the investment decisions the Minister of EZK and the Minister of Finance took regarding Porthos in their capacity as shareholders in EBN, Gasunie and the Port of Rotterdam. During the audit 2 other decision points proved to be important to the expected consequences for Porthos and the government.

This chapter looks successively at:

- the Minister for K&E's decision-making on SDE++ grant funding;
- the Minister of EZK and the Minister of Finance's investment decisions;
- the Minister for K&E's approval of EBN's participation in Porthos.

The decision points differ in nature. What we audited at each decision point is explained below.

## 7.1 SDE++ grant funding

We investigated whether the Minister for K&E had a full understanding of the expected cost of carbon capture, transport and storage to calculate what would be willing to fund through the SDE++ scheme. The minister's information position to decide on the grant award was generally positive. Less positive was that he did not have an insight into the consequences of the Porthos project as a whole for the public purse. The scenario of high CO<sub>2</sub> prices delivering high returns for Porthos's customers was not appreciated.

## 7.1.1 Transport and storage fee for SDE++ grants

### **Minister for K&E's information position**

The SDE++ grants Porthos's customers applied for had 2 components: one to cover the expected cost of their carbon capture plants and one to cover the expected cost of the transport and storage fee they had to pay to Porthos. We found that the Minister for K&E was well informed of the expected costs of both components.

Regarding the expected cost of the carbon capture plants, the minister based his decision on an advisory report issued by the PBL. The Ministry of EZK, however, initially did not know at what level it should set the fee. At the time, Porthos had not made final fee agreements with its customers because the customers first wanted to know what fee the Minister for K&E would reimburse through the SDE++ scheme.

The Ministry of EZK therefore engaged the XODUS consultancy to determine whether Porthos's fee was reasonable. XODUS established that it was (XODUS, 2020).<sup>13</sup> In addition, the Ministry of EZK contacted Porthos about the level of the fee and then settled on a maximum fee of €47.10 per tonne of CO<sub>2</sub> and a capacity utilisation rate for Porthos of 80%. The minister was responsive to Porthos's concerns about a lower fee. According to Porthos, a lower fee would not cover all costs and risks if a large customer were to drop out. Furthermore, it wished to have a margin to offset any setbacks. A far lower fee could have led to the project's abandonment.

### **Minister of EZK prevents high profits due to excessive grant funding**

The Ministry of EZK was aware that there was a risk of Porthos and its customers earning high profits due to excessive grant funding at a fee of €47.10 per tonne of CO<sub>2</sub>. To determine whether they would, the Minister for K&E set a reasonable return of 7.5%, as recommended by the PBL. The minister assumed that Porthos would achieve its target return of 6.6%. The ministry did not calculate how high the profits would be at this rate of return.

The minister thought high profits due to excessive grant funding could be prevented by:

- having Porthos state in the transport and storage contract that the fee was a maximum that would be reduced if possible;
- exerting pressure as a shareholder on EBN, Gasunie and the Port of Rotterdam if Porthos did not lower its fee if it earned a surplus profit;
- having the RVO assess over-incentivisation (EZK, 2020)..

### **...but not at a high CO<sub>2</sub> price**

These 3 solutions will help prevent high profits at Porthos and its customers due to excessive grant funding. They have no effect on the return Porthos's customers can earn when the CO<sub>2</sub> price is higher than the cost of CCS and SDE++ grants are not awarded.

When the Minister of EZK opened up the SDE++ scheme to CCS projects, the expected CO<sub>2</sub> price was lower than the cost of the Porthos CCS project. The Minister for K&E made no allowance for a higher than expected CO<sub>2</sub> price and did not analyse the impact on the public purse of Porthos's expected costs and benefits as a whole. The effect of higher profits at Porthos's customers as a result of high CO<sub>2</sub> prices was not appreciated, even though the PBL had allowed for the uncertainty of price movements by extrapolating a range of CO<sub>2</sub> prices in its annual Climate and Energy Outlook. The Ministry of Finance did work out the consequences of a high CO<sub>2</sub> price for Porthos's customers.

## **7.2 Investment decisions**

In their capacity as shareholders in EBN, Gasunie and the Port of Rotterdam, the Minister of EZK and the Minister of Finance assessed whether the investments in Porthos were in the public interest.

We investigated how their assessment of several pre-investments in Porthos that the Ministers of EZK and Finance approved at the end of 2021 and at the end of 2022. According to the Ministry of EZK, these pre-investments were so high that there was no way back. The Ministry of Finance said they were in effect final investment decisions. We therefore decided to concentrate on these pre-investments.

The shareholders clearly considered the importance of Porthos's contribution to the climate goal in their investment decisions. Its importance to the public purse, however, was poorly understood.

### **7.2.1 The shareholders' investment decisions**

The shareholders clearly took the public interest into account in their decisions: the Minister of EZK and the Minister of Finance were willing to accept a lower return on the investments in view of Porthos's contribution to the 2030 climate goal. The shareholders were allowed to take the contribution into account. The Policy Document on State-Controlled Companies 2022 specifically refers to their discretion to accept a lower return on energy transition investments (Finance, 2022a).

The Ministry of Finance concluded at the end of 2022 that Porthos's return was too low in view of its risk exposure (Finance, 2022b). Porthos then calculated that the return on the project would approach the target return if the Aramis CCS project, which uses part of the Porthos infrastructure, were to go ahead. It is uncertain, however, whether it will.

Given the low expected return, we find it remarkable that the shareholders did not analyse the investments' effect on the government's dividend income. The Policy Document on State-Controlled Companies 2022 requires shareholders to explain such effects and include them in the investment assessment. When the investment decisions were taken, however, it was not known what effect the investments in Porthos were likely to have on the public purse.

The Manual on Investments by State-Controlled Companies, which details government policy on State holdings, states that a social cost-benefit analysis (SCBA) can provide an outcome. It notes that an SCBA can be helpful if the business case is negative from a financial perspective but there are other important reasons to go ahead with the investment. In the case of Porthos, an SCBA of a variety of scenarios might have revealed the investments' social effects and provided an insight into the impact on the public purse. The Ministers of EZK and Finance did not carry out an SCBA when deciding whether or not to invest in Porthos.

### 7.3 EBN's participation in Porthos

EBN's participation in Porthos must satisfy several requirements laid down in the Mining Act. In our opinion, it is uncertain whether its participation meets the requirements. No legal analysis is available that can dispel this uncertainty.

#### **Hindrance to core tasks**

The government tasked EBN with exploiting the Netherlands' gas reserves as efficiently and fully as possible. EBN accordingly holds a share in virtually all Dutch gas fields, including Porthos's carbon storage field.

Under the Mining Act, EBN may carry out other activities alongside its core oil and gas operations subject to the State Secretary for EZK's permission. EBN received such permission for Porthos. These other activities may not frustrate the correct performance of its core task but that is precisely what Porthos is doing. The current high gas prices make it attractive to extract the residual gas from the field but that is



prevented by the development of Porthos. EBN's participation in Porthos hinders the efficient and full performance of its core gas operations. The state secretary did not fully appreciate this risk when giving his permission.

This problem might also arise in future CCS projects as the state secretary intends to task EBN with carbon storage activities.

### **Financing**

EBN's financing of its participation in Porthos also raises questions. EBN is paying for the investment partly through an intragroup loan from the parent company to a subsidiary that will participate in Porthos on its behalf.

Under the Mining Act, EBN may not use income from its oil and gas operations to finance other activities, in this case CCS. EBN earns most of its profits through its participation in oil and gas projects. We suspect the intragroup loan is financed from these activities. The Ministry of EZK and the Ministry of Finance could not adequately explain the make-up of the intragroup loan. What is clear is that the staff at the Ministry of EZK have doubts about this financing method and its conformity with the requirements of the Mining Act (Finance, 2023). In this light, we think it is remarkable that staff at the Ministry of EZK could not provide a legal analysis explaining whether EBN's participation in Porthos met the financing and other requirements of the Mining Act.

### **Market conformity**

The Mining Act further lays down that EBN must perform non-core activities at competitive rates and on competitive conditions. The latest EBN evaluation concludes that this market conformity requirement is at odds with EBN's exposure to new energy transition risks (Ecorys, 2023). These risks are also present in EBN's participation in Porthos.

Porthos's expected return in September 2023 was lower than its target return. We cannot judge the market conformity of the current expected return. The State Secretary for EZK has not set a standard against which market conformity can be assessed.

## 7.4 Conclusion

We conclude that the ministers and state secretary concerned did not have a full understanding of Porthos's financial consequences for the public purse when they took their investment decisions. The Minister for K&E took no account of the risk of higher than expected CO<sub>2</sub> prices feeding through into high profits at Porthos's customers. In their capacity as shareholders, the Ministers of EZK and Finance inadequately considered the public purse in their investment decisions for Porthos.

We further conclude that it is uncertain whether EBN's participation in Porthos satisfies the Mining Act's requirements and that there is no legal analysis that could dispel the uncertainty.

# 8.

# Conclusions and recommendations

## 8.1 Conclusions

### **The Porthos CCS project will make a significant contribution to the 2030 climate goal**

The Netherlands is aiming for climate neutrality by 2050. To this end, the Climate Act states that annual national atmospheric emissions of greenhouse gases must be 55% lower in 2030 than in 1990. This will require industry to emit 20.7 megatonnes less CO<sub>2</sub> in 2030 than in 2022.

We conclude that the government and industry will take a large step towards the 2030 climate goal through the Porthos project. This is positive. Porthos's carbon capture and storage will cut CO<sub>2</sub> emissions by 2.3 megatonnes per annum by 2030. We therefore conclude that the Porthos CCS project will be an efficient means for the government to achieve its 2030 climate goal.

The storage field is expected to be completely full by 2042. The government, industry and society will then have to take further steps to reduce atmospheric CO<sub>2</sub> emissions and so become climate neutral by 2050. Porthos's customers will have to find a solution to their CO<sub>2</sub> emissions. The solution could be another carbon capture and storage project or another technique to prevent atmospheric emissions. The Porthos CCS project is an intermediate step; the government and industry are buying time to find a solution to become climate neutral by 2050.

### **The Porthos CCS project is efficient**

We calculated the expected efficiency for the government using the costs and benefits to the government until 2042. We stress that this is the expected efficiency as there are uncertainties in the calculations and future financial results may differ from our expectations.

We conclude that the government's support for the Porthos CCS project is expected to be a very efficient means to achieve the 2030 climate goal. The calculations indicate that Porthos's customers will not need SDE++ grants to recoup their investments. The expected cost to the government will comfortably meet its efficiency standard. The government will actually earn a profit due to the additional corporation tax it collects.

It should be borne in mind, however, that Porthos's insurance for the carbon storage will end in 2062 and the long-term risks, including the risk of leaks, and monitoring costs will then be for the account of the government. Experts think the risk of leaks is very low, but the risk itself is never-ending. As there is no reliably underpinned estimate of the cost of remediation measures, we calculate that the Porthos CCS project will still be profitable for the government provided the cost of future setbacks after 2062 remains below €1 billion (2023 prices). However, there is another perspective to the potential costs. Costs of up to €30 billion (2030 prices) after 2062 would still meet the government's efficiency standard of €300 per tonne of CO<sub>2</sub> avoided.

### **Government does not share proportionally in the benefits given its risk exposure**

Porthos has been able to factor many risks into the transport and storage fee it will charge its customers. Porthos, however, is still exposed to several significant risks, including construction cost overruns, compensation for residual gas reserves and lower than expected storage capacity. Even before construction of the infrastructure began, some of these risks had significantly reduced Porthos's return.

The customers make a limited contribution to these additional costs through a risk surcharge in the transport and storage fee and a contribution towards the compensation for residual gas. Higher than expected CO<sub>2</sub> prices have made Porthos a very profitable prospect for the customers. Their expected return is considerably higher than the reasonable return set for the SDE++ scheme. It will also be higher in the PBL's low CO<sub>2</sub> price scenario.

Until 2062, the Porthos CCS project will be very profitable to the government, but Porthos is expected to earn a low return for its shareholders, EBN, Gasunie and the Port of Rotterdam. This will have an impact on the public purse through the lower dividends distributed to the government by these state-owned enterprises. The return could be lower or even negative if Porthos suffers new significant setbacks.

We cannot rule out that Porthos will suffer significant setbacks because CCS technology is still in its infancy. In view of CCS's contribution to the 2030 climate goal, the government may have to support Porthos with another guarantee if EBN, Gasunie and the Port of Rotterdam are unable or unwilling to provide a financial injection in the event of a new setback. The reliance on CCS to achieve the 2030 climate goal is thus a risk to the public purse. The cost of this risk, like the cost attaching to storage risks that the government will assume from Porthos in the longer term, is uncertain.

Given the expected development of CO<sub>2</sub> prices and the allocation of risks to the government, Porthos and Porthos's customers, we conclude that the government should do better for itself. The government's share in the benefits of the Porthos CCS project will not be proportionate to its risk exposure.

## 8.2 Recommendations

Porthos is the first large-scale carbon capture and storage project in the Netherlands. In his letter informing the House of Representatives of the guarantee granted to Porthos, the Minister for K&E referred to Porthos as a pioneer (first of a kind) (EZK, 2022d). The government, Porthos and Porthos's customers have developed the project by trial and error, as it were, over recent years and have overcome challenges as and when they occurred.

We understand that, as a pioneer, Porthos will be confronted with unforeseen setbacks. We expect the government to learn from Porthos and apply the lessons in future CCS projects. Porthos might be the first large-scale CCS project in the Netherlands but it will probably not be the last. The lessons we have learnt from Porthos are presented in the recommendations below.

### **Recommendation to the Minister for K&E and the State Secretary for EZK**

*Recommendation 1: In future CCS projects, study the opportunities offered by the Mining Act and the SDE++ scheme to have more revenue accrue to the government. Also assess the consequences of a scenario in which the carbon capture companies or the operator of the transport and storage infrastructure enjoys a disproportionately high benefit from CCS given their risk exposure.*

The Minister for K&E and the State Secretary for EZK have not created a single opportunity for the government to benefit more from higher than expected CO<sub>2</sub> prices. Given the current expectations regarding CO<sub>2</sub> prices, the government's return inadequately reflects its risk exposure.

This must not be repeated in future CCS projects. The Minister for K&E recently announced that the SDE++ scheme for wind and solar projects would be amended in order to limit grant recipients' profits. The minister could extend this amendment to include CCS projects. Furthermore, the Minister for K&E could consider applying Contracts for Difference to SDE++ grant funding of CCS projects. The SDE++ grant would then be awarded subject to assurances that companies would earn a reasonable return before CO<sub>2</sub> prices exceeded the expected CCS price and the public purse would benefit when the CO<sub>2</sub> price passed a given strike price.

The Mining Act gives the State Secretary for EZK the power to include an annual charge in the storage permit. The state secretary could consider whether the public purse would benefit from a variable charge, linked for instance to the CO<sub>2</sub> price. The holder of the storage permit could pass on the charge to its customers. The state secretary could also make use of the opportunities offered by the Mining Act to request a contribution in addition to the monitoring costs and other foreseeable costs that the government will bear when it becomes responsible for the CO<sub>2</sub> storage.

### **Recommendation to the Minister of EZK and the Minister of Finance**

*Recommendation 2: As shareholders, in conjunction with the policy-making ministry, analyse all costs and benefits of investments made by state-owned enterprises in CCS projects in advance. The analysis could take the form of a social cost-benefit analysis (SCBA). Carry out the analysis preferably well before the final investment decision is taken. The policy-making ministry can use the outcomes when deciding on the grant award and the storage permit.*

The Minister of EZK and the Minister of Finance can decide whether investments by state-owned enterprises in CCS projects are in the public interest correctly only if they have a full understanding of the costs and benefits of the SDE++ scheme and CO<sub>2</sub> storage not only to the shareholders but also to the government. This is why cooperation with the policy-making ministry is required.

The Manual on Investments by State-Controlled Enterprises 2023 suggests that an SCBA would be appropriate, especially if both the effect on the public purse, including tax schemes and the social impact of lower CO<sub>2</sub> emissions were analysed in a range of scenarios. All public interests – financial, climatic and environmental – could then be included transparently in decision-making. Such an analysis could have provided an insight into the consequences of rising CO<sub>2</sub> prices for the government's financial result.

### **Recommendation to the State Secretary for EZK**

*Recommendation 3: Analyse the extent to which EBN's participation in Porthos complies with the requirements of the Mining Act. Consider what amendments of the Mining Act or of the participation are necessary for EBN's future participation in CCS projects.*

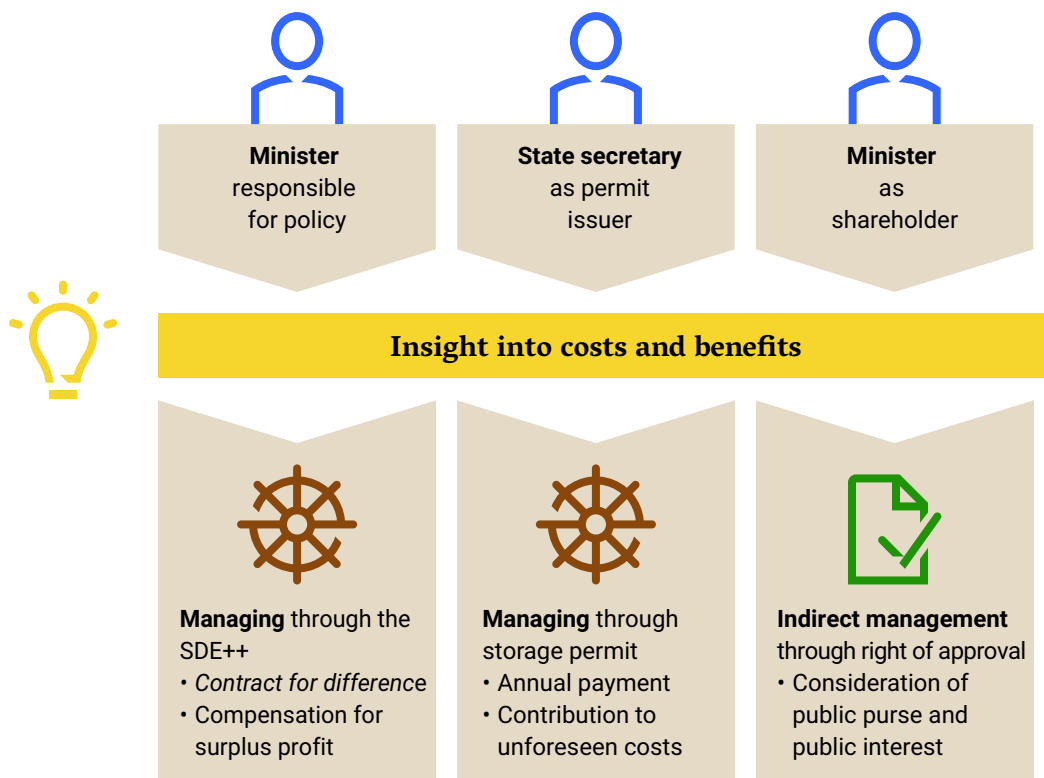
In our opinion, the state secretary and parliament should decide whether EBN participates in new energy transition activities (Court of Audit, 2021). Once the decision has been taken, the new activities must comply with the Mining Act's requirements on, for instance, financing and competitive fees. At present, it is uncertain whether EBN's participation in Porthos meets these requirements; a legal analysis that could dispel the uncertainty has not been made. In our opinion, the State Secretary for EZK must provide clarity and decide what measures need to be taken. This is particularly pertinent given the state secretary's intention to have EBN participate in future CCS projects.

### Summary of the ministers and state secretary's options

The figure below summarises the first 2 recommendations. Based on a joint analysis of the expected costs and benefits, the ministers and state secretary can take measures in their respective fields to promote future CCS projects for the benefit of the public purse.

**Figure 13** Ministers and state secretary acting for the benefit of the public purse

### Ministers and state secretary have several options to act in the interest of the public purse in future CCS projects





# 9. Response of the ministers and state secretary and the Court of Audits afterword

Response of the ministers and state secretary and the Court of Audits afterword  
On behalf of the Minister of Finance, the Minister for Climate and Energy (K&E) and the State Secretary for Economic Affairs and Climate Policy (EZK), the Minister of EZK responded to our draft report on 27 February 2024. Her response is summarised below. The full response can be read (in Dutch) at [www.rekenkamer.nl](http://www.rekenkamer.nl). We close this chapter with our afterword.

## 9.1 Response of the ministers and state secretary

The Minister of EZK is very grateful for our report and its recommendations. The conclusions that the Porthos CCS project is effective and exceedingly efficient for the government provide, she says, important support for the CCS policy. Moreover, the report contains important lessons and suggestions to improve CCS policy. The minister then responds to the report's recommendations.

### **Recommendation 1**

The minister will study the opportunities offered by the Mining Act and the SDE++ scheme to have more of the benefits of CCS accrue to the government.

With regard to the SDE++ scheme, the minister does not regard the high avoided EU ETS costs on account of high CO<sub>2</sub> prices as a problem. Creaming off avoided costs after companies have taken CO<sub>2</sub> reduction measures, according to the minister, is not in keeping with the spirit of the ETS and removes industry's incentive to become sustainable. The minister thinks it is important, however, that surplus profits are not grant-funded. In her response, she writes that the SDE++ scheme includes several

options to deal with higher than expected CO<sub>2</sub> prices. Further amendment of the SDE++ scheme would be time consuming and require a far-reaching policy. She notes that the Minister for K&E will study the further development of the SDE++ scheme later this year.

Regarding the opportunities offered by the Mining Act to include a charge for the CO<sub>2</sub> storage permit, the minister says she deliberately did not use this option in Porthos's case. She has left the door open, however, to include a charge in future CCS projects and will study the matter further. The minister is unsure whether a charge is the right instrument to have the benefits obtained through the avoidance of high ETS costs accrue to the government. Moreover, the minister wonders whether that would be desirable, as she believes there are practical objections.

Besides the first recommendation, the minister considers a number of recommendations in the report regarding the provision of information to the House of Representatives. The minister acknowledges that the House was not informed that the gas field concerned was not completely empty. The minister undertakes to be more transparent in future when issuing CO<sub>2</sub> storage permits if the natural gas has not been fully extracted and will inform the House accordingly. In addition, the minister notes she does not believe there is a substantive relationship between the award of a guarantee to Porthos and the gas compensation agreed between Porthos and its customers.

### **Recommendation 2**

The minister will study how the other ministries can improve cooperation between shareholders and policy-making ministries in order to gain a full understanding of all the government's CCS costs and benefits in a range of scenarios. She recognises the value of having a more comprehensive insight in advance. She notes that it is not possible to foresee all risks, such as a surge in CO<sub>2</sub> and gas prices.

### **Recommendation 3**

The minister agrees with the Court of Audit that it is important to check that EBN's participation meets the requirements of the Mining Act and will consider whether the Mining Act should be amended in the future. She concludes from the evaluation of EBN's participation in Porthos that EBN's funding of Porthos's activities does not contravene the Mining Act. The government loan to EBN for its participation in Porthos was awarded on competitive conditions and market conformity was assessed when agreement was reached on EBN's participation.

## 9.2 The Court of Audit's afterword

The minister's response underlines our conclusions on expected effectiveness and efficiency. We also think it is positive that the minister will implement our recommendations. However, we have several comments on the minister's response.

### **Discussion needed regarding the government's return on future CCS projects**

In our opinion, the Minister of EZK can receive a contribution from the other CCS parties by amending the SDE++ scheme and/or by receiving an annual charge as permitted by the Mining Act. In our opinion, this should be discussed because we conclude that the government does not share proportionally in the Porthos CCS project in light of the risks it is taking and the expected development of CO<sub>2</sub> prices.

We stress that amending the SDE++ scheme and/or the payment of an annual charge will not automatically remove the sustainability incentive for industry. How the scheme is amended is important: amendment will lead to a different allocation of the costs, benefits and risks to the government and the parties that capture, transport and store CO<sub>2</sub>. If the minister does not wish to amend the SDE++ scheme's application to CCS projects, an annual charge is an alternative. We recommend the minister carry out a serious study of the feasibility of various amendments.

### **Dispel the legal uncertainty about EBN's participation in CCS projects**

With a view to future projects, it is exceedingly important that EBN's participation in CCS projects meets the requirements of the Mining Act. Whether it does or not is currently uncertain.

# Appendices

## Appendix 1 Audit questions and standards framework

### Audit questions

**Key question:** To what extent can the Minister for K&E increase the efficiency of the SDE++ grant scheme and how can the State improve consideration of the public interest when state-owned enterprises make public investments in CCS?

### Audit questions:

1. Is the Minister for K&E supporting only the CO<sub>2</sub> emissions avoided in CCS projects?
2. When deciding on SDE++ grants for CCS, does the Minister for K&E allow for expected project costs and benefits (including financing through tax and other facilities) for the parties concerned?
3. Is the Porthos CCS project an efficient solution to avoid CO<sub>2</sub> emissions based on expected costs per tonne of CO<sub>2</sub> avoided?
4. Is the allocation of negative and positive financial risks allocated amongst the government, Porthos and Porthos's customers so as to contribute to the Porthos CCS project's efficiency for the government?
5. Have the ministers and state secretary carefully weighed the importance of Porthos's contribution to energy transition against the importance of its contribution to the public purse, and does the outcome contribute to the Porthos CCS project's efficiency for the government?

## **Standards framework**

The Court of Audit applies a standards framework to answer its audit questions. The standards we applied are based on literature and the basic standards the Court of Audit applies in its performance audits. They are presented below.

### **Audit question 1**

- The Minister for K&E has information on Porthos's CO<sub>2</sub> storage capacity.
- The Minister for K&E has information on the expected additional CO<sub>2</sub> that will be emitted during carbon capture, transport and storage.

### **Audit question 2**

- The Minister for K&E has an insight into all project costs and benefits for Porthos and its customers.
- The Minister for K&E has an insight into all tax and other facilities available to Porthos and its customers.
- The Minister for K&E analysed all project costs and benefits before deciding on the grant.

### **Audit question 3**

- Porthos's expected efficiency is expressed by the grant intensity per tonne of CO<sub>2</sub> avoided. We put the efficiency into perspective by applying the following limits (EZK, 2021c):
  - less than or equal to €300 per tonne of CO<sub>2</sub> avoided: efficient. Techniques with a grant intensity of more than €300 per tonne of CO<sub>2</sub> avoided do not match the lowest costs for tonne of CO<sub>2</sub> avoided;
  - more than €300 but less than €450 per tonne of CO<sub>2</sub> avoided: limited efficiency (expensive). Reasons must be given to explain why this technique is needed to achieve medium to long-term climate goals;
  - €450 or more per tonne of CO<sub>2</sub> avoided: not efficient.

### **Audit question 4**

The government, Porthos and Porthos's customers have made agreements on the allocation of financial risks. We expect the following:

- The government understands the main risks and their potential consequences (Finance, 2023).
- The government, in keeping with the efficiency standard in the literature on public-private partnerships, ensures that the allocation of financial risks amongst the government, Porthos and Porthos's customers contributes to the Porthos CCS project's efficiency for the government. The government, Porthos and Porthos's customers accordingly share both the risks and benefits (IISD, 2015).

**Audit question 5**

- The Minister of EZK and the Minister of Finance consult policy-making ministries in investments in accordance with the Policy Document on State-Controlled Companies 2022 (Finance, 2022a).
- The Minister of EZK and the Minister of Finance weighs the importance of energy transition against the importance of the public purse when state-owned enterprises invest in Porthos.
- The Minister of EZK and the Minister of Finance carefully consider the public interest. Their consideration satisfies the standards of 'orderly' and 'auditable'.

## Appendix 2 Methodological appendix to chapter 6

This audit investigated the financial results of the Porthos CCS project for 3 parties: Porthos, Porthos's customers and the government. We analysed the costs and benefits arising from the Porthos CCS project for each of these parties and then calculated their return. We present the results that were expected at two points in time:

- June 2020 (when the SDE++ grant decision was taken).
- September 2023 (when the final investment decision was taken).

### Data

The financial data on Porthos were taken from Excel files that Porthos shared with us. They contained the Porthos business case: all Porthos's expected costs and benefits used by it to calculate the return on the project. We used 2 versions of the file, one from October 2020 (that presented the costs and benefits expected in June 2020) and one from September 2023 that was used for the final investment decision.

Financial data on Porthos's customers were taken from the feasibility studies the companies submitted to RVO with their SDE++ grant applications. The companies' applications had to be accompanied by a statement of expected costs, incomes and returns. These documents dated from 2020. We held interviews at each of the companies and requested up-to-date and additional information for our analyses. The expected investment costs, for instance, were higher than initially stated and we received information on the energy the companies consumed to capture carbon.

Financial data on the government, including expected grant funding and tax revenues, were taken in part from the financial data provided by Porthos and its customers. Other government data were taken from internal policy documents and talks. We used all this information to prepare a statement on the State's and the government's funds flows.

We complemented these data with economic data from other sources. We used estimates of CO<sub>2</sub> price movements made by the PBL in its 2022 Climate and Energy Outlook (PBL, 2022), and we used the Netherlands Bureau for Economic Policy Analysis's August 2023 estimates of the rate of consumer price inflation (CPI).

To process and analyse these data correctly, we held talks with Porthos, the Ministry of EZK, RVO, the Netherlands Emissions Authority (NEa) and other parties.

### **Third party access to the data**

Under section 2.2 (1) (e) of the Open Government Act (WOO), the WOO applies to the Court of Audit. Under section 7.41 (2) of the Government Accounts Act 2016, information that the Court collects in the exercise of its statutory duty (auditing) is exempt from the WOO. Third party requests to access this kind of information are forwarded to the body, person or board that provided the information.

### **Analysis**

We mapped out the financial results of the project for the 3 parties (Porthos, its customers and the government) with the aid of net present value (NPV) calculations. NPV is a key measure used to assess project profitability. The calculations discount all a party's cash flows using a relevant discount rate. We used a nominal discount rate of 6.6% for Porthos, a nominal rate of 7.5% for its customers and a real discount rate of 2.25% for the government. We explain this further in the terms and definitions in appendix 4.

Our calculations were based on two scenarios of CO<sub>2</sub> prices for the comparison between the situation in June 2020 and that in September 2023. They were the low price scenario and the middle price scenario in the PBL's 2022 Climate and Energy Outlook (PBL, 2022).

### **Assumptions**

The results presented in this report rely on a series of assumptions.

### **Reference situation (base path/counterfactual)**

We compared the expected costs and benefits of the Porthos CCS project with a situation without the project. We assume that if the Porthos carbon capture project does not go ahead Porthos's customers will maintain their current production in the Rotterdam port area and will not take alternative measures to reduce their CO<sub>2</sub> emissions. This assumption is consistent with the method used by the Ministry of EZK and RVO to calculate SDE++ grants. In consequence of this assumption:

- we included only additional project costs and benefits to the government, Porthos and Porthos's customers in our calculations. A non-additional benefit to the government is the tax on the residual gas compensation (see the funds flows in appendix 5).
- the sale of CO<sub>2</sub> allowances and the avoidance of having to buy CO<sub>2</sub> allowances qualifies as a benefit to Porthos's customers.



### **Corporation tax (profit tax)**

We assume in our calculations that carbon capture is a stand-alone production process. In reality, it is not. The carbon capture plants are part of a bigger process at Porthos's customers. The profits and losses and the corporation tax Porthos's customers pay are calculated at a higher operational level. Actual amounts can therefore be different from those used in our calculations. We have also assumed that the effective corporation tax rate is 25.8%. We decided to use these assumptions in our calculations because:

- the data available to us were limited to carbon capture, and
- our calculation methods agreed with the method Porthos's customers used to calculate the project's financial result in the feasibility studies they submitted to RVO with their SDE++ grant applications.

### **Movement in CO<sub>2</sub> prices**

CO<sub>2</sub> price are an important factor in our calculations. The PBL presents projected CO<sub>2</sub> prices in its annual Climate and Energy Outlook. The PBL looks back at recent price movements and extrapolates a range of scenarios of future movements. Our calculations used the middle scenario of the PBL's CO<sub>2</sub> price projections. The 2022 Climate and Energy Outlook contains the most recent projections of CO<sub>2</sub> price movements for our audit period.

### **Regressive energy tax rate not included in calculation of government's costs**

Since the 2023 Budget Memorandum, the regressive energy tax rate has been classified as a tax facility. The amount concerned and the reason for not including it in our calculations are given in the government funds flows in appendix 5. The method used by EZK and RVO to calculate SDE++ grants does not take account of the regressive energy tax rate either.

### **Start-up costs do not count as project costs**

The Ministry of EZK awarded EBN a grant in 2019 to study the use of underground carbon storage fields and to carry out feasibility studies. We did not include the total cost of these activities, €10 million, in our calculations. We treated the grant as a sunk cost. This agrees with the approach taken by the CPB/PBL (2013).

## Appendix 3 CO<sub>2</sub> prices in the 2020 SDE++ applications and various PBL scenarios (2021 prices)

Jaar	RVO	PBL Low	PBL Middle
2023		65.4	78.1
2024	25.3	69.1	82.0
2025	25.6	72.8	86.0
2026	26.0	75.7	90.4
2027	26.4	78.6	94.9
2028	26.8	81.6	99.6
2029	27.2	84.5	104.6
2030	27.6	87.5	109.8
2031	28.0	91.2	115.3
2032	28.5	95.0	121.1
2033	28.9	99.1	127.1
2034	29.3	103.3	133.4
2035	29.8	107.6	140.1
2036	30.2	112.2	147.1
2037	30.7	117.0	154.4
2038	31.1	121.9	162.2
2039	31.6	127.1	170.2
2040	32.1	132.5	178.7

The table above shows various CO<sub>2</sub> price scenarios. The second column lists the CO<sub>2</sub> prices used in the SDE++ grant applications in 2020. The third and fourth columns are based on the PBL's 2022 Climate and Energy Outlook. The PBL has published a table of projected CO<sub>2</sub> prices for each year until 2030. For the period 2031-2040, we extrapolated prices using the rate of increase in the PBL's projections until 2030. Our calculations agree with the amounts for 2035 in the current issue of the Climate and Energy Outlook (€140 per tonne of CO<sub>2</sub>) and 2040 (179 per tonne of CO<sub>2</sub>).

## Appendix 4 Terms and definitions

### Discount rate

A discount rate is used to calculate net present value (NPV). We used different discount rates for Porthos, Porthos's customers and the government as the return Porthos's customers earn on their investments differs from the return that Porthos and the government earn.

We use the following discount rates in this report:

1. for Porthos's customers we use a nominal discount rate of 7.5%. This is the reasonable return the PBL recommended in view of the overall risk that companies face in an SDE++ grant-funded CCS project (PBL, 2023);
2. for Porthos we use a nominal discount rate of 6.6%. This is the target return set by Porthos itself;
3. for the government we use a real discount rate of 2.25%. This is the standard discount rate recommended for SCBAs of government policy (Finance, 2020).

### Net present value

The NPV of all costs and benefits is a key measure to assess project profitability. NPV maps out all the funds flows for an investment and all expected costs and benefits during the project's lifetime. Because €1 in 2026 is not worth the same as €1 in 2041, the current value of future costs and benefits are calculated by means of a discount rate. In effect, the discount rate is equal to the return that would have been earned on an alternative investment. With a discount rate of 5% per annum, €1 today would be worth €1.05 in a year's time.

### Over-incentivisation

For every category of eligible SDE++ project, the PBL recommends reference rates including a reasonable return. If a grant-funded company's profit is higher than the reasonable return, it has been over-incentivised.

### Return (internal rate of return)

The return (internal rate of return) is the discount rate at which net present value equals zero. The internal rate of return is the highest value of the discount rate at which a project is only just profitable. If a project developer insists on a particular return (discount rate), the internal rate of return may not be lower than that return.

## Appendix 5 Government funds flows

The table below presents the funds flows we audited and explains how we used them in our calculations.

### **EBN loan**

The Ministry of EZK awarded EBN a €53.4 million (in current prices) loan to cover its investment in the Porthos project's carbon storage infrastructure. EBN will repay the loan with interest between 2022 and 2038.

### **Tax on residual gas compensation**

TAQA pays tax (50%) on the compensation it receives from Porthos for residual gas. An additional duty will increase the tax rate to 72% in 2023 and 2024. This is not additional revenue for the government. If Porthos did not exist, the government would still receive this revenue, just not from Porthos or its customers. We therefore did not include it in our calculation of the cost per tonne of CO<sub>2</sub> to the government.

### **CEF grant**

Porthos received a CEF grant from the EU for the FEED phase (development phase) and a CEF grant for the investments (construction). In total, the grants amounted to €108.5 million (in current prices).

As the CEF grants were awarded by the EU, they do not represent a cost to the government.

### **Energy tax**

Porthos and its customers pay energy tax on the energy they consume. We requested data on projected energy consumption from the parties concerned and applied the regressive energy tax rate to it.

### **Regressive energy tax rate**

The regressive energy tax rate has been classified as a tax facility since the presentation of the 2023 Budget Memorandum. We calculated that the financial importance of the facility to the government over the project's lifetime (the 15 years in which SDE++ grants are available) was €848 million (2023 prices). We explained why we did not include this amount in the calculation of the government's costs in the text box in section 6.2.1.

## **EIA**

The energy investment allowance (EIA) is a tax facility to support investments to reduce emissions from energy production. The EIA will be applied during the construction of Porthos's infrastructure. It represents lost income to an amount of €6.8 million.

## **Porthos guarantee**

The Ministry of EZK issued a €175.6 million guarantee to Porthos to cover the financial risks assumed by the Porthos parties when they signed the procurement contracts. The risks arose on the withdrawal of the construction exemption. Porthos paid the Ministry of EZK a premium of €21.9 million for the guarantee (EZK, 2022d).

## **Sufferance tax**

Porthos pays €200,000 per annum in sufferance tax to Rotterdam municipality to lease space in the pipeline corridor. As the sufferance tax is not a revenue for the government, it was not included in our calculations.

## **SDE++**

The Ministry of EZK approved the award of SDE++ grants to Porthos's customers. The amount of the grants depends on the difference between the amount Porthos's customers applied for and the CO<sub>2</sub> price in a particular year.

## **EBN grant**

The Ministry of EZK awarded a grant to EBN in 2019 to study the use of underground carbon storage fields (up to €7,389,412.50, in current prices) and to carry out feasibility studies (up to €2,410,587.50, in current prices). This expenditure is a start-up cost and we therefore did not include it in our calculations. This is consistent with the approach taken by the CPB/PBL (2013).

## **Profit tax**

The government receives profit tax (corporation tax) from Porthos and its customers. The figures were taken from the business cases made by Porthos and its customers (see also appendix 2).

## Appendix 6 Abbreviations

CCS	Carbon Capture and Storage
CEF	Connecting Europe Facility
CO <sub>2</sub>	Carbon dioxide
CPB	Netherlands Bureau for Economic Policy Analysis
CPI	Consumer price index
EBN	Energie Beheer Nederland
EIA	Energy investment allowance
ET	Energy tax
EU	European Union
EU-ETS	EU Emissions Trading System
EZK	Economic Affairs and Climate Policy
FEED	Front-End Engineering Design
IISD	International Institute for Sustainable Development
K&E	Climate and Energy
MOB	Mobilisation for the Environment
NEa	Netherlands Emissions Authority
NPV	Net present value
PBL	Netherlands Environmental Assessment Agency
RVO	Netherlands Enterprise Agency
SCBA	Social cost-benefit analysis
SDE++	Sustainable Energy Production and Climate Transition Incentive Scheme
SodM	State Supervision of the Mines
TSA	Transport Capacity and Storage Space Agreement

## Appendix 7 Literature

CPB/PBL (2013). *Algemene leidraad voor maatschappelijke kosten-batenanalyse* [General guidance on social cost-benefit analyses]. The Hague, self-publication.

CPB/PBL (2023). *Afschaffing fossiele energiesubsidies: eerder een hersenkraker dan een no-brainer* [Abolition of fossil energy grants: more of a brainteaser than a no-brainer]. The Hague, self-publication.

Ecorys (2023). *Evaluatie EBN* [EBN evaluation]. Rotterdam: self-publication.

EZK (2020). Nota "SDE++ 2020: Opslag- en transporttarief CCS" [SDE++ 2020 policy document. CCS storage and transport fee]. 29 June 2020.

EZK (2021a). Letter "Rol staatsdeelnemingen m.b.t. de afvang, transport en opslag van CO<sub>2</sub> (CCS)" [The role of state-owned enterprises in the capture, transport and storage of CO<sub>2</sub> (CCS)], House of Representatives, session 2020-2021, 32 813, no. 758. The Hague, Sdu.

EZK (2021b). Letter "Voorlopige resultaten SDE++ 2020 en voortgang SDE++ 2021" [Provisional SDE++ 2020 results and progress of SDE++ 2021], House of Representatives, session 2020-2021, 31 239, no. 332. The Hague, Sdu.

EZK (2021c). Bijlage 1: Technische uitwerking aanpassing SDE++ 2023 [Appendix 1: Technical amendment of SDE++ 2023]. The Hague, self-publication. Appendix to parliamentary paper 31 239, no. 340. House of Representatives, session 2021-2022.

EZK (2022a). *Beslisnota garantieregeling Porthos* [Porthos guarantee scheme decision document]. Appendix to parliamentary paper 35 334, no. 214. The Hague, Sdu. House of Representatives, session 2022-2023.

EZK (2022b). Nota "Voorinvesteringen Porthos" [Policy document on Porthos pre-investments]. 8 November 2022.

EZK (2022c). *Besluit vergunning voor het permanent opslaan van CO<sub>2</sub> in het opslagvoorkomen P18-2* [Permit decision for the permanent storage of CO<sub>2</sub> in the P18-2 storage facility]. 12 July.

EZK (2022d). Letter “Garantieregeling Porthos” [Porthos guarantee scheme], House of Representatives, session 2022-2023, 35 334, no. 214. The Hague, Sdu.

EZK (2022e). *Wijziging van de begrotingsstaat van het Ministry of Economische Zaken en Klimaat voor het jaar 2023* [Amendment of the budget statement of the Ministry of Economic Affairs and Climate Policy for the year 2023]. House of Representatives, session 2022-2023, 36 271, no. 2. The Hague, Sdu.

EZK (2023a). Letter “Marktontwikkeling en –ordering van CO<sub>2</sub>-transport en –opslag” [Market development and organisation of CO<sub>2</sub> transport and storage]. House of Representatives, session 2023-2024, 32 813, no. 1298. The Hague, Sdu.

EZK (2023b). *Klimaatnota 2023* [Climate policy document 2023]. The Hague, self-publication.

EZK (2023c). Letter “Stand van zaken gaswinning Noordzee” [State of North Sea gas production]. House of Representatives, session 2023-2024, 33 529, no. 1174. The Hague, Sdu.

Finance (2020). *Rapport Werkgroep discontovoet 2020* [Report of the discount rate working group 2020]. The Hague, self-publication. Appendix to parliamentary paper 29 352, no. 10. House of Representatives, session 2020-2021.

Finance (2022a). *Nota Deelnemingenbeleid Rijksoverheid 2022* [Policy document on State-Controlled companies]. The Hague, self-publication.

Finance (2022b). *Nota “Voorinvesteringen Porthos (Gasunie en HbR)”* [Policy document on Porthos pre-investments (Gasunie and the Port of Rotterdam)]. 6 December 2022.

Finance (2023). *Handboek Investerings Staatsdeelnemingen 2023* [Manual on Investments by State-Controlled Companies]. April 2023. The Hague, self-publication

IISD (2015). *Risk allocation in Public-Private Partnerships: Maximizing Value for Money*. Winnipeg: self-publication.

Netherlands Court of Audit (2021). *In public hands*. The Hague, self-publication.



PBL (2020). *Eindadvies basisbedragen SDE++ 2020* [Final advisory report on SDE++ reference amounts 2020]. The Hague, self-publication.

PBL (2022). *Climate and Energy Outlook 2022*. The Hague, self-publication.

Porthos (2021). *Porthos Transport Capacity and Storage Space Agreement*.  
17 December 2021.

Porthos (2023a). *Synthesis paper Porthos – Final Investment Decision*. September 2023.

Porthos (2023b). Amendment No. 2 to the Porthos Transport Capacity and Storage Space Agreement. 8 March 2023.

SodM (2021). Letter “Advies opslagvergunning CO<sub>2</sub> P18-2” [Advice on P18-2 CO<sub>2</sub> storage permit]. 22 July.

Trinomics (2022). Second opinion ETS price. Rotterdam, self-publication. Appendix to parliamentary paper 31 239, no. 342. House of Representatives, session 2021-2022.

XODUS (2020). *Porthos CCS – Transport and Storage (T&S) Tariff Review Final*. London: self-publication.

## Appendix 8 Endnotes

1. The cost is the pre-agreed expected cost that is eligible for grant funding. The PBL advises the Minister for K&E on this.
2. Stored CO<sub>2</sub> x CO<sub>2</sub> return: 2.45 megatonnes x 92% = 2.25 megatonnes (see also § 4.2).
3. RVO is an agency of the Ministry of EZK. It administers the SDE++ scheme.
4. For reasons of commercial confidentiality, we do not state the exact amount.
5. For reasons of commercial confidentiality, we do not state the exact amount.
6. The TSA includes an agreement on indexation for inflation.
7. For reasons of commercial confidentiality, we do not state the exact amount.
8. For reasons of commercial confidentiality, we do not state the exact amount.
9. Nevertheless, the public purse can expect to recover a large proportion of the compensation. About 70% of the compensation will be returned to the government in the form of gas revenues. These revenues are not included in our calculation of costs and benefits to the government in § 6.2. The government would have received them anyway because TAQA, the operator of the gas field, could have continued its gas production.
10. The storage permit is currently still issued to EBN CCS B.V. and TAQA. It will ultimately be transferred to Porthos's management entity before Porthos begins its storage activities.
11. Section 31j, (1) (c) of the Mining Act. The permit will not be withdrawn until the permit issuer is satisfied that the stored CO<sub>2</sub> is completely and permanently sealed.
12. Section 31j, (1) (c) of the Mining Act.
13. We did not assess the quality of XODUS's study.



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Photo: Danny Cornelissen

**Original title**

Opslag van CO<sub>2</sub> onder de Noordzee; Over  
winsten onder water

**The Hague, March 2024**