Dutch Ministry of Economic Affairs and Climate Policy

Costs of CO2 transportation and storage abroad

Study Findings

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XODUS

Glasgow

Floor 5
180 St Vincent Street . Glasgow
G2 5SG . UK

E colin.laing@xodusgroup.com

www.xodusgroup.com

REVISIONS & APPROVALS

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EXECUTIVE SUMMARY

This study was undertaken by Xodus for the Dutch Ministry of Economic Affairs and Climate Policy to assess if the SDE++ scheme requires a different level of allowance for the Transport and Storage of Dutch CO_2 outside the Netherlands and what form that allowance might take. The work was prompted by the extension of the scheme to allow Transport and Storage projects located outside of the Netherlands to form part of the value chain.

Status of the CCS industry in the EEA

The CCUS industry is still in its infancy, with only one major 'operational' project, Northern Lights, in the EEA and a small number of other projects having reached FID. As a result, the cost of CO_2 transport and storage services remains highly uncertain for both small and large volumes. Given these uncertainties, the SDE++ scheme puts measures in place to ensure value for money for taxpayers and avoid the risk of excess subsidy. In the past the scheme administrators have worked with the industry to understand the costs of these services to inform the level of subsidy provided and a similar approach was requested for Transport and Storage (T&S) projects subsidised by the scheme but operating and storing emissions outside of the Netherlands.

Study Approach

The study comprised a structured screening of European Carbon Capture and Storage (CCS) projects, followed by targeted engagement with shortlisted Transport and Storage companies (T&Scos). Shortlisted companies were those that were planning to store Dutch emissions by 2031, were located within the European Economic Area (EEA) and had already been promoted by the European Commission via Innovation Fund or Connecting Europe Facility type schemes. The purpose of the focused engagement was to obtain information on the technical, commercial and financial basis of representative and mature transport and storage services for Dutch CO_2. The ultimate aim was to build an evidence base to inform the discussion about setting a Tariff which would apply to T&S projects outside the Netherlands.

This study was therefore not intended to constitute a full market review across all potential EEA transport and storage projects. It was a targeted policy-support assessment based on projects meeting defined eligibility and relevance criteria for the SDE++ context.

General Findings

The engagement undertaken through this study indicates that the relevant transport and storage companies were generally approachable and engaged constructively with the work. The information provided has helped to improve understanding of the potential cost range for liquid CO_2 transport and storage services outside the Netherlands and has provided useful insight into the current maturity of the market. However, this should be understood in the context of a nascent and increasingly competitive sector, where detailed cost and tariff information is commercially valuable, costly to develop, and may influence future negotiations with emitters and other market participants. In those circumstances, there are reasonable limits to the level of detail that a rational company would be expected to provide, particularly where tariff methodologies, financial assumptions and forward commercial positions remain under development. The resulting evidence base is therefore useful for policy

development and discussion, but it should not be interpreted as a complete view of obtainable market costs for Dutch emitters.

Indicative Tariff

On the limited evidence received during this study, €75/tCO_2 may be considered as a provisional policy reference value for a liquid transport and storage value chain, subject to an estimated accuracy range of at least ±30–40%, with uncertainty potentially higher. It should not be interpreted as a robust market tariff, a settled view of efficient costs, or as implying a level of precision that the current evidence base does not support. This research has instead provided an indicative reference point based on the information made available to the review team during the course of this study.

Existing Safeguards and Next Steps

Despite the positive market engagement undertaken through this study, the depth and breadth of evidence currently available means that the indicative liquid value chain tariff for T&S projects outside of the Netherlands remains subject to a wide uncertainty band. This may be difficult to overcome in the short term, given the maturity of the projects and markets currently available to Dutch emitters, the commercially sensitive nature of tariff information, and the value of cost evidence in a competitive market. The indicative tariff should therefore be treated as a provisional policy reference point, rather than as a definitive market tariff or a settled view of efficient costs.

The existing SDE++ framework includes mechanisms that may help manage the risk of overcompensation, including the cumulation test, the appropriateness of support test and related ex-post controls. These mechanisms allow actual project costs, revenues and other public funding to be reviewed once projects are operational, with the potential for future subsidy reductions or clawback where support is later shown to have exceeded the appropriate level. They provide an important backstop while the market develops, but they do not remove the need for careful ex-ante calibration of any allowance adopted for storage abroad if the existing principles of the SDE++ scheme are to be upheld.

For that reason, any interim allowance should be kept under review as projects mature, commercial negotiations progress, and more complete project cost estimates become available. Further structured engagement with eligible transport and storage providers would strengthen the evidence base and support a more robust assessment of whether a separate allowance remains justified, and if so, at what level. In the meantime, any separate allowance should be clearly presented as the best available evidence with the caveats listed and also supported by the existing safeguards within the SDE++ framework

1 INTRODUCTION

This research was commissioned by the Dutch Ministry of Economic Affairs and Climate Policy (EZK), which is responsible for the SDE++ subsidy scheme, and carried out by Xodus in support of that work. The SDE++ scheme is designed to support renewable energy production and CO_2 emissions reduction by compensating the difference between the cost price and market value of eligible technologies. For CCS, part of that cost is determined by the fees associated with transporting and storing CO_2.

Since 2025, the SDE++ scheme has allowed CO_2 to be stored outside the Netherlands, provided it is within the EEA (European Economic Area). However, the transport and storage fees currently reflected in the scheme are based on domestic Dutch projects and offer allowances for both Gaseous and Liquid transport and storage value chains. These allowances are commonly known as "Tariffs" and are described in the SDE++ literature as a "processing fee" (Verwerkingstoeslag) and are one of the components that make up the CCS category Base Amounts. While there has already been substantial engagement with stakeholders in Dutch projects such as Aramis and Porthos, equivalent cost information for Transport and Storage projects operating outside of the Netherlands has not been available. This creates a risk that the current support level may not accurately reflect the costs of storing Dutch CO_2 in projects other than Porthos and Aramis.

The purpose of this work was to support EZK in assessing whether separate Gaseous and Liquid allowances may be needed for CCS transport and storage projects serving Dutch emitters but storing CO_2 outside the Netherlands. To support that assessment, Xodus screened potentially relevant projects, identified those considered most relevant to the SDE++, and engaged with project stakeholders to gather and review the available information.

Given the commercially sensitive nature of the information shared during stakeholder engagement, and in line with the agreements put in place with participants in this research, the findings in this report are presented at a summary level only. The report does not disclose information in a form that can be attributed to, or linked back to, individual projects, except where such information is already suitable for reporting at that level.

1.1 Research Approach and Assessment Process

The research followed a structured process. It began with a screening of European CCS projects using publicly available information, before applying further filters relating to expected operational timing, value chain relevance and geographic suitability.

From this process, a shortlist of projects was identified for targeted stakeholder engagement. Xodus then engaged directly with those parties, and requested information on the technical, commercial and financial basis of representative transport and storage services for Dutch CO_2. Appropriate disclosure arrangements were established to protect commercially sensitive information as part of this process.

The information gathered was then reviewed to assess the scope, quality, and limitations of the available evidence, including project phasing, cost profiles, maturity of definition, and the degree of uncertainty linked to potential tariffs. It is important to note that Xodus was not tasked with re-estimating Capex or Opex profiles or imposing commercial models on the projects as part of this work.

Based on this assessment, the research examined whether the evidence substantiated the use of an alternative processing fee or Tariff in the Base Amounts applicable to CCS projects transporting and storing emissions outside the Netherlands. Additionally, it considered what could be an appropriate level of Tariff support and how existing SDE++ mechanisms designed to prevent overcompensation could be applied.

2 EEA PROJECT SCREENING

Xodus performed a screening process, informed in part by criteria set by the EZK team and in part by Xodus advice, to determine the sample of projects to be engaged in this research. The screening process was designed to identify CCS projects that are sufficiently advanced and relevant to CO_2 storage for Dutch emitters and was not a comprehensive benchmark of all possible projects. The screening was conducted in two main steps:

1. Initial Screening Process based on EU support and Designation.
2. Secondary filtering using four targeted criteria provided by EZK, which match their policy intentions for this work.

The funnel diagram below summarises the screening process undertaken, beginning with the broad population of CCS projects identified through publicly available surveys and reports, applying the relevant assessment criteria, and arriving at the final shortlist of projects selected for further consideration.

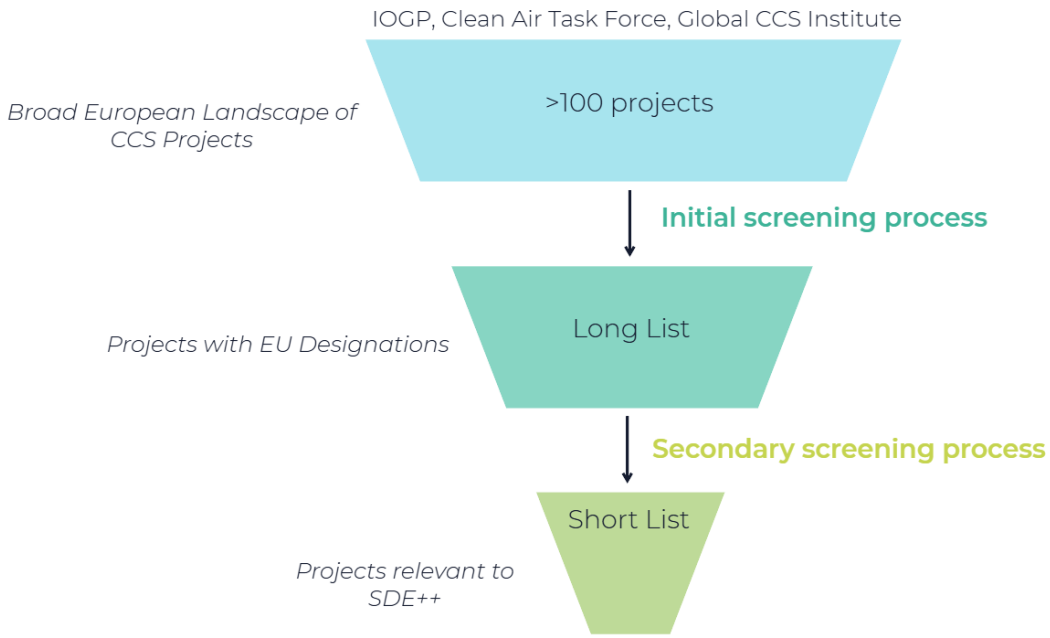

Figure 2.1 - Funnel diagram highlighting high-level screening process to final short list

2.1 Initial Screening - EU support and Designation status 2025

The initial stage of the screening process focused on CCS projects that had either secured support through relevant European funding mechanisms or had achieved strategic status under the relevant EU infrastructure frameworks. Projects retained in this screening step were backed by the Innovation Fund, as well as those identified under the Project of Common Interest (PCI) / Project of Mutual Interest (PMI) framework and the Connecting Europe Facility (CEF). The review relied on the published list of projects retrieved in Q4 20251. These mechanisms were used as a

practical starting point for the screening process, as they provide evidence that a project has been subject to a degree of technical, commercial and strategic assessment at EU level.

The award of EU funding does not, in itself, confirm that a project will meet all SDE++ requirements, and should not be read as excluding the potential relevance of projects outside those mechanisms. However, it provides a practical first filter before applying more targeted criteria relating to operational timing, value chain relevance and geography.

The map below shows the indicative locations of all 23 projects, colour-coded by EU funding source.

Sequence	Project
1	EU2NSEA
2	CO2TransPorts (including Porthos)
3	Aramis
4	Bifrost
5	CCS Baltic Consortium
6	Nautilus CCS
7	Northern Lights
8	Pycasso
9	Callisto
10	D'Artagnan: Dunkirk CO2Hub Phase I
11	Prinos
12	Kairos@C / Antwerp@C
13	StarFish
14	ACCSION
15	TarraCO2
16	CO2LLECT
17	CarboClearTech
18	Coda Terminal
19	Danube Removals
20	Greensand
21	MarcegaglIa AdriatiCO2
22	CapturEste
23	Silverstone

Figure 2.2 - Distribution of the long list CCS projects with EU support, light blue have PCI/CEF and white have Innovation Fund

2.2 Secondary Screening - EZK Screening Criteria

Based on the policy intent of the SDE++, EZK provided screening criteria relevant to transport and storage projects located outside the Netherlands. The criteria were as follows:

1. Operational by 2031 – Corresponds to the six-year realisation period of projects receiving a subsidy and reflects the national climate targets for 2030 and 2035, ensuring subsidised CCS capacity contributes to near-

term emissions reduction. This also avoids subsidising early-stage project concept unlikely to reach operation within the required timeframe.

2. Use CO_2 storage within the EEA – The 2026 round of SDE++ support will apply to cross-border storage capabilities within the European Economic Area.
3. Can Accept and store Dutch emissions – The subsidy is designed to support decarbonisation of Dutch industry, so only projects with a route for receiving Dutch CO_2 emissions are relevant.

These criteria reflect the specific policy question being considered for SDE++ and should not be interpreted as a broader assessment of the technical, commercial or strategic merit of projects outside the screening scope

2.3 Secondary Screening - Final Shortlist

The final step in the filtering process drew on Xodus' and EZK's knowledge to consider whether projects should be included in the research using the following additional criteria:

- Funding Award Date
- Implied project maturity
- Level of Grant Funding
- Value Chain Type
- Geography

Given the commercially sensitive nature of the information provided during engagement, and the potential for individual projects or sources of information to be identified if the shortlist were disclosed, the final project shortlist has not been made public. This approach is consistent with the summary-level reporting adopted in this study and arrangements agreed with participating projects.

3 SHORTLISTED PROJECT ENGAGEMENT AIMS AND PROCESS

The aim of the stakeholder engagement was to develop an understanding of the cost base and Tariff proposed by each shortlisted project. To support comparison across the projects included in the review, the transport and storage company project teams were asked to provide information on an open-book basis. The following sections describe the type of data requested and the engagement process followed with the shortlisted companies.

3.1 Shortlisted Project Engagement Data Request

The stakeholder engagement was structured to obtain information in a sufficiently consistent form to allow comparison across the shortlisted transport and storage projects. To support this, Xodus requested information against a defined set of parameters reflecting the requirements of the SDE++ scheme and the characteristics of a representative transport and storage service for Dutch CO_2 capture projects. This request was divided between a number of fixed assumptions, applied consistently across all projects, and a set of variable project-specific inputs covering the technical, commercial and financial basis of the proposed service. Together, these information requests were intended to provide an appropriate basis for assessing indicative tariff levels, the underlying cost drivers and the extent to which the available evidence could support consideration of a separate transport and storage allowance for storage abroad.

The fixed assumptions imposed on the projects are noted in the table below.

INFORMATION	DESCRIPTION & JUSTIFICATION
Contract Duration	15 years - Following discussion we believe 15 years is appropriate and aligns with other products being offered in other countries in the EEA and the current approach to SDE++ contracts for emitters.
System Boundaries	The tariff should only include costs for transport and storage. The boundary is drawn at the delivery point to the Transport system.

Table 3.1 - Fixed requirements for data requested

The information requested specific to each project is shown below in Table 3.2.

INFORMATION	DESCRIPTION & JUSTIFICATION
Delivery location in NL	Representative location to be proposed by T&Sco.
User Booked Capacity in MTPA	To understand the economies of scale that are inherent in the tariff proposed. This needs to be representative of type and scale of projects outlined in the SDE++base rate calculations for emitters.
System utilisation (i.e. capacity utilised vs design capacity of common infrastructure)	Booked capacity vs business case assumptions vs design capacity

INFORMATION	DESCRIPTION & JUSTIFICATION
Project phase	Noting that most T&S projects are developed in a phased approach and often shares infrastructure, a description of the approach being taken by the specific project and how it relates to the data provided.
Capex profile	To cover all the costs required including Abex (Abandonment expenditure), Devex (Development Expenditure) etc
Opex profile	Operational costs including cost of 3rd party access and post closure costs.
Financial obligations / liabilities	Insurance costs etc and a discussion about the terminal value of the asset
Target IRR	To explain the return being targeted by the project and reflects the nuances around country and company specific approaches that influence this important variable.
Tariff Calculation methodology and model	For example, capacity/variable, charge type split, contract duration etc and an explanation of how the tariff would be calculated i.e. a methodology.

Table 3.2 - Variable / Flexible information requested

3.2 Applicable Tariff Types

The original Aramis review completed in 2024 considered two separate system configurations and accordingly compiled a gaseous and a liquid transport and storage tariff, reflecting the two emitter inlet routes assessed in that research. In contrast, the projects shortlisted through this research were limited to systems based on a liquid CO_2 transport and storage arrangement as no gaseous transport solutions fulfilled the project selection criteria.

For the purposes of this report, only a liquid tariff value is investigated and discussed.

3.3 Stakeholder Engagement Process

Xodus engaged directly with the shortlisted projects to support discussion and information sharing on the potential cost base and tariff structure for liquid CO_2 transport and storage services. The engagement process required careful handling of commercially sensitive information, particularly given the early stage of market development and the potential relevance of tariff information to future commercial negotiations.

To support appropriate disclosure, time was allowed for the necessary confidentiality and information-sharing arrangements to be put in place with participating parties. Initial engagement commenced in the second half of 2025, with information subsequently provided during Q1 2026. The information received was then reviewed and used to inform the assessment of indicative tariff levels, cost drivers and the limitations of the available evidence base.

4 PROJECT ENGAGEMENT NOTES

4.1 Project Engagement

Engagement with the eligible T&Sco projects was very constructive, and the overall process was supported by the parties involved. However, the market for CO_2 storage outside the Netherlands remains at a relatively early stage of development, and some participants were understandably cautious about sharing commercially sensitive cost and Tariff information. This sensitivity reflects the role that Tariff cost discovery may play in a developing and increasingly competitive market.

As a result, the outcomes of the engagement should not be regarded as an exhaustive market review, but the information received does provide useful insight into the potential range of tariffs. It also helps to shed further light on the level of certainty that can currently be attached to the underlying cost base.

4.2 Varied Levels of Project Development

Information received from projects indicated there are varying levels of project development and corresponding estimating uncertainty within the project that build up the tariff such as Capex and Opex costs. Key uncertainty in tariff costs can stem from several key factors within a CCS T&S project with the following items playing a major role:

- Pre-FID engineering design and Estimate Accuracy. As a project matures through engineering design (e.g. through a typical major project lifecycle; Asses-Select-Define-Execute) the projected outturn capital and operational expenditure throughout the life of the project can be defined with greater certainty. The projects that engaged in this research exhibited unknown or Pre-FEED levels of engineering design with corresponding estimate accuracy.
- Contract Terms and Booked Volumes. A T&Sco requires contracted volumes of adequate tenor to provide certainty for the project revenue, through direct revenue generation from tariffs or to support the operation of a network, i.e. meeting minimum injection rates. At this moment, eligible projects are actively engaged in negotiations with emitters / aggregators to secure volumes (revenue), and the tariff cost is expected to be the dominant negotiating subject, but they are ongoing. As such, T&Scos do not have a definitive tariff that their customers are willing to pay.

The information received from T&Scos indicated a range of tariff accuracies between +/-30 to +/-40% based on typical project cycles within the industry.

4.3 Information Received

The information supplied by the projects presents a varied level of detail across the requested parameters. While all participants provided core technical inputs, such as capacity assumptions, development phasing, operating cost profiles, and long-term injection durations, other areas were addressed only partially or not at all. For example, capital cost accuracy was not directly reported by any project, but the status of the project was. Commercial and financial indicators, including target returns and tariff accuracy bands, were shared by only a subset of respondents, and no project disclosed a tariff calculation methodology or supplied a model. Overall, the dataset reflects a

combination of some well understood technical elements and more limited commercial or financial information. The project data received also indicates that initiatives targeting injection by or before 2031 are progressing toward FEED-level engineering maturity, with commercial engagement underway in line with the general maturity of the project design.

Table 4.1 below provides an overview of the information submitted by the T&Sco projects participating in this research, highlighting the extent to which each of the requested parameters was addressed.

Information Requested	Information received
Project Definition Q1 2026	Only some projects detailed the current project definition with a schedule provided.
Capex and Opex Accuracy (+/-%)	Not reported by any project, status of development provided.
Project Capacity Basis	Provided by all projects
System utilisation (i.e. capacity utilised vs design capacity of common infrastructure)	Fully or majority supplied by all projects
Project phasing	Phasing detail provided by all projects
Injection Duration	15 years and beyond confirmed by all projects.
Capex Total	Data provided by all companies; Profiles provided by some companies. ABEX provision provided by some but not all projects.
Opex Total	Data provided by all companies; Profiles provided by some companies.
Financial obligations / liabilities	No liabilities linked to development of the projects were declared by any of the companies
Target IRR	Only some of the companies provided a target IRR for their Project.
Tariff Calculation methodology and model	No companies provided a tariff calculation or model.
Tariff Accuracy Band	Only some companies provided a tariff accuracy band

Table 4.1 - Summary Project information received

The limitations in the information available to this study should not be read as a lack of engagement by the participating projects. They reflect the current maturity of the market, the commercial sensitivity of tariff formation, and the fact that several relevant commercial positions remain under development or active negotiation

5 EVIDENCE UNCERTAINTITY AND EXISTING SDE++ SAFEGUARDS

The information gathered through this study provides useful insight into the potential cost range for transport and storage services outside the Netherlands and reflects the current maturity of the cross-border storage market. The projects that took part in the research are developing in a competitive and evolving environment, where project definitions, customer demand, commercial positions and tariff methodologies are still being refined. As a result, the cost information received from the projects looking to operate outside the Netherlands is different in nature from the information previously used to inform transport and storage allowances for the Porthos and Aramis systems. This should not be framed as a criticism of the project and is entirely consistent with normal infrastructure project development, where estimated costs evolve as project concepts are refined, customer demand becomes clearer, store performance and subsurface risk are better understood, and investor appetite for the sector develops.

In this context, where costs are expected to evolve, any allowance for T&S projects will need to manage this risk effectively if the desired policy outcome of the SDE++ scheme is to be achieved. For example, if an allowance is set above the level ultimately required, it may affect value for money for Dutch taxpayers; if set below the level required, it may affect the commercial viability of projects seeking to provide storage services for Dutch emitters. This risk is particularly relevant in a developing market where projects differ in maturity, cost structure, financing assumptions, capacity utilisation, commercial risk allocation and stage of tariff development.

5.1 Existing SDE++ Safeguards

The SDE++ framework contains mechanisms intended to mitigate the risk of overcompensation. In the context of this study, the most relevant are the appropriateness of support test and related ex-post controls administered by RVO. Under this process, the subsidy recipient, which in this occasion is the emitter company, is required to provide information on total investment costs, operating costs, revenues and other support received or expected, supported by an auditor's report. This information is then assessed using the prescribed approach to determine whether support has exceeded the level considered appropriate. This includes contracts with T&S companies as a major cost component of the subsidy. Where overcompensation is identified, the mechanism can result in a reduction to future subsidy payments and, where relevant, clawback of subsidy already received. The mechanism operates as a downward adjustment during the subsidy period and does not provide a basis for increasing support where a project's costs are higher than assumed.

These safeguards are relevant to storage abroad because they provide a mechanism to review actual costs, revenues and other public funding once projects are operational. They may help manage the risk that support is later shown to have exceeded the appropriate level. However, they should be understood as an ex-post backstop rather than a substitute for proportionate ex-ante calibration. They do not remove the need for any tariff or allowance to be informed by the best available cost evidence, with due regard to both value for money for Dutch taxpayers and the commercial conditions required for relevant projects to be delivered and support the intended SDE++ policy outcomes.

5.2 Discussion

In light of the information received, the current maturity of the market and the safeguards available within the SDE++ framework, there would be value in keeping any allowance proposed or applied for transport and storage services outside the Netherlands under review. Further engagement with eligible transport and storage providers, particularly as projects move through FEED, commercial negotiations progress and more detailed tariff methodologies become available, would strengthen the basis for future tariff-setting. In the interim, the existing SDE++ safeguards provide a useful mechanism for managing overcompensation risk and this is important given the outcome of this research work.

6 PROJECT RESULTS & CONCLUSION

This research has provided a useful basis for understanding the potential range of transport and storage costs for projects outside the Netherlands. The information received from the projects taking part in this study gives insight into a developing market and helps inform consideration of how storage abroad may be treated under the SDE++ scheme but it is also important to reflect on the context in which the data was provided. At this time in the development of a CCCS T&S market in the EEA, tariff information remains commercially sensitive, and the projects considered are still developing. The evidence received during this study has a different level of maturity from the previous processes used to inform transport and storage allowances based on the Porthos and Aramis systems.

With these important points noted, an indicative value of €75/tCO_2 for a liquid transport and storage value chain tariff may be considered on a provisional basis, subject to an associated estimate accuracy range of at least ±30–40%, recognising that uncertainty may be higher. This value should not be interpreted as a definitive "whole market" tariff or as a settled view of efficient costs. This research has instead provided an indicative reference point based on the information made available to the review team during the course of this study.

It should be noted by the industry that the existing SDE++ framework provides mechanisms that may help manage the risk of overcompensation. In particular, the appropriateness of support test allows support to be reviewed against actual project costs, revenues and other public funding once a project is operational, with the potential for future subsidy reductions or clawback where support is later shown to have exceeded the appropriate level. These mechanisms provide an important ex-post safeguard, but they do not remove the need for any tariff or allowance to be informed by sufficiently mature cost data, with due regard to both value for money for Dutch taxpayers and the commercial conditions required for relevant projects to be built and support the intended SDE++ policy outcomes.

In light of the information received, the current maturity of the market and the safeguards available within the SDE++ framework, any allowance proposed for T&S services outside the Netherlands should be kept under review. Further engagement with eligible transport and storage providers, particularly as projects move through FEED, commercial negotiations progress and more detailed tariff methodologies become available, would strengthen the basis for future tariff-setting. In the interim, the existing SDE++ safeguards provide a mechanism for managing residual overcompensation risk.

APPENDIX A ACRONYMS AND GLOSSARY

ACRONYM	MEANING
ABEX	Abandonment expenditure
Tariff	Means the value equivalent to the processing fee in the SDE++ literature.
CAPEX	Capital expenditure
CCS	Carbon capture and storage
CEEAG	Climate, Environmental Protection and Energy Aid Guidelines
CEF	Connecting Europe Facility
CO_2	Carbon dioxide
Devex	Development expenditure
EEA	European Economic Area
EZK	Dutch Ministry of Economic Affairs and Climate Policy
FEED	Front-End Engineering Design
FID	Final Investment Decision
IRR	Internal Rate of Return
MSK	Environmental and Energy Aid Framework overcompensation assessment
MTPA	Million tonnes per annum
OPEX	Operating expenditure

ACRONYM	MEANING
PCI	Project of Common Interest
PMI	Project of Mutual Interest
RVO	Netherlands Enterprise Agency
SDE++	Stimulation of Sustainable Energy Production and Climate Transition
T&S	Transport and Storage
T&Sco	Transport and Storage Company