CCSA

Accelerating a Europe-wide CO_2 storage market

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Acknowledgements

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Finally, we would like to express our gratitude to several CCSA members, who have provided data to the modelling; insight and advice throughout the process; and financial sponsorship of the project.

About the contributors

The data analysis supporting this paper has been prepared by Xodus, a Subsea7 company. Xodus is a global energy consultancy, we unite our unique and diverse people to share knowledge, innovate and inspire change within the energy industry. We provide support across the energy spectrum, from advisory services to supply chain advice across the full lifecycle of energy projects. Our people strive to ensure global energy supply as we all work together to realise a net zero world.

Subsea7 is a global leader in the delivery of offshore projects and services for the energy industry, including the offshore energy transition solutions the world needs and was pleased to contribute to some of the analysis.

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Executive summary

Carbon capture, utilisation and storage (CCUS) is a core element of decarbonisation and climate change plans in Europe and beyond. This paper sets out why enabling the transport and storage of captured carbon dioxide (CO_2) between the European Union/European Economic Area and the United Kingdom is crucial to effective and timely emissions reduction, how it will reduce the cost of reaching net zero, and how governments and the European Commission can make it happen.

Carbon capture and storage prevents CO_2 from industry and power generation reaching the atmosphere, and can also remove CO_2 from the atmosphere. CO_2 can be captured from point sources or from the air, then securely and permanently stored in geological formations in the subsurface. There is often a mismatch within countries between the amount of CO_2 they need to capture and the amount they are able or willing to store, so the ability to use geological CO_2 storage in other countries is essential.

An integrated EU/EEA-UK cross-borders CO_2 storage market can provide cost-efficient, close-at-hand and rapid storage solutions for industrial emitters. The European Commission recognises this and has put in place a framework that enables member states to store their captured CO_2 in other parts of the European Union (EU) and the European Economic Area (EEA). This supports countries with limited availability of CO_2 storage to decarbonise using CCS and enables countries with available CO_2 storage to provide it as a service.

Currently, transporting CO_2 across the EU/EEA-United Kingdom (UK) border for permanent storage is technically possible, but not feasible due to policy barriers, including that CO_2 captured in the EU/EEA, but stored outside that jurisdiction would not be recognised under the EU emissions trading system (ETS) as having been stored. Therefore, the responsible party would still be liable to surrender allowances for their captured and stored CO_2- and effectively pay twice. This means that EU/EEA countries are unable to take advantage of the fact that the UK has significant CO_2 storage potential in the North Sea and that the cost of storing CO_2 in the UK would be lower than in other countries.

A study carried out by Xodus Group on behalf of the Carbon Capture and Storage Association (CCSA), demonstrates that **emitters in EU member states with access to the North Sea would stand to gain significantly if EU/EEA-UK cross-border transport and permanent geological storage of CO_2 was supported and enabled by governments.** This is due to the high quality and large capacity of available storage in the UK-Southern North Sea (SNS) region that could accommodate CO_2 volumes captured in mainland Europe, and the reduction in transport distances to the UK compared to other options.

The table opposite shows the estimated average cost* to emitters of storing their CO_2 offshore under scenarios where EU/EEA-UK cross-border CO_2 transport and storage is and isn't available.

The research found that UK stores are among the most cost-effective and well-located in Europe, so enabling access to these means **emitters in the EU are likely to see considerable cost savings** compared to the status quo. **UK emitters too would benefit from slightly lower storage costs** due to the efficiency and savings from having more resilient networks that are likely to be developed in a near-term timeframe. CO_2 volumes from Europe can be critical to unlocking the business case for investing in new CCS Clusters, hence allowing European emitters, including those in the UK, to access CCS networks to decarbonise their operations. This will also spur investments in new CO_2 transport and storage projects in less industrialised UK areas, where having CO_2 volumes from Europe could be crucial to developing new projects at competitive costs. Moreover, the benefits to countries that make their storage resource available to others go beyond the savings seen by their emitters: most obvious is the revenue upside of selling the storage service, but the list of benefits should also consider jobs-creation in new locations – both direct and in the supply chain – determined by accelerating the growth of their CCUS industry.

Estimated cost to emitters of offshore CO_2 transport and storage

	Estimated unit cost to emitters		Estimated unit cost reduction with EU/EEA-UK cross-border transport and storage	
	Without EU/EEA-UK cross-border CO_2 transport and storage	With EU/EEA-UK cross-border CO_2 transport and storage	Cost reduction	Percentage reduction
Europe (EU, EEA & UK)	€52/t	**€41/t**	**€11/t**	**21%**
EU	€57/t	**€41/t**	**€16/t**	**28%**
UK	€40/t	**€39/t**	**€1/t**	**3%**
Norway	€59/t	**€56/t**	**€3/t**	**5%**

Average cost to emitters of offshore storage under each scenario, in 2040, in € per tonne CO_2.

The research demonstrates that Europe as a whole would benefit in a scenario where access to UK storage is enabled. In 2040, in particular:

- **Emitters in Europe using offshore CO_2 storage would benefit from a 20% cost saving (€11/t).** With the market expected to grow to 243† $MtCO_2pa$ by 2040, this would represent €2.7 billion in annual savings, accruing to emitters using storage in the North Sea.
- **Emitters in the EU-27 countries could, on average, benefit from a €16/t reduction in the cost for offshore transportation and storage (T&S) of CO_2. This represents a 28% reduction in transport and storage costs.** With the EU alone projected to need 164 $MtCO_2pa$ of offshore CO_2 storage by 2040, this would represent €2.6 billion in annual savings.
- **The UK would benefit from lower CO_2 storage costs for its emitters due to CCS projects with a higher scale factor**, as well as the ability to make the most of its geology by offering CO_2 storage to support other countries and the associated economic benefits through tax receipts and job retention and creation that this would bring.
- **Reduction in transport and storage costs for North-West European (NWE) emitters are shown to be even greater than the average percentage (28%) mentioned above for the EU-27 countries.** The algorithm found that it would be cost-effective for EU/EEA-UK cross-border CO_2 transport and storage to be used as soon as it becomes available: in a scenario where this happens straight away 16 $MtCO_2pa$ from the EU would use UK storage by 2030.
- **Any delay in enabling cross-border solutions would lock emitters into higher-cost storage**, which would endure for the lifetime of their project.

CO_2 storage projects are progressing in the EU, Norway and the UK, with the first sites expecting to begin storing captured CO_2 in 2025. Enabling EU/EEA-UK cross-border CO_2 transport and storage would enable a more resilient and efficient system overall, and give emitters across Europe more, lower cost options for storing their CO_2. **We must act quickly before higher cost options are locked in, or companies move their operations outside Europe, and the opportunity to prevent Europe's deindustrialisation is lost.**

* Note that the calculation of the cost to emitters takes in capital expenditure, operational expenditure and the cost of capital for the CO_2 transport and storage facilities. It only includes the offshore element of CCS: transport from a port location (or pipeline terminal at the shore) to the store, plus the storage itself. It does not include the cost of capturing CO_2, or the cost off any onshore transport to the terminal.

† 243$MtCO_2pa$ is the total volume of CO_2 from the EU, UK and Norway that is expected to be stored offshore, calculated as part of Xodus' analysis. The calculation uses the methodology used by the JRC applied to the UK and Norway.

Recommendations

Both the UK and the EU have expressed commitments to enable countries to store CO_2 outside their borders. This will require mutual recognition that CO_2 is safely and permanently stored ensuring that emitters can be exempted from the need to surrender allowances in the respective ETSs and that projects that capture, transport and store CO_2 can be accepted accordingly. There are four key recommendations that governments need to undertake to enable this to happen.

1. EU-UK Trade and Cooperation Agreement

Establish a bilateral agreement between the EU and UK under the Trade and Cooperation Agreement (TCA) to enable mutual recognition of each jurisdiction's CCS regulatory regime (Action: European Commission and UK Government).

This would provide the following:

- a set of minimum criteria that each CCS regime would need to meet;
- a dispute resolution mechanism;
- a governance body to oversee implementation of the requirements of the agreement and to address changes that may be needed;
- assurance that the use of CCS will not increase hydrocarbon recovery and will lead to an overall reduction in CO_2 emissions (a key requirement under the EU regulation Net Zero Industry Act);
- mechanisms for sharing information about the CO_2 transport across the EU/UK border and, potentially, how it is accounted for in national greenhouse gas inventories.

The default position is that any new bilateral agreement between the UK and the EU will be a TCA supplementing agreement (i.e. not a new international agreement/treaty). Advantages of a supplementing agreement would include an established governance and dispute resolution framework. A key objective of the TCA is the use of trade to enhance climate change mitigation.

2. EU and UK legislation

Amend EU and UK legislation to accommodate CO_2 storage outside the EU and EEA (Action: European Commission and UK Government)

- Amend the EU ETS Directive.
- Amend the EU ETS Monitoring and Reporting Regulation.
- Amend the EU ETS Accreditation and Verification Regulation.
- Amend the UK Greenhouse Gas Emissions Trading Scheme Order 2020.
- Amend UK legislation to accommodate any necessary changes that have been made to the above EU legislation, including any material amendments which have been made since the UK left the EU, and which are not therefore reflected in UK law.

Once the key actions above – which relate to how CO_2 stored in the UK is accounted for under the EU ETS, and vice versa – have been completed, there are then additional issues that will need to be addressed.

3. Other legislative considerations

Explore the other legislative changes required to facilitate cross-border CO_2 transport and storage (Action: European Commission, UK, EEA and Member State Governments)

- These include arrangements for monitoring, standards, liabilities, third party access and infrastructure development.

4. The London Protocol

Make notifications and agreements under the London Protocol (Actions: Member States, UK, EEA countries)

- Notify the International Maritime Organisation (IMO) of the intention to provisionally apply the Article 6 amendment to the London Protocol (if the Member State has not already notified them).
- Enter into bilateral agreements or arrangements on the provisional application of the above amendment.
- Notify such an agreement or arrangement to the IMO.

1 Background

Carbon capture utilisation and storage (CCUS) has a crucial role to play in EU/EEA and UK climate plans.

The European Commission and the UK Government have an opportunity to make CCUS more cost-effective for their CO_2 emitting industries, and society at large, by enabling cross-border transport and storage of carbon dioxide (CO_2) both within the EU and beyond between the EU and third countries such as the UK.

The need for action

2024 is projected to be the first year in which global warming exceeds the ambition of the Paris Agreement, breaching 1.5°C[‡1]. In Europe and the world has seen unprecedented loss of life, economic and ecological destruction due to flooding, hurricanes fires and heatwaves.

The UN has warned that the current Nationally Determined Contributions (NDCs) are not sufficient to meet the target of the Paris Agreement – to keep global average temperature rise below 2°C - and are in fact on track to lead to a rise of 3.1°C by the end of the century[2].

As countries develop their next round of NDCs in time for COP30 in Brazil, the need to work together to tackle climate change is more critical than ever, and the UN has been clear that any delay in taking the necessary action risks debilitating impacts to people, planet and economies.

The role of CCS

The Intergovernmental Panel on Climate Change (IPCC) and many others recognise CCUS as a crucial technology for reaching net zero greenhouse gas emissions. CCUS can both prevent CO_2 reaching the atmosphere by capturing at point source and also by removing CO_2, that has already been emitted, via direct air capture. CO_2 is captured, transported, and then stored safely, securely and permanently in geological formations a kilometre or more below the seabed[§].

CO_2 capture can be applied to any activity that emits CO_2 and can therefore contribute to climate change mitigation while enabling industry and energy production – and the jobs they support – to continue to provide the essential materials and energy that societies need. Some key benefits of CCS are:

- **Reducing emissions in hard to abate sectors:** Where CO_2 emissions cannot be prevented – for example in industries such as cement, where it is an unavoidable part of the process, or industries such as energy from waste, where electrification and/or fuel or feedstock switching may not be feasible, practical or affordable – CCUS prevents the CO_2 reaching the atmosphere and contributing to climate change.
- **Low-carbon energy:** CCUS supports the production of low-carbon electricity and hydrogen, providing low-carbon energy in the volumes needed to enable activities such as manufacturing, heat and transport to switch away from use of unabated fossil fuels. It also enables the provision of grid balancing services to make up the shortfall when renewable generation is low.
- **Removing CO_2 from the atmosphere:** Where CO_2 is captured from biogenic sources – for example from the combustion of biomass or biogenic waste - or captured directly from the air, reducing the concentration of CO_2 in the atmosphere.

CCS can speed up the low-carbon transition by enabling industries to switch their fuel and/or feedstock to low-carbon hydrogen or electricity, without having to wait for the widespread deployment of renewables, meaning that renewable energy resources can be used where they are most needed. In some cases existing oil and gas infrastructure, such as wells, pipelines, platforms and depleted reservoirs, can also be repurposed for CCS projects.

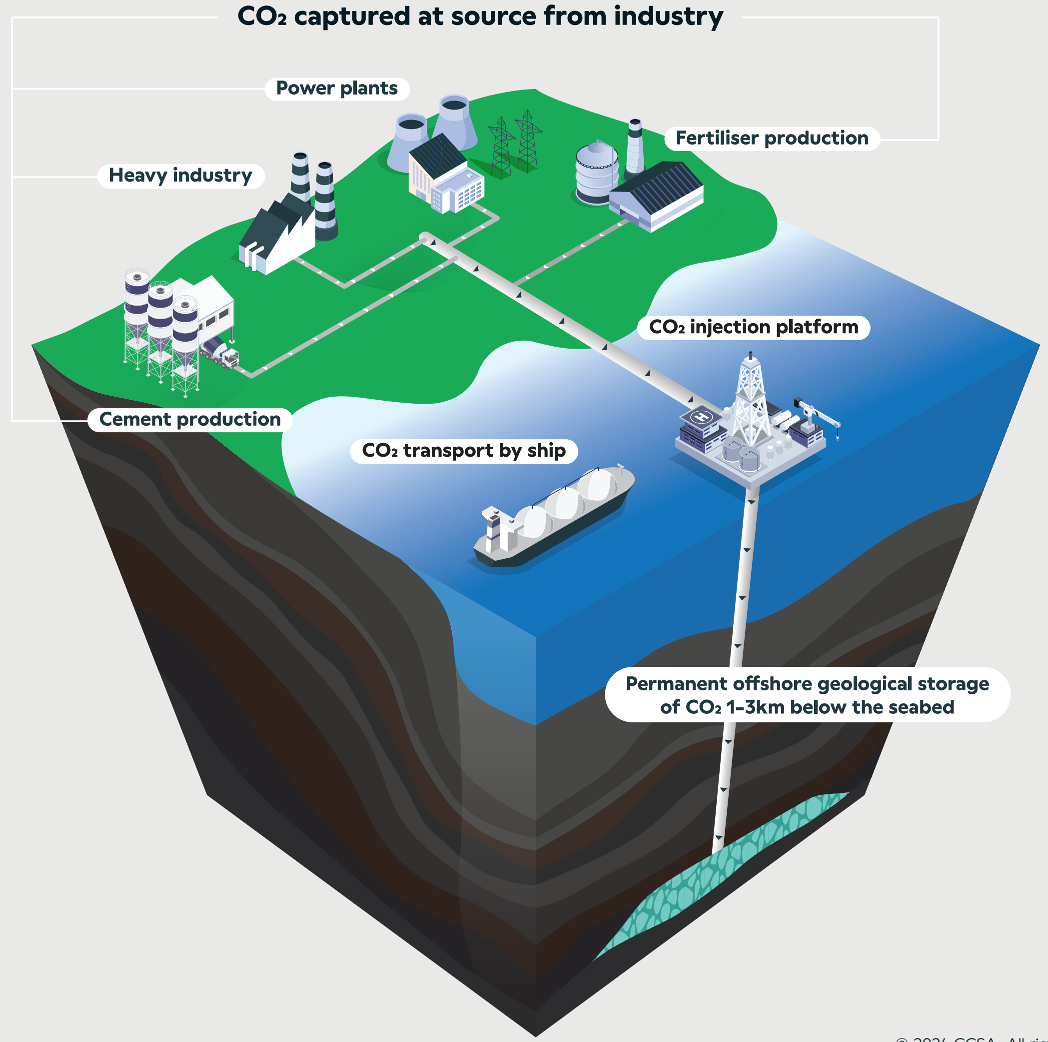
‡ Above the pre-industrial revolution global average temperature.
§ Note that CO_2 utilisation (CCU) may also prevent CO_2 reaching the atmosphere, or displace the use of fossil CO_2 in fuels, but since this report is focused on enabling geological CO_2 storage, this is not explored here.

Carbon capture utilisation and storage is a set of low carbon technologies which capture carbon dioxide (CO_2) emissions from industrial facilities such as power generation, iron & steel, fertiliser, cement, chemicals and refining, and transports it by either pipeline, rail, road or ship for utilisation or safe and permanent underground storage, preventing it from entering the atmosphere.

There are four types of capture: post-combustion, pre-combustion and oxyfuel combustion and direct-air capture. These capture methods can capture more than 95% of the CO_2 in the gases they treat.

The CO_2 is then compressed and transported to a suitable storage site or utilisation plant. Transport is usually carried out by pipelines or ship, although road and rail transport are also possible.

The CO_2 is injected into a suitable storage site deep under the seabed (typically between 0.8 – 3km down). The storage site is a carefully selected geological formation that ensures safe and permanent storage. Storage can either take place in depleted oil & gas fields, or deep saline formations.



CCUS in Europe

Governments across Europe have recognised the importance of CCUS in climate change mitigation. It is a crucial part of the European Commission's Communication on Industrial Carbon Management and the NDC, as well as the NDCs of Norway and the UK, and the National Energy and Climate Plans of multiple member states. The Industrial Carbon Management objective to achieve 50 million tonnes of annual CO_2 storage injection capacity in the EU by 2030. In the Netherlands, the Porthos project is expected to be operational in 2026: it will store CO_2 captured from industries in Rotterdam and is designed to be open-access. Norway's Northern Lights project is operational and expects to start receiving CO_2 captured from emitters in Norway in 2025, and the Netherlands and Denmark in 2026.

Strategy indicates that by 2050 the EU will need to capture and store up to 250 million tonnes and capture and utilise up to 200 million tonnes of CO_2 per year in order to meet its climate goals[3].

CO_2 capture, transport and storage are – commercial and regulatory arrangements notwithstanding – three separate elements of the value chain. In theory, CO_2 that has been captured from any source could be transported by any suitable means and injected into any geological storage site for permanent sequestration. Countries have recognised that enabling emitters to share the use of CO_2 transport and storage infrastructure for their captured CO_2 is the most cost-effective way of enabling CCUS to develop.

The European Commission has already put forward legislation to boost the role of CCS in Europe. The EU regulation Net-Zero Industry Act[4] includes an

To meet the UK's Climate Budgets, the Climate Change Committee set out that the UK must capture and store 20-30 MtCO2 pa by 2030, rising to 50-60 $MtCO_2$pa by 2035[5].

In the UK, CCUS is being developed through a cluster programme, whereby four CCUS clusters are being developed initially. The UK Government has recently announced £21.7bn (EUR26bn) over 25 years to support the first Track-1 projects (HyNet and East Coast Cluster). The two Track-2 clusters (Viking and the Scottish Cluster) are awaiting updates from the Government on the next stages of capture project selection, as are Track-1 clusters on the expansion of their emitter base through the Track-1 Expansion. In addition to these CCUS clusters, a further 21 CO_2 storage licences have been awarded by the competent authority. CCSA research suggests that there are over 90 CO_2 capture projects being developed in the UK[6].

The case for EU/EEA-UK cross-border CO_2 transport and storage

While suitable geology for CO_2 storage can be found across Europe, by far the largest known resource – and therefore the primary CO_2 storage basin for North-Western Europe – is below the North Sea[7]. Due to its history of oil and gas production, this area's geology is well characterised and understood, and legacy oil and gas infrastructure that could be repurposed for CO_2 transport and storage in both depleted hydrocarbon reservoirs and saline aquifers.

The UK's offshore CO_2 storage potential is estimated at 78 billion tonnes[8], almost one third of Europe's geological CO_2 storage capacity[9]. In countries across Europe, there is often a mismatch between the amount of industrial CO_2 that will need to be captured, and the amount of CO_2 storage resource available to prevent it reaching the atmosphere, with some countries having much more storage than they need, and others having high emissions but access to little or no storage in their territory. This is mostly due to not having the right geology in the right location, or due to the legal or policy approach in the country.

Recognising this, and the need for countries to work together to tackle climate change, the Trans-European Networks for Energy Regulation[10] seeks to support the CO_2 transport and storage infrastructure between EU member states and with neighbouring third countries. The Industrial Carbon Management Strategy[11] indicates a willingness of the Commission to consider storage in third-party countries (i.e. non-EU/EEA) countries depending on equivalent conditions to ensure permanent geological storage of captured CO_2. Currently, for reasons explored in Chapter 3, third party storage is an option between the EU and EEA countries, but not between the EU/EEA and the UK.

The UK Government's CCUS Vision document (published under the previous government)[12] recognises the opportunities and benefits of enabling cross-border storage services and supports exploring bilateral agreements/arrangements with other countries. Many of the licensed storage sites in the UK sector of the Southern North Sea are closer to EU emitters than sites in the Northern North Sea, implying that, all other things being equal, transport costs, and therefore the overall costs to emitters of using UK CO_2 storage, are likely to be lower. This assumption has been borne out by economic analysis carried out on behalf of the CCSA (see Chapter 2), which found that many European countries would benefit from having the resilience and optionality that enabling EU/EEA-UK cross-border CO_2 transport and storage would deliver.

However, as the European Commission's Joint Research Centre report, *Shaping the future CO_2 transport network for Europe*[13], implies, delays to enabling cross-border CO_2 transport and storage will make it much harder for EU emitters to use the resource in future, as the first CO_2 storage developments are likely to influence the location of pipeline infrastructure. **We therefore call on all parties – the EU, UK and Member States – to take the actions set out in this report to enable all of Europe to decarbonise through CCS at the lowest cost.**

2 Economic modelling

Economic modelling, carried out on behalf of the CCSA, has found that emitters in the EU/EEA and the UK would benefit from enabling cross-border CO_2 transport and storage.

The modelling demonstrates that if cross-border CO_2 transport and storage is enabled, the most cost-effective storage location for just over a quarter of the EU's captured CO_2 destined for offshore storage (44 $MtCO_2pa$) in 2040 would be in geological areas owned and licensed by the UK. This translates to a 28% (€16/t)cost reduction for EU emitters, whilst those in the UK will benefit from improved CO_2 storage utilisation and from providing geological CO_2 storage as a service.

Even as early as 2030, 16$MtCO_2pa$ from EU sources would go to UK storage sites if they were available, highlighting the need for urgent action to enable EU/EEA-UK cross-border storage.

Analysis Results show in 2040:

- **Emitters in Europe using offshore CO2 storage would benefit from a 20% cost saving (€11/t).** With the market expected to grow to 243** $MtCO_2pa$ by 2040, this would represent €2.7 billion in annual savings, accruing to emitters using storage in the North Sea.
- **Emitters in the EU-27 countries could, on average, benefit from a €16/t reduction in the cost for offshore transportation and storage of CO_2. This represents a 28% reduction in transport and storage costs.** With the EU alone projected to need 164 $MtCO_2pa$ of offshore CO_2 storage by 2040, this would represent €2.6 billion in annual savings.
- **Reduction in transport and storage costs for North-West European (NWE) emitters is shown to be even greater than the average percentage (28%) mentioned above for the EU-27 countries.** Emitters across Europe would benefit from increased optionality in terms of routes, access to a wider pool of storage sites and greater resilience of an integrated pan-European transport and storage CO_2 network.
- **Reducing transport distance accounts for 60% of the cost savings, with the remaining 40% of the savings coming from an integrated market bringing economies of scale;** improved utilisation of T&S infrastructure thereby reducing unit costs; and network benefits that result in a more resilient T&S system.
- **Access to cheaper decarbonisation routes would facilitate companies' energy transition and increase industrial job retention in the EU.** Both EU and UK taxpayers will benefit as reduced costs and increased resilience should necessitate to a smaller amount of required government funding.
- **The UK would benefit from lower CO_2 storage costs for its emitters due to CCS projects with a higher scale factor**, as well as the ability to make the most of its geology by offering CO_2 storage to support other countries and the associated economic benefits through tax receipts and job retention and creation that this would bring.
- **Acting quickly on enabling EU/EEA-UK cross-border CO_2 transport & storage will be crucial, otherwise early infrastructure development could lock in higher costs for emitters over the lifetime of the infrastructure.** If the costs are too high, companies could move their operations outside Europe, and the opportunity to prevent Europe's deindustrialisation would be lost.
- **The algorithm found that it would be cost-effective for EU/EEA-UK cross-border CO_2 transport and storage to be used as soon as it becomes available**: in a scenario where this happens straight away 16 $MtCO_2pa$ from the EU would use UK storage by 2030.
- **Any delay in enabling this storage market would lock emitters into higher-cost storage**, a cost which would endure for the lifetime of their project.

** $MtCO_2pa$ is the total volume of CO_2 from the EU, UK and Norway that is expected to be stored offshore, calculated as part of Xodus' analysis. The calculation uses the methodology used by the JRC applied to the UK and Norway.

†† This figure is due to the large number of CO_2 storage exploration licences awarded in the UK compared to other countries, and so does not reflect actual CO_2 injection or storage potential in each territory.

Background

The CCSA commissioned Xodus to carry out research to understand the value – in terms of reduced unit cost and network resilience – of enabling CO_2 transport and storage across the border between the EU/EEA and the UK, compared to the business-as-usual approach of restricting CO_2 storage access to only those countries in each bloc.

Previous work by Xodus, in 2023[14], evaluated the potential development of North Sea CCUS infrastructure. In the high-case scenario, they projected a significant expansion by 2050, envisioning 100 storage sites and 7,000 km of pipelines, with 55% of the infrastructure being repurposed from existing assets. This projection underscored the scale of development required to meet future CO_2 storage demands. However, it also revealed that the most cost-effective storage options are not evenly distributed: ***74% of the selected storage sites are located in the UK continental shelf*††**, suggesting that emitters in the EU would probably benefit from being able to access these, rather than being restricted to EU or EEA storage only.

The approach used in the new study aligns the estimated demand from emitters for CO_2 storage, with the anticipated available supply of CO_2 storage capacity. Offshore transport and storage costs (but not onshore transport, nor CO_2 capture costs) were calculated as part of the study, and a minimum-cost algorithm was used to allocate demand to supply under a selection of scenarios and time intervals. This new study has drawn heavily on the work of the JRC in estimating volumes of CO_2 captured in Europe over the time period modelled.

This figure is due to the large number of CO_2 storage exploration licences awarded in the UK compared to other countries, and so does not reflect actual CO_2 injection or storage potential in each territory.

The results of the study are presented in terms of the unit cost to emitters in each country for CO_2 storage under each scenario. The additional value to countries in terms of retention of high-emitting industries and the jobs and energy and materials security that come with that; the additional jobs created through the development of CCUS; and the increased revenue and tax receipts associated with providing CO_2 storage as a service are not included in the figures but should not be underestimated.

Findings

This study focused on CO_2 volumes seeking offshore storage, and the economic modelling found that enabling EU/EEA-UK cross-border CO_2 transport and storage would result in reduced costs for emitters and society at large in the EU/EEA and the UK. For European emitters using an offshore storage location, **projected cost reductions are estimated to be over 20%, or a reduction in transport and storage costs of about €11/tCO_2 in 2040 in a scenario where EU/EEA-UK cross-border CO_2 transport and storage is allowed, compared to continuing with the current regime. With the offshore storage market expected to grow to 243 $MtCO_2pa$ by 2040, this would represent €2.7 billion in annual savings.**

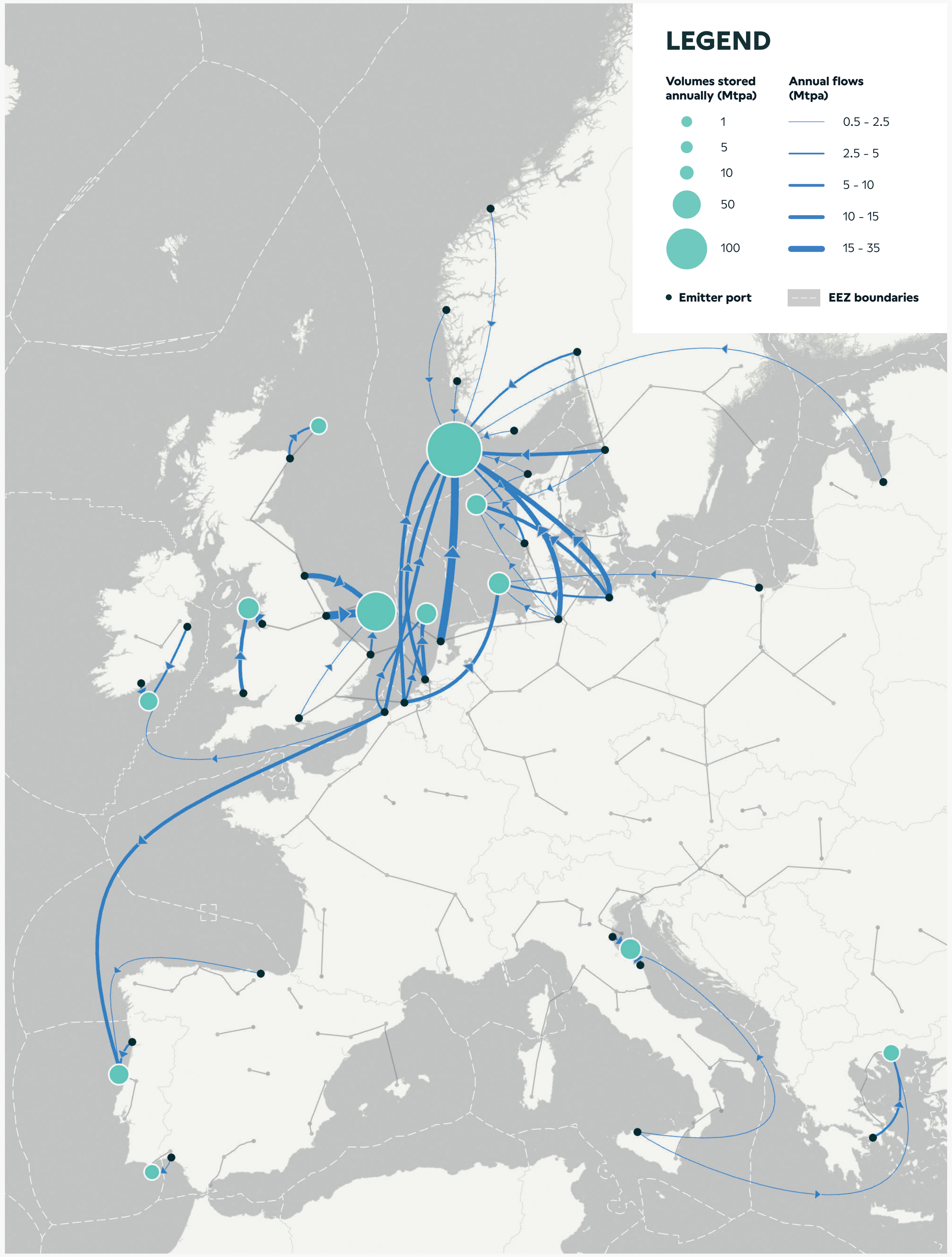
EU emitters would receive the bulk of the savings, with an average cost reduction of 28% or €16/tCO_2, amounting to €2.6 billion per year in 2040.

Although savings for UK emitters would not be as great, the primary benefit from allowing cross-border is to stimulate the development of UK CO2 stores and in a shorter timeframe. Without cross-border, only a subset of the available storage in the UK is likely to be required and therefore, matured; costs for decarbonisation will likely remain high and Govt. subsidy will continue to be required for UK emitters.

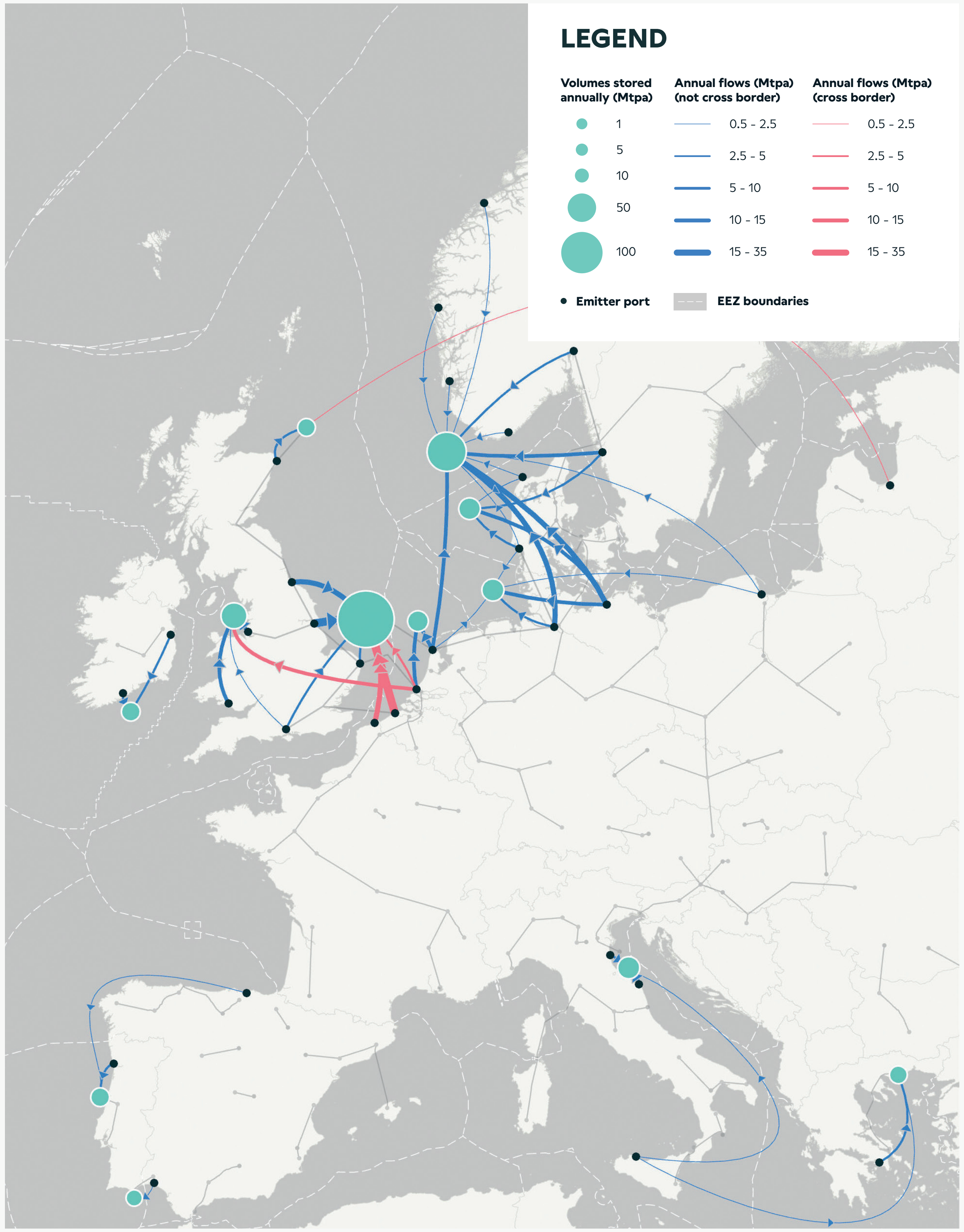
The cost reduction impact of enabling access to UK stores is even greater for emitters in North-West Europe, being higher than the average percentage (28%) mentioned above for the EU-27 countries.

Fundamentally, the savings stem from reducing the transport distance for CO_2 headed to offshore storage. The economies of scale caused by the large-scale storage in the UK and Norway have not been incorporated. Access to the SNS is key as emitters in France, western Germany, and the Benelux can reach SNS storage more efficiently than storage in the Northern North Sea. Without cross-border access, while some of the CO_2 volumes would go to sites in the Netherlands, a large proportion would need to be transported over longer distances to sites in Denmark or Norway, with the additional 500-800 km of transport adding significant expense and, for pipeline transport, a larger physical footprint on land and seabed.

Map 1: Offshore CO_2 flows in a scenario where EU/EEA-UK cross-border storage is not available



Map 2: Offshore CO_2 flows in a scenario where EU/EEA-UK cross-border storage is available (2040)



The maps illustrate the transportation and storage of CO_2 from terminals to offshore regions, excluding onshore storage. This schematic shows that offshore regions may have multiple storage sites accessible by shipping or pipeline.

The onshore network, depicted in grey, transports CO_2 from emitters to terminals for offshore transport and storage. The maps indicate which export terminals would be expected to serve which storage sites, but do not differentiate between ship and pipeline, and nor do they attempt to show the routes that would be taken by either of those methods.

The arrows are purely indicative of the size and destination of CO_2 flows.

For the detailed methodology for this study, and full outputs, see the dashboard at:

Projected in the modelling are primarily driven by a greater choice in storage sites. All other things being equal, this eliminates the most transport expensive routes, which significantly impact the average cost for emitters. Volumes in Northern France particularly benefit from this effect – some emitters from that region are explicitly asking for access to UK stores. Additionally, emitters using sites in Norway and Denmark also experience tariff savings, as the most cost-efficient sites are not crowded out by other volumes. **Reducing transport distance accounts for 60% of the cost savings for EU emitters**, with the remainder of the savings coming from the benefits of a network.

The maps show the projected evolution of the European CO_2 storage market (for offshore volumes), with (Map 2) and without (Map 1) EU/EEA-UK cross-border CO_2 storage (i.e. access to stores in the UK) enabled.

In the scenario where EU/EEA-UK cross-border transport and storage is not available, most CO_2 from North-West Europe is projected to be stored in Denmark and Norway. Some CO_2 from Northern France is stored in Portugal and Ireland. In the scenario where EU/EEA-UK cross-border transport and storage is enabled, CO_2 tends to stay closer to its origin: not only is this a cheaper solution but it also creates a smaller emissions footprint in the construction and operation of the Europe-wide CO_2 transport and storage network. For instance, CO_2 from ports in France, Belgium and the Netherlands (including emissions from German emitters) primarily goes to the UK SNS. The destination of CO_2 from Spain, Italy or Greece remains unchanged due to the distance to the UK and the availability of CO_2 stores in the Mediterranean region.

The benefits of a network and an integrated market

As with most markets, there are benefits for market participants of a free trade agreement or cooperation on CO_2 transport and storage. An integrated market brings economies of scale and network benefits. **For EU emitters, we found that these savings account for just under 40% of the cost savings in 2040**. This integrated market leads to higher utilisation of storage sites and pipelines, thereby reducing the cost to emitters of the transport and storage system; a more resilient CO_2 storage system; and a lower carbon footprint in the construction and operation of the future Europe-wide CO_2 transport and storage system.

Reliance on a single transport route and/or storage site has an inherent 'single point of failure' risk. Building resilience in the system by enabling the use of multiple storage sites and transport routes can increase cost-effectiveness and reduce risk by ensuring that CO_2 storage is consistently available, even when an individual site or transport mode is undergoing maintenance or remedial works. This single point of failure is a particular risk in first of kind CCS projects and drives up the cost as the risk inherently has to be factored into the tariff. Reducing the likelihood of the risk materialising should improve the overall investability of CCS projects.

Rather than just removing risk at the project level, a key benefit of a network is its ability to "pool" demand and supply, thereby reducing system overcapacity. Many projects tend to be oversized initially, operating at 40 to 60% utilisation with the expectation of growing emitter volumes over time as regional capture picks up. An integrated network and coordination of CO_2 demand to CO_2 storage from the onset should reduce the need for constructing overly large and/or poorly utilized infrastructure that leads to higher transport costs.

Offshore infrastructure can provide additional benefits by pooling demand from different regions (e.g., the UK and Northwest Europe). This results in higher utilisation of storage sites, thereby reducing unit costs for the transport and storage system. Consequently, individual project storage tariffs could be lower and

both transport and storage infrastructure, and capture project investments would benefit from a more reassuring and stable market outlook. At the storage system level, less excess capacity would need to be built to serve each region. This benefit could accelerate storage utilisation by an additional 5 to 20% which, in turn would drive down the cost and reduce the difference between the cost of decarbonisation and the prevailing CO_2 price.

The Xodus study estimates that the creation of a network is more likely to develop where there is a high density of CO_2 volumes. This network effect is strongest in the SNS region, encompassing the UK and Northwest Europe, which can pull large volumes from a relatively small regional footprint when EU/EEA-UK cross-border CO_2 transport and storage is allowed. Furthermore, the study finds that when given the choice, CO_2 volumes from Northwest Europe would select UK sites, highlighting the urgency of pursuing this. Without EU/EEA-UK cross-border allowances, CO_2 will be transported further afield, creating a larger environmental footprint in the operations of such infrastructure, while UK sites might be developed to serve only domestic UK emitters. This would leave a valuable resource underutilised and increase the risk of plant closures and carbon leakage if emitters are unable to cost-effectively decarbonise. **Countries in Northwest Europe have the dual benefit of both shorter distances and the network benefit – so they see the biggest savings**.

This offshore network effect can potentially have a greater impact initially to support CCUS deployment, particularly if the onshore network is not developed as fast or as extensively as is assumed in the JRC's forecast[15]. Additional benefits of an integrated market include removal of tariffs on final goods produced, simplifying standards, decreasing the costs of compliance and administration, enhanced regional logistics networks and customs cooperation, and more efficient project execution.

3 Regulatory and legislative barriers

The key barrier to enabling EU/EEA-UK cross-border CO_2 transport and storage is storage recognition within the EU Emissions Trading System (ETS) and vice versa.

This is necessary to ensure that EU/EEA-UK cross-border CO_2 transport and storage is beneficial for CO_2 emitters. Barriers relating to the UK and EU ETS are explored further below, and recommendations for how to address them are given in the next section. Until recently, the London Protocol was a major barrier to cross-border CO_2 transport and storage. However, a 2019 decision to allow provisional application of the relevant amendment to the treaty means that this is now just an administrative hurdle to overcome.

The analysis and recommendations in this and subsequent chapters are based on work carried out by international law firm Clifford Chance; *How to address the EU ETS barrier to EU-UK cross-border transportation and storage of CO_2*[16], commissioned by a CCSA member.

EU-UK Emissions Trading Scheme alignment

Under the EU Emissions Trading System (ETS) CO_2 emissions verified as captured, transported and stored in permanent geological storage within the EU will be treated as not having been emitted under EU ETS emissions accounting and reporting. The emitter will therefore not incur a legal obligation to surrender EU emission allowances for those emissions.

This exemptive accounting treatment does **not** apply to CO_2 emissions captured in the EU and transported for storage in any third country (including the UK) outside the EU and the EEA, because the EU ETS Directive only recognises storage facilities for which a permit is in force in accordance with the CCS Directive - which applies only in the EU and EEA.

This is the same case for the UK ETS, where an operator may subtract from the emissions of an installation any amount of CO_2 that has been captured in the UK and permanently stored in accordance with the UK CCS licensing regime, but this will not be recognised if the CO_2 is stored **outside** the UK.

Therefore, EU and UK emitters wishing to commercially arrange to transfer CO_2 for storage in a third-party country will still be liable under their respective ETS' to surrender the allowances, as if those CO_2 emissions had not been captured and permanently stored.

Currently there is no recognition system or equivalence between the EU ETS and UK ETS.

As a result of this, there is currently **no financial incentive or route to market for EU capture projects to utilise non-EEA third country CO_2 storage**, even though in the case of the UK, the storage facilities and regulatory regimes are recognised as robust and aligned with the EU CCS Directive. This creates a barrier to the development of a Europe wide market for CO_2 transportation and storage, limits access to readily available economic storage, and for EU industrial projects in particular, could limit the speed at which they can decarbonise.

A crucial aspect of the barrier is that only the EU's CCS permitting regime for the safe geological storage of CO_2 is acknowledged for the EU ETS monitoring and reporting exemption. The EU's CCS permitting regime is governed by the CCS Directive[17], which also underpins the UK's CO_2 storage permitting framework. The requirements of the CCS Directive were transposed into UK law before the UK departed from the EU and have since been retained with no substantial amendments, meaning that it remains largely consistent with the EU regime.

Principles for removing the barriers to EU/EEA-UK cross-border CO_2 transport and storage

Any proposed solution to the EU/EEA-UK ETS barrier must:

- Require minimal legislative interventions or amendments.
- Not threaten the investability of CCS projects.
- Ensure there is a mechanism for addressing any future changes to EU and UK law.
- Be compatible with the current design of the EU ETS and UK ETS.
- Not create unintended consequences which could impact the overall objectives and smooth functioning of either ETS regimes.
- Be actioned in a timely manner to capture the opportunities before significant infrastructure development is initiated.

The actions that the European Commission, UK Government, and Member States can take to resolve the EU/EEA-UK ETS regulatory barrier and enable EU/EEA-UK cross-border CO_2 transport and storage are set out in the next chapters. In brief, they are to:

- Enter into a bilateral agreement under the EU-UK Trade and Cooperation Agreement to underpin these amendments.
- Amend EU legislation: the EU ETS Directive, the Monitoring and Reporting Regulation, and the Accreditation and Verification Regulation.
- Amend UK law to reflect material amendments that have been made to the above EU legislation since the UK departure from the EU.
- Amend the UK Greenhouse Gas Emissions Trading Scheme Order 2020.

Once these have been resolved, there are then further regulatory conditions that should be addressed in order to accommodate and facilitate EU/EEA-UK cross-border CO_2 transport and storage, plus actions under the London Protocol.

4 Recommended actions

RECOMMENDATION 1: EU-UK Trade and Cooperation Agreement

The EU-UK Trade and Cooperation Agreement (TCA) is a crucial mechanism to agree on alignment between the UK E TS and EU ETS, and thus enable CO_2 stored in one jurisdiction to be recognised in the ETS of the other.

There is currently no system of recognition or equivalence between the EU ETS and UK ETS. However, the European Commission and the UK Government have agreed to include CCS in their discussions under the TCA[18], and the agreement expressly recognises the significance of collaborating on trade and investment in goods and services that are crucial for mitigating the risks of climate change.

Addressing these issues through the TCA would allow for the removal of the EU/EEA-UK ETS barrier through a degree of equivalence or recognition of CCS permitting regimes but would not require a full linkage of the two ETSs. Equivalence or recognition of the CCS permitting regimes is preferable to full linkage of the ETSs as it would take less time to implement, although the continuing nature of the TCA negotiations means that there is a need to act quickly before the opportunity is lost. Agreeing equivalence or recognition of CCS permitting regimes under the TCA does not prevent the potential full linkage of the two ETSs in the future.

The CCSA stands ready to support these discussions

The agreement could either be a standalone treaty or a *"supplementing agreement"* to the TCA. According to Article 2 of the TCA, any additional bilateral agreements between the EU and the UK would typically be considered supplementing agreements, unless otherwise stated and *"shall be an integral part of the overall bilateral relations as governed by [the TCA] and shall form part of the overall framework"*. A supplementing agreement would benefit from the existing TCA governance and dispute resolution mechanisms. Therefore, our proposal supports a bilateral agreement between the UK and EU in the form of a supplementing agreement under the TCA.

The agreement should contain the following provisions:

CCS regime minimum criteria

A set of minimum standards that each CCS regime would need to meet to ensure CO_2 is stored safely and permanently in geological storage. These standards would be based on the existing CCS permitting regimes and should cover the following points[‡‡]:

- a requirement for CO_2 transportation and storage activities to be licensed and for the licences to contain conditions in line with the CCS Directive;
- oversight by a governmental regulator, including routine inspections of the storage facility and a mechanism for dealing with any possible discrepancies between the amounts of CO_2 transferred between installations;
- sanctions for failing to comply with key permit-related obligations, such as holding a licence and complying with the licence conditions;
- a requirement for the storage facility operator to monitor the storage site
- a requirement for the storage facility operator to monitor and report fugitive greenhouse gas emissions from the facility;
- sanctions for the release of CO_2 from the facility; this could be through the existing application of the relevant ETS such that the facility operator would have to surrender emissions allowances for any CO_2 emitted from the facility and/or through another type of penalty that has a comparable deterrent effect;
  a. an outline of measures that can be taken in case of leakages or significant irregularities;
  b. closure and post-closure obligations and transfer of responsibility of the CO_2 store to the state;
  c. requirements relating to financial security;
  d. requirements relating to third-party access; and
  e. maintaining a register with information about storage sites;

Governance body

The role of a governance body would be to oversee the implementation of the above requirements as part of an international agreement. Under the TCA, a Partnership Council has been established to *"oversee the attainment of the objectives"* of the TCA and any supplementary agreements and to *"facilitate the implementation and application"* of these agreements.

The Partnership Council includes representatives from both the EU and the UK. It holds the authority to delegate tasks to various specialised bodies under its jurisdiction and to make amendments to the TCA.

Dispute resolution mechanism

A mechanism for resolving disputes is included in the TCA, which sets out the procedures for addressing disputes under the TCA and any supplementary agreements. The process involves consultations between the involved parties and arbitration before a specially formed arbitration tribunal.

The international agreement would also need to provide for the following:

- Assurance that the use of CCS will not increase hydrocarbon recovery and will lead to an overall reduction in CO_2 emissions.
- Mechanisms for sharing information about the CO_2 transported across the EU/UK border and, potentially, how it is accounted for in national greenhouse gas inventories.
- Arrangements regarding information exchange and access to reporting.

‡‡ As outlined by Clifford Chance in its position paper 'How to address the EU ETS barrier to EU-UK Cross-border transportation and storage of CO_2' (2024) and adopted by the CCSA.

RECOMMENDATION 2: EU and UK Legislation

Three key bits of EU legislation would need to be amended to enable EU/EEA-UK cross border transport and storage of CO_2 by allowing CO_2 captured in the EU/EEA but stored in the UK to be recognised by the EU ETS as not having been emitted.

These elements are the EU ETS Directive, the Monitoring and Reporting Regulation and the Accreditation and Verification Regulation.

The ETS Directive, Monitoring and Reporting Regulation (MRR) and Accreditation and Verification Regulation (AVR) would require some amendments to recognise storage of CO_2 from EU based emitters in UK storage sites. UK CO_2 storage sites would be subject to the UK CCS legal/regulatory framework, ensuring permanently secure and environmentally safe geological storage of CO_2, (which it currently does through UK CCS storage legislation). This would satisfy the purposes of the exemption of Article 12(3a) of the EU ETS Directive.

(i) ETS Directive[19]

Article 12 of the ETS Directive covers the transfer, surrender and cancellation of EU ETS allowances. It is the article that allows CO_2 that is captured, transported and geologically to be considered not to have been emitted, therefore exempting the facility from which the CO_2 came from having to surrender allowances for it. Currently it only applies to CO_2 stored in the EU.

Article 12(3a) provides that an obligation to surrender EU allowances shall not arise in respect of emissions verified as captured and transported for permanent storage to a facility for which a permit is in force in accordance with the CCS Directive.

Article 2(1) of the CCS Directive provides that it applies *"to the geological storage of CO_2 in the territory of the Member States, their exclusive economic zones and on their continental shelves within the meaning of the United Nations Convention on the Law of the Sea (UNCLOS)"*. Its scope does not cover third countries. In addition to this, the process set out in the EU CCS Directive for granting a permit contemplates that only sites located in the EU will be able to comply with the permitting requirements.

RECOMMENDATION:

Amend Article 12(3a) of the ETS Directive to incorporate by reference facilities for which a permit is in force under the CCS permitting regime recognised under an international agreement between the EU and UK.

(ii) Monitoring and Reporting Regulation[20]

Article 49(1) of the ETS Monitoring and Reporting Regulation sets out the point at which captured CO_2 is considered to have been transferred for storage and therefore not emitted.

It provides that the operator of an installation subject to the EU ETS can subtract from the emissions of that installation any amount of CO_2 originating from fossil carbon in activities covered by Annex I to the EU ETS Directive that is not emitted from the installation, but transferred out of the installation to any of the following:

(i) a capture installation for the purpose of transport and long-term geological storage in a storage site permitted under the CCS Directive;

(ii) a transport network with the purpose of long-term geological storage in a storage site permitted under the CCS Directive; or

(iii) a storage site permitted under the CCS Directive for the purpose of long-term geological storage.

The CCS Directive only applies to storage sites in the EU so the above principle of subtracting captured CO_2 emissions from an operator's overall emissions liability would not currently apply where the emissions are being captured for storage in third country storage sites.

Annex I of the MRR requires a monitoring plan for an installation which includes information on the identification of the receiving and transferring installations according to the installation identification code recognised by Regulation (EU) 2019/1122.30, in the case of the transfer of CO_2 in accordance with Article 49.

Article 48(3) of the MRR addresses situations where the quantities of CO_2 transferred between installations are not identical (i.e. there is a discrepancy between the amounts identified by the transferring installation and the receiving installation). In certain circumstances involving such a discrepancy, the operators of the transferring and receiving installations must align the values by applying conservative adjustments approved by the competent authority. Where the receiving installation is based in the UK, this raises the question of which entity should approve the adjustment and how information should be shared between the EU and UK authorities.

RECOMMENDATIONS:
Amend the Monitoring and Reporting Regulation as follows:

Amend Article 49(1) to add a new limb to the provision to cover capture installations, transport networks and storage sites permitted under the CCS permitting regime recognised under an international agreement between the EU and the UK.

Amend Article 49(1) to clarify that the transportation of CO_2 by ship and other non-pipeline methods of transport does not alter the right of CO_2 emitters to subtract captured and permanently stored CO_2 from their EU ETS liabilities and/or to specifically recognise non-pipeline methods of CO_2 transportation.

Amend Annex I(7)(d) to refer to a different method of identification for receiving installations in the UK.

Amend Article 48(3) to clarify which entity should approve the adjustment, in the case of the receiving installation being based in the UK; and how information should be shared between the UK and EU authorities.

(iii) Accreditation and Verification Regulation[21]

Article 17(4) of the AVR requires the verifier verifying an installation's annual emissions report to check that the process set out in Article 48(3) of the MRR is followed.

RECOMMENDATION:
Amend Article 17(4) of the AVR to reflect the changes made to Article 48(3) of the MMR.

Consequent changes to UK legislation

Changes to UK law would be dependent on what minimum criteria might be agreed between the UK and the EU in an international agreement on storage permit recognition.

Given the high degree of alignment still between the UK CCS permitting regime and the EU CCS Directive, any changes made would be expected to be minimal and would mirror material changes to EU law. The EU's AVR[§§] and MRR have been amended since the UK's departure from the EU, so these and any other future changes would need assessing to determine whether changes are material.

Assuming mutual recognition by the UK/EU of their respective CCS permitting regimes, at a minimum paragraph 23(a)(ii) of Schedule 4 of the Greenhouse Gas Emissions Trading Scheme Order 2020 (which substituted references in Article 49 (a) of the MRR related to EU CCS Directive with references to the UK CCS permitting regime), would need to be amended to reinstate references to the EU CCS Directive as well. This would allow UK CO_2 emitters to subtract from their reportable annual emissions any CO_2 that is transferred to a capture installation, transport network or storage site, for geological storage in a site permitted under either the EU CCS Directive or the UK CCS permitting regime.

In addition, any changes to Article 48(3) of the MRR and Article 17(4) of the AVR described above in section 4.1a would need to be reflected in the equivalent UK law provisions.

§§ The Accreditation and Verification Regulation (AVR) was updated in 2021. As this amendment was adopted after 11 November 2020, it would not be reflected in UK law (Clifford Chance 2024).

RECOMMENDATION 3: Further legislative considerations

For EU emitters to benefit from UK storage availability a route to accommodate imports within the UK commercial and regulatory frameworks will need to be made available without a material overhaul of the supporting UK legislation.

There are several egulatory issues that will need to be addressed once the primary issues around EU-UK ETS recognition are addressed.

We have provided an inexhaustive list of the issues, but further analysis will be required to establish their relative importance and how they can best be addressed.

CO_2 stream specification standard

The development of minimum CO_2 stream specification standards to be recognised across Europe, which are not excessively restrictive.

This will ensure that acceptable CO_2 stream impurity limits are defined which will enable compatibility between different transportation modes, (both pipeline and non-pipeline) as well as greater destination optionality between storage sites. This allows for increased market competition and optionality if all transport and storage sites are compatible.

In November 2023 the European Committee for Standardisation (CEN) created a Technical Committee on CO_2 capture, transportation, utilisation, storage and carbon accounting. The aim of this work is to build on existing ISO/TC 265 work and to collaborate and coordinate the update and development of standards which are tailored to CCUS project developers. The UK is represented by BSI in this Technical Committee. The CCSA, representing industry, has been granted liaison status on the CEN TC 474 standardisation CO_2 streams committee, to ensure we can work across borders with the EU to develop common standards.

We recognise that for some transport and storage sites, CO_2 specifications above the minimum standard may be necessary, however, a minimum standard would create a baseline from which industry can work.

CO_2 metering standards

A set of accepted standardised methodologies for CO_2 stream metering would help to ensure compatibility for CO_2 metering across the value chain from capture to storage, as well as compatibility for imported CO_2 streams.

This could help ensure high accuracy of metering and speed up the assessment of data for ETS compliance requirements.

Third-party access

Ensuring standardisation and alignment where possible on third-party access principles across Europe will assist with creating a favourable environment for CO_2 stream transport and storage businesses.

The UK has plans to review the third-party access principle of the UK CO_2 storage legislation (2010), as part of the Transport and Storage Regulatory Investment (TRI) business model and regulatory framework to balance pipeline access, shipping access and handling of imported CO_2 streams. This is expected to take place in 2025. The EU is also looking to build a regulatory framework across Europe including addressing how third-party access is codified in network regulations.

Liabilities for CO_2

Clarity on ownership and clear guidance on the associated liability for the CO_2 throughout the transportation and storage chain needs to be set out.

Any regulation on liability transfer points should look to be consistent across the market.

Infrastructure and facilities between the UK and the EU

For a Europe-wide CO_2 market to be established, the supporting fit-for-purpose infrastructure and facilities will need to be developed across Europe.

Given the often long-term nature of planning and permitting for large scale infrastructure development (e.g. port terminal infrastructure), as well as global supply chain restrictions experienced in recent years, there is a risk that the necessary infrastructure and facilities required may not be ready in time, or not coordinated across countries in order to capitalise on the market opportunity, if associated development work is not started now.

A clear, aligned, regulatory framework across Europe for the transport and storage of CO_2 would give confidence to CO_2 capture project developers to progress deployment, which in turn would enable investments in the infrastructure networks required to service the market. This should include consideration of the following:

- **Technical and policy innovations needed for faster licensing, certification, and permitting across Europe to prevent lengthy delays**
- **Fast approval processes that enable the re-use and re-purposing of existing infrastructure**
- **Prioritisation of investment in ports and infrastructure in Member State, UK and EU planning**
- **Coordination between UK and EU Health and Safety regulators on any new CCS safety regulation development for the transportation of CO_2 streams, to ensure a seamless transfer through jurisdictions.**

RECOMMENDATION 4: The London Protocol

Make notifications and agreements or arrangements under the London Protocol[22] to enable cross-border CO_2 transport and storage.

The London Protocol is an international treaty under the UN Convention on the Law of the Sea (UNCLOS), aimed at protecting the marine environment from pollution and governing the cross-border transport of waste between countries. Article 6 of the London Protocol specifically prohibits the export of waste or other substances for disposal in the marine environment. The Protocol was amended in 2009 to allow for the transfer of CO_2 between two contracting countries for permanent storage in subsea geological formations, subject to specific conditions outlined in the Article 6 Amendment[23]. This amendment has so far not been ratified, and so, until 2019 it prohibited cross-border CO_2 transport and storage.

In 2019, to enable cross-border CO_2 transport and storage in advance of the amendment being ratified, the London Protocol signatories adopted a resolution[24] which allows the provisional application of the Article 6 Amendment, subject to certain requirements being met.

This means that the London Protocol is no longer a barrier to EU/EEA-UK cross-border CO_2 transport and storage, and instead a procedural formality to overcome.

These requirements include:

- **The signatory must deposit a formal declaration of provisional application of the Article 6 Amendment with the International Maritime Organisation (IMO).**
- **The relevant signatory parties must enter into an agreement or arrangement with the importing country to export CO_2 for the purpose of permanent geological storage. If the importing country is a party to the London Protocol this agreement only needs to cover permitting responsibilities between the jurisdictions consistent with the London Protocol and other international law. Where the importing country is not a party to the London Protocol, that agreement must also require the importing country to handle the CO_2 in line with London Protocol standards.**
- **The relevant signatory parties must notify such an agreement or arrangement to the IMO.**

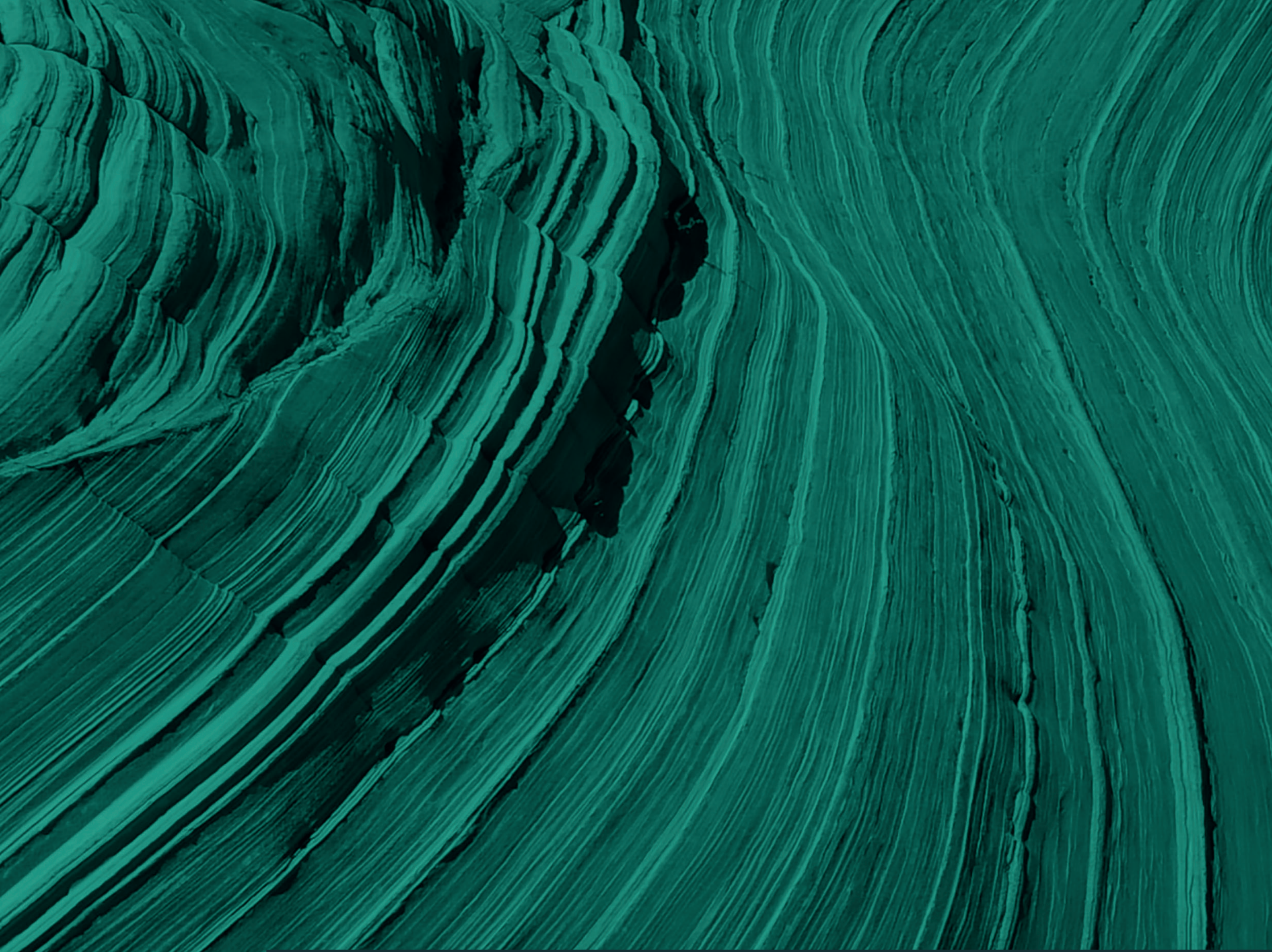
The European Union is not a contracting party to the London Protocol, so it is for individual Member States to decide whether and how to progress with the Article 6 Amendment.

So far, nine countries have deposited a formal declaration of provisional application of the Article 6 Amendment with the IMO: Norway, the Netherlands, Denmark, South Korea, the UK, Belgium, Sweden, Switzerland and Australia.

Several countries in Europe have already entered into bilateral agreements in the form of MoUs. There is no fixed time for how long it takes to conclude a bilateral agreement, as this will be dependent on the time it takes to reach political alignment between contracting parties. The London Protocol agreements already in place are concise in length (see, for example, the bilateral agreement between Belgium and The Netherlands[25]), so once political agreement has been reached, we would not expect the drafting and finalisation of an agreement to cause significant delay.

References

1. Copernicus Climate Change Service (2024) Monthly Climate Bulletin
2. UN Environment Programme (2024) Emissions Gap Report 2024
3. European Commission (2024) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the committee of the regions, Towards an ambitious Industrial Carbon Management for the EU
4. European Commission (2024) Net Zero Industry Act: Accelerating the transition to climate neutrality
5. Climate Change Committee (2020) The Sixth Carbon Budget: The UK's path to Net Zero
6. CCSA (2023) CCUS Delivery Plan Update
7. Karvounis, P. and Blunt, M.J. (2021) Assessment of CO2 geological storage capacity of saline aquifers under the North Sea - International Journal of Greenhouse Gas Control, Volume 111
8. CO_2Stored (undated) Project FAQs. http://www.co2stored.co.uk/home/about_faq (accessed 19/09/23).
9. Karvounis, P. and Blunt, M.J. (2021) Assessment of CO2 geological storage capacity of saline aquifers under the North Sea - International Journal of Greenhouse Gas Control, Volume 111
10. European Commission (2022) Trans European network for energy regulation
11. European Commission (2024) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the committee of the regions, Towards an ambitious Industrial Carbon Management for the EU
12. UK Government (2023) Carbon Capture Utilisation and Storage; A vision to establish a competitive market
13. Joint Research Centre (2024) Shaping the future CO2 transport network for Europe
14. Xodus (2023) Forecasting the North Sea CCUS Infrastructure to 2050
15. Joint Research Centre (2024) Shaping the future CO2 transport network for Europe
16. Clifford Chance (2024 Position paper: How to address the EU ETS barrier to EU-UK Cross-border transportation and storage of CO_2
17. DIRECTIVE 2009/31/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006
18. European Commission Secretariat General (2024) Third meeting of the Partnership Council established by the EU-UK Trade and Cooperation Agreement
19. Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC
20. Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012
21. Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council
22. London Protocol 1996 legislation
23. London Protocol Article 6 Amendment (2009)
24. London Protocol resolution LP.5(14) (2019)
25. Memorandum of understanding on cross-border transportation of CO2; Belgium and Netherlands (2023)



CCSA

The Carbon Capture and Storage Association (CCSA) is the lead European trade association focused on accelerating the commercial deployment of carbon capture, utilisation and storage (CCUS).

We work with our members, governments and other organisations to ensure CCUS is developed and deployed at the pace and scale necessary to meet net zero goals and deliver sustainable growth across regions and nations.

The CCSA has over 120 member companies that are active in exploring and developing different applications of carbon capture, CO_2 transportation by pipeline, ship and rail, utilisation, geological storage, and other permanent storage solutions, end-users of the technology and those in the supply chain, as well as members from management, legal and financial consulting sectors.

www.ccsassociation.org