Legal and regulatory barriers to CCS projects in Europe

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1 Executive Summary

Developers of carbon capture and storage (CCS) demonstration projects in Europe continue to face a multitude of complex and interrelated barriers. The introduction of an enabling regulatory framework for CCS in Europe has provided certainty on many aspects of the technology, but it has also introduced a number of legal concepts which are unfamiliar to potential project developers. In September 2012, an expert meeting was organised in an effort to assemble CCS project developers, policy makers and experts in the field, to discuss and identify possible solutions to outstanding legal barriers. By far the most pressing legal issue agreed by stakeholders is commonly termed as 'climate liability'. Storage operators are liable for any leakage (however unlikely it may be) of CO_2 in the future, and must purchase European Union Allowances for each ton of CO_2 leaked. However, the price of future allowances are inherently uncertain and may be much higher than at the time of injection. Furthermore it will be unlikely that the storage operator will be the main benefactor of the use of CCS within the European Union Emissions Trading System, and thus faces a severe imbalance between financial incentive and risk. Much of the expert meeting was dedicated to scoping for potential solutions to the issue of climate liability, and assessing their suitability on a European and national level. This document provides an overview of the discussion that took place during the meeting.

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2 Workshop details

Date: Tuesday 25 September, 13:00-16:30

Location: Maasvlakte CCS Project BV (ROAD office), Parallelweg 1, Schiedam.

Attendants: 17 persons from the following organizations: Air Liquide; Bellona (ZEP); DCMR EPA (Rotterdam Climate Initiative); DNV KEMA; Ecofys; ECN; E.On, Ministry of Economic Affairs, Agriculture and Innovation; ROAD, Stedin, TAQA, TNO University College London and University of Groningen.

Background: The long-term liability of stored CO_2 and the provision of a financial security are important examples of issues where CCS stakeholders from multiple Member States have raised questions and concerns. The regulation and policy concerning the combination of CCS with enhanced hydrocarbon recovery, and the use of biomass in CCS installations are other areas where regulatory barriers or uncertainties are acknowledged.

In the Dutch national CCS R&D programme 'CATO2' a team of researchers has been closely monitoring the transposition of the 'EU CCS Directive' and the consequences for government and industry. Recently, focus has turned to the salient issues outlined above, and dialogue between researchers and CCS stakeholders on such issues has accelerated. This expert meeting is an effort to assemble CCS project developers, policy makers and experts in the field, in order to discuss and identify possible solutions to outstanding legal barriers. The meeting was held in the ROAD office in Schiedam, and has been attended by (amongst others) representatives of the ROAD CCS demonstration project, Air Liquide's Green Hydrogen project and potential storage operators in the North Sea.

3 Agenda

Legal and Regulatory Barriers to CCS Projects in Europe - Agenda		
13:00	**Opening and welcome**	Chair: Barend van Engelenburg *(DCMR/RCI)*
13:10	**Introductions / Roundtable**	
13:20	**Intro: CATO2 Legal and regulatory WP**	Tom Mikunda *(ECN)*
13:30	**Agenda setting: Key legal issues background**	Avelien Haan Kamminga *(Groningen Centre for Energy Law)*
13:45	**Expert session 1: Long-term liability**	Intro: Avelien Haan Kamminga
14:30	Break	
14:45	**Expert session 2: Financial security**	Intro: Joost de Wolff *(DNV KEMA)*
15:30	**Expert session 3: Supporting CCS incentives through regulation**	Intro: Tom Jonker *(ROAD)*
16:15	**Key points from expert sessions**	Barend van Engelenburg
16:30	**End of session and informal reception**	
17:00	Close	

4 Expert session 1: Long-term liability

It is very difficult for CO_2 storage operators to accept liability for the surrendering of EUA's in the extremely unlikely event of a leakage from the storage complex. Although the EU ETS provides an incentive for capture operators to capture CO_2, there is little incentive for storage operators to store CO_2. The majority of the reward stays with the operator capturing the CO_2, whereas the storage operator receives only a negotiated service fee. Since the EUA price at the moment is at a minimum level, there are no sufficient incentives from the EU ETS at all. It should be further noted that the incentive/reward for the operators storing the CO_2 in aquifers or depleted pressure gas fields is relatively small if compared to operators using CO_2 for EOR or enhanced gas recovery. The EU ETS provides an additional level of liability for transport and storage operators, which is unquantifiable. In other transport and storage operations, in the event of liquid or gas leaks, the problem is rectified as quickly and safely as possible and in the absence of damage to the environment or third-parties, there are no further consequences for the operators. If CO_2 leaks, the volume of CO_2 that leaked has to be calculated and then the corresponding amount of EUA's must be procured from the market at the market price at the moment of or soon after such leakage (a price unknown at time of injection). In the extreme case the storage operator is facing higher potential exposure than a transport operator, as sections of pipelines can be isolated and the maximum amount of CO_2 released, during the transport phase, is therefore limited (although the transport operator also has to surrender EUA's at a price at the moment of future leakage). Initial indications point towards no economically feasible solution from the private insurance market to insure liabilities related to CO_2 leakage, at least not in the demonstration phase time span.

The group agreed that it would be interesting to learn from CCS projects overseas, and how liability is dealt with in such cases. In the Shell Quest project in Canada, Shell have said that they cannot manage the liabilities, and the understanding is that the Alberta authorities have taken the liability exposure.

At present, the Dutch government is supporting the two demonstration CCS projects, ROAD and Green Hydrogen in the Netherlands but there is no real active additional CCS policy. It will be necessary to wait for the next government to form, upon which more information will become available on whether CCS will be sufficiently supported. With regard to environmental pollution, the principle 'the polluter pays' will very likely remain a cornerstone of government policy.

It may be difficult to move away from the polluter pays principle, although there can be debate on who the polluter is along the delivery chain, for example after closure and transfer of responsibility to the competent authority. In terms of options to limit the EU ETS liability faced by storage operators during their term of custodianship, there could be a way to lock the EU ETS price applicable when CO_2 leakage takes place to the price for CO_2 injected. In this way the exposure for the storage operator could be reduced, with the financial exposure being linked to the decision to store CO_2 at a specific point in time, rather than the financial exposure being subject to the unpredictable EU ETS market price. However, this option will increase the costs for a CCS project severely. Even after injection stops, an operator would need to keep a large sum of EUA's in reserve.

It was highlighted by a member of industry present at the workshop, that companies should do what they're good at. Industrial operators who produce power or industrial gases know little about subsurface gas storage, and therefore are unwilling to assume such liabilities. Given sufficient incentives, in an ideal economic scenario, liabilities should be incorporated into a storage fee and added to the total cost of storage. However this would push the price of CCS projects even higher and thereby increase the price of power or industrial products to uncompetitive levels and therefore the alternative will be to simply continue emitting and paying the price for emission rights. From the perspective of the storage operator, a tariff for potential exposure could be built in, but it depends on the perception from time to time of a worst-case scenario. The storage operator insists that the

probability of a catastrophic leakage event occurring is less than negligible, particularly for a reservoir that is only partly repressurised. However, as long the storage operator is expected to carry this additional EU ETS price exposure both if leakage occurs and also in the financial security required by the competent authority then the perception of size of potential exposure will far exceed the perception of probability and the resulting tariffs will be high.

It was mentioned that there are examples of pollution liability regimes, where not the entire penalty sits with the operator. This holds for nuclear accidents. The operator of a nuclear power plant has a financial responsibility (recently upped to €1.2 billion), and the government has an additional financial responsibility in this case. However the decision for the needs of public financial responsibility was an ex-post requirement, and this situation of long-term liability is not suitable or desirable to compare with CO_2 storage. The incentives and risks involved are completely different and the environmental consequences for a CO_2 leak are insignificant.

A number of potential options were discussed to overcome the CO_2 storage EU ETS price liability issue. Some of the options were based on fundamental alterations in the relevant EU Directives, others focused on possible workarounds based on the existing legislative boundaries:

4.1.1 A de-coupling of CO_2 storage from the EU ETS

- A view was expressed during the meeting that storage operators will do whatever it takes to prevent any chance of a leak and stop as quickly as possible any actual leak, and hence the extra penalty of the liability for ETS is in their opinion unnecessary if such liability is seen as an incentive for the storage operator to act as a reasonable and prudent operator. Opting CO_2 storage out of the EU ETS Directive as a regulated activity could solve the issue of the ETS liability.

- A view from industry is that although the EU ETS provides an incentive to capture and store CO_2 from an emitter perspective, for a storage operator there is very little incentive to take on the exposure associated with CO_2 storage. Furthermore, there are many responsibilities placed on storage operators for limited reward. The storage industry stressed that no CO_2 storage operator would undertake such an operation if there would be any possibility of leakage. There are a number of safeguards for effective CO_2 storage, without placing the burden of liability to purchase EUA's on storage operators in the event of leakage. Firstly, the risk assessment as part of the CCS Directive must prove that the storage complex is safe prior to injection taking place, which has to be agreed upon by the competent authority supported by third-party experts. Furthermore, the rectification of any leakage is likely to entail very high costs to the operator, which in itself represents a huge incentive to operate as safely as possible. Finally, the reputation of the storage operator would be badly damaged in the case of a leakage occurring. Given the fact that the majority of potential CO_2 storage operators will have activities in the oil and gas industry, the third point above is very important.

- On the other hand, this de-coupling might be interpreted as the operator being released from full liability for its activities. It could be viewed by certain stakeholders and opponents to CCS that significant exceptions are being made for the technology, and that a shift away from the polluter pays principle is occurring.

4.1.2 CO_2 leakage certificate

- A potential system was proposed whereby for every amount of CO_2 stored, a specific certificate would be supplied to the storage operator. For example, for every kiloton of CO_2 successfully stored, a certificate representing X% of this amount could be given to the storage operator by the competent authority. The figure of X% has to be determined by the competent authority, as a default value for the potential scale of leakage which one can imagine could increase as pressure in the storage reservoir increases. The storage operator receives these certificates, and in the case of a leakage, these certificates must be returned

to the competent authority equivalent to the volume calculated to have leaked. The certificates are also available at the end of custodianship by the storage operator and handed to the competent authority. The certificates replace the need to include any allowance for EU ETS liability in the security required by the competent authority. The certificates cannot be used for any other purpose than these two purposes. They cannot be traded or exchanged or cashed in.

- This option still requires the de-coupling of CO_2 storage from the EU ETS, as the certificates have no monetary value and can therefore not be used to purchase ETS credits from the market in the case of a leakage. It is not clear how an additional system of credits that have no price or value could work.

4.1.3 Spreading the ETS liability over the whole chain

- The long term EU ETS liability associated with CO_2 storage could be spread horizontally over the capture, transport and storage operators. Here the risk faced by each entity is reduced. This would require a change in the CCS Directive that currently channels the long-term liability only towards the storage operator.

- However, it was mentioned that this option could get very complicated if multiple use infrastructure were to develop for CCS, such as multi-user pipelines and platforms. It may be difficult to assign and administer liability in such circumstances, and still the incremental potential exposure associated with participating in CO_2 storage is not removed. Already the situation for P18-4 is complicated, with two partners “owning” the reservoir and well but four partners owning the platform and an unknown number of potential partners in the pipeline each holding different shares. Combine with this the possibility of two or more parties holding capacity just for the P18-4 storage and then add more parties for the next P18 reservoir and wells serving more customers and you have a very complex combination of players each tracking their separate EU ETS liability position.

- Furthermore such a system of spreading the risk over the complete chain, assumes that ‘diluting’ the risk will be an improvement. However, imposing risks upon parties, which cannot evaluate properly (as these risks are not part of their core competences), will lead to higher barriers in the chain instead.

4.1.4 Member State involvement

- Here the Member State could act as a last-resort insurance for some of the EU ETS liability, for example when the EUA price increases a certain amount, or the cumulative value of CO_2 underground exceeds a threshold. This cap could encourage private insurers to insure a project to a certain value. Other Member State involvement could include a contribution to a national financial security pool also funded by operators.

- Member State involvement may be desirable from an operator perspective, however it is contrary to the CCS Directive and would have to be assessed under state aid regulations.

4.1.5 EU Financial Security Support EU ETS

- All of the options outlined above require a party, either industry or the government to reserve funds for a very low probability event. Many developing technologies face technical and economic challenges, and additional hurdles such as this EU ETS liability represents another barrier to a technology with a very high abatement potential and the only physical way to lock CO_2 away forever. To support projects in the demonstration phase, for example the projects under the EEPR and NER300 in the EU, only in case of a leakage an amount of EUA’s matching the amount of leakage could be withheld each year from the EU ETS auction process on a rolling year basis, and used as security in case of leakage from one of the CCS demonstration projects. The principle differs from the New Entrants Reserve or 300

million EUAs announced in 2009, that no reserve of EUA's have to be established. If no leakage occurs, then the auction of EUA's can continue as planned. If something happens, the number of credits released back to the auction in the following year is reduced by the equivalent volume of CO_2 leaked in the year before. Therefore, all participants to the EU ETS pay *pro rata* in case of CO_2 leakage.

- Although many in the workshop thought this approach to be an attractive one, a number of questions may remain. For example, with 1 or 2 demonstration projects the possible withdraw of EUA's from the auction will be relatively small, however with a greater number of demonstration projects operating for multiple years, the EU ETS liability may be more substantial and therefore the reserve might need to be increased annually. On the other hand the probability of all storage sites leaking is rather unlikely and therefore the joint leakage risk might still result in relatively limited costs. It is also unclear whether this is a sustainable solution for long-term CCS development, and another solution will still have to be found for the commercial phase, but if it works for the demonstration phase then we have found a potential solution.

4.2 Session summary

To summarize this session, it was generally agreed that a distinction between the demonstration stage and the commercial stage of CCS in terms of ETS liability should be made. In the demonstration phase additional support is needed, where in the commercial phase more options such as risk spreading or insurance could become possible. There is no clear winner from the options mentioned; all have their own advantages and disadvantages. The EU Financial Security EU ETS option was found potentially useful by many members of the expert session, possibly restricting it to the demonstration phase. This option allows the consequences of CO_2 leakage to be spread across all entities exposed to the ETS, and any use of this option would in most circumstances have a very minimal price impact, which would not be noticed (especially in the early demonstration project years). It was also agreed by the participants that investigating how liability is dealt with in Norway, Australia and Alberta, Canada, which either have CCS projects running, or at an advanced stage of planning, can be beneficial to provide insights for European projects.

5 Expert session 2: Financial security

A second session dealt with the uncertainties related to the financial security. Before a permit for storage is issued, the operator has to prove that it is able to carry the financial burdens of the operation (including a financial security to cover liability). The amount of the financial security and financial contribution is relevant for project initiators in making the business case for CCS. The CCS directive does not provide detailed specification or regulation in this area, nor do the Guidance Documents. Individual Member States have the opportunity to provide additional specification and regulation, but the first indications are that it is left to projects to come up with proposals. This creates uncertainty for project developers, but on the other hand creates the possibility for a 'tailor made' approach for each project.

Three issues can be distinguished: (i) the uncertainty that is a result of the coupling of the financial security to a worst case scenario in which leakage occurs and large amounts of EUAs have to be purchased, (ii) the uncertainty on the duration between storage site closure and handover to the Member State (which is 20 years or earlier or later based at the discretion of the Minister) and (iii) the regulatory uncertainty that is related to the amount, form and timing of the financial security, financial mechanism and the transfer of responsibility. Generally speaking, the existing legislation within the CCS Directive is sufficient. The competent authority has a level of freedom to deal with each storage case, and tailor each financial security to the particular risks of a project. There are however a number of areas where additional guidance could be provided regarding the financial security and the financial mechanism.

Guidance and justification could be provided on methods to provide a financial security. Are company balance sheets sufficient? Or are bank guarantees or insurance policies required. For example, the European Commission has specified bank guarantees as preferential. However the operators themselves may have a lower risk of insolvency than the bank. Although it would be possible to adopt more specific regulation with regard to the type and amount of security, the participants in general feel that there is no need to do so. The flexibility and site-specific solutions that can be negotiated with the competent authority are valued higher than more specific regulation.

The main issue regarding the amount of financial security to be provided is that the financial security has to be based on a worst case scenario occurring, regardless of the probability of such an event occurring (although a risk based approach for the amount of EUA's that must be surrendered in case of leakage is accepted). This can be compared to taking out a car insurance policy, whereby the premium is calculated on the driver having at least one serious accident in a year. In reality, this would make such insurance unaffordable. The participants preferred to deal with this issue in the same way as was proposed in the discussion on liabilities, by way of the CO_2 leakage certificates or the EU financial security support reserve.

It was also discussed that in certain cases, such as storage in a depleted gas field, there is very little monitoring that can or needs to take place after the well has been permanently sealed. Seismic monitoring can be conducted but is unlikely to show movement of CO_2 outside the reservoir. Seismic monitoring will be appropriate for aquifer storage only. Since the well is sealed no down-hole measurements can be taken. The well should be sealed as soon as possible after injection ceases because it is the only leak path and a reasonable and prudent operator would insist on immediate closure. If the close-in pressure has only reached a proportion of the original reservoir pressure, for example 75%, then for any potential leakage paths the most likely direction of flow would be into the reservoir from the surrounding higher-pressure zones. After injection has ceased and the well plugged, the infrastructure around the site will be removed, meaning that continued monitoring will be from the sea surface or on the seabed. A variety of novel monitoring techniques could be tried thereafter. The expectation is that for all practical purposes the time between closure and transfer of responsibility to the competent authority will be much shorter than the notional 20 years.

6 Expert session 3: Supporting CCS incentives through regulation

The EU CCS Directive sets out a regulatory framework for CCS. The EU sees CCS as a transition technology needed to reach the climate mitigation objectives, assuming broad deployment of the technology in power generation and industry after 2035. However, whether or not large scale CCS will become reality depends on willing project developers in the private domain. The question is whether or not the legal framework as developed by the EU and implemented in the Netherlands does sufficiently accommodate the practical issues that project developers encounter in making their business case. This session covered 2 main issues. The combination of biomass co-firing in power plants to be potentially equipped with CCS, and the use of captured CO_2 for enhanced oil recovery (EOR).

6.1 CCS and biomass

Currently, EU legislation does not provide an incentive for capturing CO_2 from biomass-fueled plant, as no negative emissions can be credited to the operator. Moreover, legislation actually deters operators from co-firing biomass in a capture-equipped plant, as extra energy will be needed to capture, treat and compress the CO_2 from biomass plant (potentially up to 20%), which is not entitled to gain EU ETS credits. This means operators will avoid striving for negative emissions, which are becoming more relevant as a mitigation measure given the delay in tackling climate change. It was discussed during this expert session that at present, a number of national and European policies relating to biomass use and CCS are in conflict. In the Netherlands, there is a tax on the use of coal, equivalent to €5,40/ton CO_2. This, in combination with the exclusion of biomass emissions from the EU ETS, means that there is a strong case for operators to use biomass in power production and industry. However, as mentioned above, the combination of CO_2 capture with biomass is not economically favorable. The ROAD CCS project in Rotterdam has the potential to co-fire up to 20% biomass in the power plant unit (MPP3), which is expected to be equipped with post-combustion capture. Under the current situation, the operator is incentivized to only fire coal in units that have CCS and shift the available biomass to units that do not have CCS, whereby the goal to maximally reduce CO_2 emission is no longer leading.

The expert session participants briefly discussed ways to rectify this situation. The most expedient solution would be for the European Commission to develop a system for biomass CO_2 that is stored to be rewarded with negative emissions. This would mean that operators would be ‘given’ EUA’s for every ton of CO_2 stored from biomass fuel. As yet, there have been numerous calls for such an implementation, however nothing has been heard from the European Commission on this matter. The current EU ETS regulations, which exclude biomass emissions to be reported under the system, will be in place until 2020. One of the reasons for this could be that the biomass industry does not want to be exposed to climate legislation. Another option is to make it possible to trade biomass percentages. An administrative swap would be conducted by companies storing CO_2 partially from biomass, to swap that percentage with a company that does not have emissions from biomass. The company storing CO_2 would benefit because all emissions stored would count as not emitted, the other company would benefit because part of the emissions would be considered as biomass emissions. However, the general feeling among the participants was that this would lead to too much red tape. A relative easy first step could be that operators, who co-fire coal and biomass while at the same time partially emit CO_2 via a stack and partially store CO_2 at a CCS project will be allowed to above proposed swap within their own company within an annual period.

6.2 CCS and enhanced hydrocarbon recovery

A proposed business case is to transport CO_2 by ship towards another Member State where the CO_2 is first used for EOR and after that is stored. First of all, transboundary transport for storage is still not possible as long the obstacle of art 6 of the London Protocol is not resolved. The possible solutions that were addressed by the IEA do not seem that fruitful. On the other hand, as transboundary transportation for EOR is possible, the participants are confident that if a business case pops up, a solution can be found rather quickly.

There is however another legal issue that might complicate the CCS/EOR combination. The issue of the legal prohibition in the Netherlands of holding a CO_2 storage license in combination with an oil/gas production license was discussed briefly. There are no restrictions on using CO_2 for EOR, however no EU ETS credits can be acquired, as the process will be considered as an industrial activity. It was mentioned that this issue is primarily a national issue, as Denmark and other countries has interpreted the EU CCS Directive differently. Furthermore the EU ETS monitoring and reporting guidelines actually provide an activity specific guidelines for monitoring CO_2 emissions from the storage of CO_2 in combination with enhanced oil recovery. This was agreed as an issue for potential Dutch oil and gas operators considering implementing CO_2 enhanced oil or gas recovery, however no possible solutions were discussed.