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Bellona Europa response to the CCS Directive Review Survey

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The Bellona Foundation is an independent non-profit organisation that aims to meet and fight the climate challenges, through identifying and implementing sustainable environmental solutions. We work towards reaching a greater ecological understanding, protection of nature, the environment and health. Bellona is engaged in a broad spectre of current national and international environmental questions and issues around the world.

Pollution knows no borders, thus Bellona works with and against anyone and everyone relevant to our work, both nationally and internationally. Bellona has a solution-oriented approach to the environmental challenges and has since 1998 had extensive cooperation with a number of companies in different industries and businesses. Our approach is that to achieve results one must jointly work out the best social and environmental solutions, and make these financially profitable and viable. Bellona has always been and remains an independent watch dog that investigates, scrutinises and reports any environmental crime we uncover.

The Bellona Foundation was founded in 1986. We are currently 65 employees, working at the main office in Oslo and our three international offices in Brussels (Belgium / EU) Murmansk (Russia) and St. Petersburg (Russia). Bellona has been established with an office in Brussels since 1994.

Introduction

Bellona considers the objectives set out for the CCS Directive - addressing safety, environmental, health and public acceptance concerns, alongside helping to create harmonised procedures to ensure a common approach and helping to increase the speed and scale of CCS uptake – to be largely met. However, due to the delayed deployment of CCS projects in Europe, the overall impact of the CCS directive has been underwhelming.

Apart from helping to create harmonised procedures, there have been few if any concrete instances for the directive to meet the other objectives. In the future, when Europe has CCS projects, certain elaborations and additional standards may be desirable in terms of achieving standardisation of aspects of the CCS chain. However in the absence of any commercial-scale CCS deployment in Europe, efforts should first continue to be placed on the deployment of CCS before the formulation of specific standards.

Policies to actively facilitate deployment is the central requirement of CCS development in Europe. There exists a single primary cause for the slow progress of CCS in Europe: lack of or lack of anticipation of any legislative driver to develop, deploy or operate a CCS facility. The price signal set from the EU's Emission Trading System (ETS) is currently and will continue to be insufficient to affect the operational economics of fossil fuel electricity generators for years to come. Thus at present the deployment of CCS as a technology has no commercial basis in Europe, as unabated and polluting solutions continue to be rewarded by market conditions and the extant policy framework. If CCS is to be deployed in Europe in line with the 2050 energy roadmap this greater policy failure needs to be addressed.

An energy and industrial framework to enable the deployment of CCS is necessary to develop skills, expertise, infrastructure and CO_2 storage capacity to ensure the rapid growth in CCS deployment that is envisioned post-2030. A failure to build the foundations of a CCS industry in Europe now will greatly increase cost and potentially retard CCS deployment in the future – with adverse results for EU climate, industrial and energy policy.

Alongside this review process attention therefore needs to be paid to delivering CCS projects and Bellona continues to address this in relation to, amongst others, the 2030 framework and ETS reform. Bellona encourages a number of support measures and political mechanisms to spur CCS development in Europe: A CO_2 price ramp driven by a tighter ETS cap, public grants to subsidise capital and operating costs as well as a mix of feed-in-tariffs/premia, CCS certificates and a strict Emission Performance Standard (EPS). Redesign of the electricity market would also be necessary.

A. Objectives of the Directive

These questions cover your opinion on what the strategic purpose of the CCS Directive is – as currently defined.

A1. The original Impact Assessment[1] for the CCS Directive described a number of objectives for it. Do you think that these objectives are appropriate? ***[Yes, No, Don't know]***

Addressing safety concerns

Yes.

Addressing environmental concerns

Yes.

Addressing health concerns

Yes.

Addressing public acceptance concerns

Yes.

Helping to create harmonised procedures to ensure a common approach

Yes.

Helping to increase the speed and scale of CCS uptake

Yes.

Do you think there are other objectives not listed above?

No.

If yes please describe them ***[free text]***

If the question is meant to imply what objectives should be included into the CCS directive then yes. Deployment mechanisms for energy and industrial CCS projects,such as transitional measures to support the timely deployment of CCS.

[1] http://ec.europa.eu/clima/policies/lowcarbon/ccs/docs/ccs_ia_jan2008_en.pdf)

A2. How well do you think the current Directive has performed against each of these objectives? *[Not in current scope, Negative effect, No effect, Positive effect, CCS context has changed making the objective less relevant, Don't know]*

Addressing safety concerns

No effect.

Addressing environmental concerns

No effect.

Addressing health concerns

No effect.

Addressing public acceptance concerns

No effect.

Helping to create harmonised procedures to ensure a common approach

Positive effect.

Helping to increase the speed and scale of CCS uptake

No effect.

Other [free text]

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A3. Do you think some of the objectives of the CCS Directive would be better addressed by Member States (MSs) at the national level? *[Yes, No, Don't know]*

Addressing safety concerns

No.

Addressing environmental concerns

No.

Addressing health concerns

No.

Addressing public acceptance concerns

No.

Helping to create harmonised procedures to ensure a common approach

No.

Helping to increase the speed and scale of CCS uptake

Yes.

Other [free text]

-Blank-

Comment

The CCS Directive should cover the aforementioned objectives, it would also emphasise the need to allow Member States some flexibility to meet implement their own policies and legislation to help meet the objectives.

A4. What is your opinion of the following potential benefits of an EU level legislative framework for CCS? ***[Strongly agree, Agree, Neutral, Disagree, Strongly disagree, Don't know]***

Creates a framework to be tested by those MSs that are leading CCS development, that other MSs can adopt in the future (when they become involved).

Agree.

Creates a common approach to avoid market distortions.

Neutral.

Creates a larger market, giving Europe the potential to become a world leader in CCS.

Neutral.

Creates supra national guidance, which avoids each MS having to develop their own.

Agree.

Creates guidance which should be less at risk from national politics and therefore should be more technically objective.

Neutral.

Other [free text]

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A5. A series of four Guidance Documents were developed to support a coherent implementation of the CCS Directive across the EU member States. What is your opinion on the contribution of these guidance documents: *[Agree, They have no impact, Don't agree, Don't know]*

They were helpful for the preparation of CCS projects

Agree.

Comment

The Guidance Documents have generally been helpful for project developers, however, there are certain areas where they have either introduced, or reinforced barriers to CCS deployment. An example would be Guidance Document 4, which rates self-assurance and corporate guarantees from affiliated companies as the riskiest forms of financial security, despite these being acceptable for oil and operations (depending on the strength of the company).Guidance Document 4 does not provide for any suggestions of dealing with the uncertainty of EUA prices in the case of a leakage, exposing storage operators to significant future liabilities.

They were helpful for the implementation of CCS legislation in MS's

Don't know.

They have increased the impact of the Directive

Don't agree.

Other? [free text]

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A6. Do you think that the development of a European standard in line with the CCS Directive objectives, on top of the guidelines, is desirable? *[Yes, No, Don't know]*

No.

Comment

Commercial scale CCS deployment in Europe is still very limited, with no large-scale projects yet in operation. It is therefore premature to decide what standards should comprise. It is clear that regions that are progressing more rapidly on CCS such as north America will have more to add to the drafting of international standards.

A7. If yes, what is your view on the following statements? *[Agree, Disagree, Don't know, Comment]*

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A8. How important do you think developing common EU standards is to achieving the following? *[Vital, Very important, Useful, Neutral, Not important, Don't know]*

Risk assessment – evaluation processes

Not important.

Risk management protocol (how risk is assigned / treated)

Not important.

CO_2 stream composition

Not important.

Environmental impact assessment

Not important.

Other? [free text]

-Blank-

Comment

In the future, certain standards may be desirable in terms of achieving standardisation of aspects of the CCS chain. However in the absence of commercial-scale CCS

deployment, EU efforts should be placed on the deployment of CCS before the formulation of specific standards.

B. SCOPE

These questions ask for your opinion on what issues should be addressed by the CCS Directive. This includes a number of issues which have become more prominent since the Directive was drafted.

B1. Do you think that the EU regulatory framework for CCS adequately takes the following issues into account? *[Yes, No, Don't know]*

Public concerns over safety and environmental impacts

Yes.

Applying CCS to plants fuelled by biomass

No.

Comment

Bio-CCS is the only technology currently available to achieve substantial CO_2 negative emissions. That is to remove CO_2 from the atmosphere. Bellona regards Bio-CCS as essential to stabilising the climate and avoiding run away climate change[2]. The CCS Directive and the ETS currently have no provisions to account for and thus reward CO_2 negative activities.

The combination of Enhanced Hydrocarbon Recovery (EHR) with CCS

Yes.

Comment

Bellona believes that the primary function of the Directive in relation to EHR should be to not prevent the development or implementation of EHR projects as this should be facilitated at the Member State level.

[2] Report: Biomass with CO2 Capture and Storage (Bio-CCS), the way forward for Europe (June 2012) <http://bellona.org/publication/26034>

The uptake of CCS in the industrial sector (non power generation) for example, cement, refining, steel.

No.

Comment

There is a need for additional policies to incentivise the deployment of CCS in the industrial sector.

The Directive currently allows for CO_2 generated from industrial sources to be stored in geological formations and that this is wholly appropriate.

The utilisation of CO_2 captured in industrial processes (in combination with CCS) (Carbon Dioxide Utilisation (CDU))

Yes.

Comment

The CCS Directive is designed to address the geological storage of CO_2 and not utilisation therefore the Directive does not need to give further consideration to it.

Transport of captured CO_2 by ship

No.

Comment

At present transportation of CO_2 by ships is problematic as ships or the cargo are not defined as an installation under the EU ETS Directive. There is evidence that transporting CO_2 by ship may be a cost effective and low carbon way to transport the CO_2 and this barrier should be removed.

There is no evidence on the need for further regulation on environmental risks related to CO_2 transport.

Revision of the EU ETS Directive to enable cargo transporting CO_2 on ships to be defined as an EU ETS installation. Ship transport of CO_2 has also to be included in the CCS Measurement and Reporting Guideline (MRG). Note that this revision is not intended to include all ship transport and subsequent CO_2 emission as an ETS installation – this is only a requirement for ships transporting CO_2 from one ETS installation to another.

Other [free text]

-Blank-

B2. The Impact Assessment completed by the European Commission when the CCS Directive was drafted concluded that the EU Emissions Trading System (ETS) was the right enabling policy for internalising climate change externalities and that there was little evidence of a need for additional measures (going beyond the carbon market). Given the slow rate of progress in CCS to date do you think the European level policy framework needs additional (or less) policy measures to enable the transition to CCS? ***[Yes – more, No – current measures are sufficient, No - there are already too many measures, Don't Know]***

Yes.

Comment – if yes what instruments and subsidies would you suggest?

To date, incentives for CCS deployment in Europe have been solely based on the carbon price. This will remain insufficient in preparing Europe for commercial CCS deployment.

The successful deployment of wind and solar energy in Europe has relied on additional transitional measures such as feed-in tariffs, introduced by EU Member States to attain their binding targets for renewable energy sources. The Renewable Energy Directive ensured the introduction of such mechanisms that remove much of the commercial risk, accelerating deployment, learning and cost reductions. As a crucial climate change technology, CCS would benefit from similar deployment mechanisms.

Bellona has prepared a study discussing and comparing different transitional measure mechanisms to enable CCS deployment.[3]

B 2.1. What is your view of the following potential policy mechanisms to be established at EU level? ***[Strongly support, Support, Possible, Don't support, Strongly don't support, Don't know]***

A CO_2 price ramp – driven by a tighter cap

Support.

Comment

[3] Report: Driving CO2 capture and storage in the EU: new policies, new perspectives (November 2013) <http://bellona.org/publication/ccs-market-incentives-report>

The Emissions Trading System (even with significant and effective reform) is not likely to incentivise the timely deployment of CCS necessary to reach EU 2050 climate abatement targets. Bellona welcomes the legislative proposal for a Market Stability Reserve however; we do not regard them to be sufficient to provide the robust and stable CO_2 price necessary for investor certainty. Additionally the delay in implementation of the reform until 2021 risks further uncertainty in the ETS. Therefore, reforms to the ETS need to be more comprehensive and immediate.

However, the ETS alone is unlikely to provide a sufficient price signal for timely deployment. For the application of CCS to industrial facilities the ETS alone may not be sufficient due to global market competition.

Public grants to subsidise capital costs

Support.

Comment

In the case of CCS, the net marginal benefit to the 'first movers' who take the lead in CCS deployment will be lower than the overall benefit to society. Market conditions therefore render the private provision of CCS unprofitable, which in turn leads to its non-provision. Public grants to subsidise capital costs allow public authorities an effective means of redressing this market failure. CCS has accordingly benefitted from European Commission financing under the organisation's Seventh Framework Programme for Research and the European Economic Programme for Recovery. Most notably, CCS is eligible for grants raised by the auctioning of some 300 million emissions allowances from the EU ETS – the NER300 scheme.

None of the CCS projects which took part in the first round of the scheme succeeded in being awarded any funds.

A primary cause was the faltering EUA price which failed to provide the long-term price signal for the OPEX of CCS facilities. Without major reforms to the ETS (or other measures to reward OPEX) it is unlikely that grants to subsidise capital costs alone will deliver CCS projects.

Public grants to subsidise operating costs of CCS plants

Strongly support.

Comment

It is necessary to avoid a situation where CCS, once built, would not be operated due to competitive disadvantage in the electricity market.

Until/if the ETS provides a sufficient price signal to reward the operation of CCS facilities above that of an unabated plant, mechanisms will be needed to support the operation of the CCS plant.

OPEX of CCS facilities could be supported through a redesign of the electricity market, direct subsidies or a mix of FiP, Certificates, EPS among others.

Public grants to subsidise capital and operating costs of CCS plants

Strongly support.

Comment

See above comment.

CCS certificates

Strongly support.

Comment

Bellona strongly supports the introduction of a CCS certificate system to enable the timely deployment of a set amount of CCS facilities. Enabling the on time development and delivery of CO_2 storage capacity, CO_2 transport infrastructure and advancing capture technologies.

An EU-wide CCS certificate scheme could see the EU issue tradable certificates to CCS power plants for the electricity they produce. Utilities would then be obliged to acquire a certain number of certificates for the CO_2 they emit, giving the certificates a monetary value that would provide a supplementary income to CCS producers.

There would be no need for EU institutions to directly manage revenues – the Union would simply control the scarcity of certificates, indirectly giving them value to their bearers.

The advantage of a pan-European CCS market incentive scheme is that it is more compatible with the EU's single-market ambitions. The larger market for tradable certificates would also put greater downward pressure on CCS costs.

Whilst an EU-wide market-based instrument for CCS is attractive, care will have to be taken to ensure that it neither falls prey to the shortcomings of the EU ETS, nor undermine its operation.

Emission Performance Standards

Strongly support.

Comment

An EPS sets a clear and unambiguous framework for what form and method of thermal generation investment is feasible. An EPS sets a clear signal for investors, operators and technology vendors. At present no EU wide legislation or sufficient CO_2 price signal exist to dissuade investment or reinvestment in CO_2-intensive generation capacity. Under the existing framework of a generally unenforced CO_2 capture ready requirement and a poor outlook for the CO_2 price, investments in CO_2-intensive generation capacity are little affected by EU climate policy. This is resulting in investments now leading to carbon lock- in and eventually costly stranded assets.

Bellona in partnership with twelve prominent European environmental NGOs supports the rapid application of an EU wide EPS[4].

- In every economy-wide decarbonisation study, early decarbonisation of electricity supply is the linchpin for cost effective cross-sector decarbonisation.

- The ETS will likely not provide a sufficient price signal in the near term, failing to prevent the construction of new high-carbon assets, which will put pressure on the carbon price later: the worst of both worlds. This may unsettle political support for the ETS, as well as negatively impact European competitiveness. An EPS provides an earlier, more stable, signal - smoothing the ETS price trajectory.

- None of the proposed reforms to the EU ETS right now would be sufficient to ensure a complete shift away from coal and lignite. The International Energy Agency has explicitly stated that non-price measures are required in tandem with a CO_2 price.

[4] <http://bellona.org/news/climate-change/2014-02-emissions-performance-standard-key-countering-eus-coal-addiction>

- An EPS would not replace the carbon price but would complement it by providing a safeguard that encourages investment flows only to energy resources that can contribute to achieving EU decarbonisation objectives.

- The coal and lignite power plants being built today have a lifetime of at least 40 years. CO_2 capture readiness requirements are a cosmetic measure that will not prevent coal emissions.

- An EPS for existing plants should also be introduced. This could be done in line with existing timetables under the Industrial Emissions Directive, allowing newer, more efficient and flexible plants to operate for a limited timeframe, but removing older, inefficient and inflexible plants from the system.

In the EU the UK already has an EPS in place for thermal electricity generation at (450 g CO_2/kWh), while the European Bank for Reconstruction and Development also applies an EPS to its investment decisions.

Internationally emissions performance standards have been implemented to help promote CCS deployment in both Canada and the United States. In 2012 the Canadian government finalised performance standards affecting coal electricity generation. All new coal facilities post-2015 and existing facilities over 50 years will be mandated to reduce CO_2 emissions to the level of Combined Cycle Gas Turbine (CCGT) (420kg/MWh), requiring the application of CCS. This EPS was a critical policy in the delivering of the Boundary Dam CCS facility in Saskatchewan Canada (as the Canadian EPS is retroactive – applying to plant 50 years old). This CCS facility was retrofitted to an existing lignite fired plant that would otherwise have been forced to retire. The Canadian EPS has also resulted in the Thunder Bay generating station in Ontario to be converted from coal to biomass.

Other? E.g. Feed in tariff support for CCS enabled plant (for national level) [free text]

Support.

Comment

Feed-in Premia (FiP) offer investors in new power generation the greatest security of income. This is because FiP provide support to generators in a form that best

ensures them access to the electricity grid, reducing both revenue risk and price risk for investors. However this risk reduction for the generators comes at a high cost to consumers. FiP, if poorly designed, may guarantee generators windfall profits for the life time of the facility while negatively affecting competition.

B3. The CCS Directive is intended to work alongside a number of other European level policies and programmes. How well do you think the objectives and content of the CCS Directive fit with the following EU policies and tools? A good fit would be where the policies and programmes have complimentary objectives and there are no apparent contradictions in how they have been implemented. A poor fit would be where this is not the case. *[Good fit (no apparent contradictions), Reasonable fit (no important contradictions), Some contradictions, Serious contradictions, Don't know]*

The ETS mechanism (including programmes such as the NER300)

Reasonable fit (no important contradictions).

Comment

The ETS, by providing a cost on CO_2 emissions was intended to be the primary driver of CCS deployment in Europe, with the CO_2 storage directive acting as an enabling policy. The faltering EUA price has failed to reward the deployment of decarbonisation technologies such as CCS. As forecasted CO_2 prices remain weak due to difficulties in reforming the ETS significantly before 2020, so too will European commercial deployment of CCS technology. The degree of operational support the ETS would have offered demonstration plant has also declined, with demonstration operators in most Member States left with significant commercial risks to sunk investments. These include increased operating costs due to CO_2 capture and reduced competitiveness in the electricity market.

The ETS could lead CO_2 storage operators to encounter unquantifiable levels of liability for (extremely unlikely) CO_2 leakage: the EUA price is known at the moment CO_2 is stored, but the EUA price that applies to hypothetical CO_2 leakage is unknown.

The lower price of EUAs auctioned for the NER300 scheme (€8.10) greatly reduced the funds available to immediately support demonstration projects: At CO_2 prices of €30/tonne, total support could have been as high as €9 billion, however the eventual figure is likely to be around €2 billion. The shrinkage of the pot of funds meant that projects successful in the competition would receive less support than initially anticipated, placing an additional burden on co-funders

such as host states and sponsor companies. It also resulted in a rationalisation of the scheme, with fewer full-scale plants able to be supported.

The metric by which prospective demonstration projects were rated in the NER300 resulted in a distorted awarding process. Directive 2009/29/EC states that the award of NER300 funds shall be dependent upon the verified avoidance of CO_2 emissions. However, projects were reviewed primarily on the cost per tonne of CO_2 stored (€/CO_2 stored). This did not take account of the cost of electricity output, and may have resulted in poor value for money for co-financing Member States that would have been obliged to fill any resulting funding gap.

R&D support (FP7 and Horizon 2020)

Good fit (no apparent contradictions).

Comment

R&D support is not equitable with actual real world deployment. CCS will benefit most from deployment, providing CO_2 storage capacity and the development of CO_2 transport networks. Innovations that result from FP7 and H2020 projects will not be refined or commercialised without full scale CCS deployment in Europe.

Funding available under FP7 and H2020 is much too short to support development of CCS. There is only one call for CCS R&D in the current Work Program for Horizon 2020 with a pot of €35M to be shared with 2 other calls. This is too small to ensure several technologies are tested and developed (at R&D and large scale demonstration stages).

Support for Renewable Energy Sources

Some contradictions.

Comment

There is no direct contradiction. However a portfolio of technologies will be needed to achieve decarbonisation in each Member State. CCS is essential to complement renewables and energy efficiency in achieving the required emissions reductions to 2050. At present CCS does not benefit from mandated deployment targets that other low-carbon energy technologies enjoy. This results in vastly preferential investment flows to renewable energy sources with detriments to CCS development and deployment. Policies to incentivise the

deployment of renewables such as the renewable energy directive have direct impacts on the functioning of the ETS.

Support for Energy Efficiency

Some contradictions.

Comment

If binding Energy efficiency targets or further implementing measures are introduced then they should not be designed in such a way that discourages CCS investment. For example, setting limits on primary energy consumption could stifle investment in CCS as CCS out of necessity increases energy consumption in order to dramatically reduce CO_2 emissions.

The Waste Directive

Reasonable fit (no important contradictions).

Other? [free text]

The Water Policy Directive (2000/60/EC).

Reasonable fit (no important contradictions).

Comment

Article 21 of the Storage Directive inserts an indent to Article 11(3) of the Water Policy Directive in order to authorize the injection of CO_2 streams for storage purposes into geological formations which for natural reasons are permanently unsuitable for other purposes.

B4.1 Is the combination of the CCS, Industrial Emissions and EIA Directives sufficient to regulate CO_2 capture? *[Yes, No, Don't Know]*

At MS level?

Yes.

If no, what changes to the legislative provisions do you think are needed?

The combination of these three Directives is sufficient to regulate CO_2 capture from a health and safety and environmental perspective. There is, however, a

need to detail and strengthen the 'CCS-readiness' provisions of Directive 2001/80/EC (Article 33) in order to further encourage the deployment of CCS.

Once market conditions have been established to make CCS commercially deployable, operators should have the incentive to implement CCS as part of their new projects involving fossil-fuels. Until then, measures to ensure CCS-readiness are justified and should apply to both fossil fuel power plants and carbon-intensive industrial installations. Without CCS, power plants and industrial installations risk becoming stranded assets as the economy is decarbonised.

It would be useful to clarify the following points:

- Investors and authorities need further clarity on what is required to fulfil the conditions set to availability of storage, the feasibility to establish transport and the requirements to capture readiness.
- If the conditions to CCS readiness are not met, it should be clarified that the competent authority shall not grant the power plant operating license.

At EU level?

Yes.

B5. Technologies have emerged for the utilisation of CO_2 that could play an important role in decarbonising industrial processes. These technologies could also help improve the business case for CCS. The two main groups of technologies are Enhanced Hydrocarbon Recovery (HER) and innovative Carbon Dioxide Utilisation (CDU). Should additional regulatory measures and/ or incentives be considered to support CDU technologies in combination with CCS? *[Yes, No, Don't Know]*

Yes.

There is also a need for additional policies to incentivise EHR; not just CDU.

B5.1 If yes, what is your opinion of the following measures: *[Strongly support, Support, Possible, Don't support, Strongly don't support, Don't know]*

Targeted R&D grants, e.g. a Horizon 2020 call, and NER300 type programmes

Support.

Incentives via emissions trading

Possible.

Extend / adjust CCS Directive to include HER and CDU

Don't know.

Other? [free text]

-Blank-

B5. Are there any challenges which have been identified for CCS and Enhanced Hydrocarbon Recovery (EHR) projects under development? *[Yes, No, Don't know]*

Yes.

If yes, how could these be overcome?

At present there are no CCS and Enhanced Hydrocarbon Recovery projects in development in the EU. The economic potential of EHR has yet to be widely proven in many MS. Therefore it is imperative that if the EU is to take advantage of these technology options (as is the case in Canada and the US) than the regulatory framework must play an enabling role and not create barriers to this option. MS such as Romania along with the North Sea basin have large potential to benefit from EHR technologies.

B6. What is your opinion of the following statements on why additional regulatory measures to support CDU should not be supported? *[Agree, Disagree, Don't know]*

Low CO_2 abatement potential in comparison to CCS on electricity generation

Don't know.

Comment

CDU encompasses a vast array of technologies and applications, each with different costs, applicability and environmental suitability. As such it is impossible to treat such a diverse collection of CO_2 management methods as a single or even similar entity.

High cost of abatement

Don't know.

Comment

Again, CDU is a diverse group of technologies. It is not clear to what technology or setting the questionnaire is referring to. The cost of abatement will be dependent on the technology, where it is deployed, and what ancillary or operational benefits it provides.

The use of cost of abatement alone is a poor guide to the benefits of deployment. For example some CDU technologies may enable the construction of CO_2 transport networks with wider benefits for CCS deployment.

Other (please specify)

-Blank-

B7. Are you aware of any scientific evidence that environmental risks associated with the transport of CO_2 should be further regulated, on top of the existing legislative framework? *[Yes, No, Don't know]*

No.

C. PROGRESS – WITH THE DIRECTIVE AND CCS IN GENERAL

As stated in the Consultative Communication on CCS published by the European Commission in March 2013, CCS technology demonstration in Europe is not progressing at the pace as envisaged at the time of European Council of March 2007. The following questions aim to capture your views on the rate of progress of CCS in Europe. We encourage you to provide additional evidence for this group of questions (see end of questionnaire for the procedure to submit this evidence).

C1. How much do you think knowledge of the potential costs of the different elements of the CCS chain in Europe has developed over the last five years (since the Directive came into force)? *[Good development, Some development, Very little development, No development, Adverse development, Don't know]*

CO_2 Capture

Good development.

CO_2 Transport

Some development.

CO_2 Storage

Some development.

Other? [free text]

Knowledge of potential costs has improved over the last five years mainly as a result of practical experiences and developments from outside Europe.

C2. How much do you think knowledge of the technical feasibility and performance of the different elements of the CCS chain in Europe has developed over the last five years (since the Directive came into force)? *[Good development, Some development, Very little development, No development, Adverse development, Don't know]*

CO_2 Capture

Good development.

CO_2 Transport

Some development.

CO_2 Storage

Some development.

Other? [free text]

There has been no new, large-scale injection in Europe in the last five years and as a result there is still a void in terms of knowledge of technical performance of the CO_2 transport and storage elements of the CCS chain. Technical feasibility is well understood and knowledge continues to grow as a result of successful R&D both within and outside Europe.

C3. Looking forward in time, how do you expect the potential costs of the different elements of the CCS chain in Europe to develop between now and 2030? *[Good development- reducing costs, Some development, Very little development, No development, Adverse development, Don't know]*

CO_2 Capture

Good development (reducing costs).

CO_2 Transport

Good development (reducing costs).

CO_2 Storage

Good development (reducing costs).

Other? [free text]

Bellona is confident that with wide deployment of CCS the resulting growing market for CO_2 capture technologies, CO_2 handling and CO_2 storage service providers will provide increased competition and reducing costs.

Deployment of CCS in Europe is essential to realise lower costs for CO_2 transport and CO_2 storage. Both these activities benefit greatly from increased scale. The development of CO_2 transport networks, transport hubs and CO_2 storage complexes have the greatest impact on reducing costs. As such the cost of the CCS value chain will very much be contingent on EU action to incentivise timely and planned deployment. Cost reductions will not be realised until there is EU activity in these sectors.

C4. Looking forward in time, how do you expect knowledge on technical feasibility and performance of the following aspects of CCS in Europe to develop between now and 2030? *[Good development- improving knowledge, Some development, Very little development, No development, Adverse development, Don't know]*

CO_2 Capture

Good development (improving knowledge).

CO_2 Transport

Good development (improving knowledge).

CO_2 Storage

Good development (improving knowledge).

Other? [free text]

Good progress on knowledge of CO_2 capture technical feasibility and performance is expected, even if there is relatively little progress with CCS in Europe, as there will be substantial learnings from projects in other regions. In this case Europe will need to import CO_2 capture expertise.

However, it will be impossible for Europe to import CO_2 storage capacity. Deployment of CCS in Europe is essential to realise lower costs for CO_2 transport and CO_2 storage. Both these activities benefit greatly from increased scale. The development of CO_2 transport networks, transport hubs and CO_2 storage complexes have the greatest impact on reducing costs. As such the cost of the CCS value chain will very much be contingent on EU action to incentivise timely and planned deployment. Cost reductions will not be realised until there is EU activity in these sectors.

C5. One of the key objectives of the CCS Directive is to help expand the understanding of the technology and improve public acceptance of the technology. Do you think the CCS Directive has helped improve public acceptance of CCS? *[Yes, No, Don't know]*

No.

Comment

The Directive considers CO_2 storage as a hazardous activity and as such has approached it with contingency. Public acceptance is based on trust and belief in the necessity of the technology, neither of which has been increased by the Directive. The EU, along with some Member States, has inconsistently communicated the need for CCS to the public. This has been detrimental to the public support for a necessary climate technology.

C6. Do you think the EU legal framework for CCS helped remove legal barriers to CCS deployment in the EU? *[Yes, No, Don't know]*

Yes.

Comment

The CCS Directive has helped to address legal barriers, such as those associated with the OSPAR Convention, and has put in place the legal framework to enable CCS deployment in the EU. That said, there is no doubt that barriers still remain, for example, those around the Transfer of Responsibility and financial mechanism resulting from the CCS Directive (see Section E).

Additionally and not a direct comment on the CO_2 Storage Directive. Member States such as Germany and Poland have transposed the directive in such a way to increase legal barriers to CCS deployment.

C7. Have any other legal barriers been identified via project experience that were not apparent when the Directive was prepared? *[Yes, No, Don't know]*

Yes.

Comment

One of the legal barriers that was identified in the UK was with respect to the transfer of decommissioning liability from the hydrocarbon licensees to the carbon storage licensees. This was resolved at the MS level. No other legal barriers that apply at the EU level have been identified.

C8. Do you think that the CCS Directive could do more to support an increase in the number of storage permits? *[Yes, No, Don't know]*

Yes.

C9. Are you aware of the regulatory approach to CCS in other parts of the world?

Yes.

C10. How do you think progress on the uptake of CCS technology in Europe compares with the rest of the world? *[Similar progress, Europe is leading, Europe is a little behind, Europe is well behind, Don't know]*

Europe is well behind.

C11. Do you think this position will influence the ability of Europe to export CCS technology in the future? *[Improves prospect, No influence, Reduces prospect, Don't know]*

Reduces prospect.

Comment

The failure the NER300 and other demonstration incentives have left many barriers to commercial CCS deployment unaddressed. The absence of full-scale integrated CCS demonstrations will have significant long term repercussions on the development of CCS in Europe, retarding the development of indigenous CCS service providers, jeopardising the timeline for commercial deployment and subsequently reducing the technologies' ability to contribute to CO_2 emissions reductions.

As the timeline for commercial CCS deployment becomes more remote, so too do the learning benefits of hosting a demonstration to the operator. The poor market outlook for CCS equipment and services providers – an essential constituent of the future CCS industry – also increases the opportunity cost of their investments into R&D. To date valuable work has been achieved on CCS that has generated a significant body of research on topics such as the development of advanced CO_2 storage sites characterisation and monitoring methods, along with front-end engineering and design studies. The delay in furnishing an effective policy framework for CCS will result in the costly dissolution of acquired knowledge and skills.

Without successful implementation of demonstration projects, Europe will, however, continue to fall behind the rest of the world on CCS and this will reduce prospects for exporting CCS learning (particularly around capture technology). In order to change this trajectory, there is an urgent need for policies to be developed to support the development and implementation of CCS demonstration.

D. CAPTURE AND TRANSPORT

These questions relate to capture and transport specific issues of the Directive.

D1. What is your view on the following statements on CO_2 acceptance criteria and procedures from Article 15 of the Directive? *[Agree, Disagree, Don't know]*

The criteria are not strict enough and need to be tightened.

Disagree.

The criteria strike a good balance and are ok.

Agree.

The criteria are too rigid and could be important constraints on CCS take up.

Disagree.

The criteria need to be adjusted to allow for greater variability and acceptance of certain additional substances.

Disagree.

Comment

The criteria allow Member States to develop country-specific approaches and solutions, and it is vital that this flexibility is retained.

The spirit of Article 12 is to avoid using the carbon sequestration stream for other waste disposal whilst preventing to set conditions which would make CCS unnecessarily expensive. It is Bellona's opinion that the wording of Article 12 reflects this whilst also allowing for flexibility, when required, by the geology of the storage complex.

D2. Under the current CCS framework, the operator of the capture installation gains the emissions trading benefit (by not having to surrender emission allowances). This means there is no direct emissions trading benefit to the CO_2 transporter and storage operators. Is this arrangement causing (or could it cause in the future) problems for developing CCS project business cases? *[Yes, No, Don't know]*

Yes.

Comment

If the CO_2 market was functional, and provided a sufficient and reliable price signal for investment this needs not be a problem. If the cost for CO_2 storage is lower than the cost for emissions than transport and storage operators will be able to recover their capex and opex with an acceptable rate-of-return.

At present Europe contains little CCS infrastructure. CCS operators will be required to commit large upfront investment in order to roll-out the transport and storage facilities for emitters to use. Such investments will require policy makers to ensure a high level of certainty in the future deployment trajectory of CCS.

D3. Do you think the Directive (Article 33) adequately supports the future implementation of 'capture ready' plants in a harmonised way across Europe, e.g. fossil fuel power plants built when the assurance of a future proven CCS retrofit option? *[Yes, No, Don't know]*

No.

Comment

The combination of these three Directives is sufficient to regulate CO_2 capture from a health and safety and environmental perspective. There is, however, a need to detail and strengthen the 'CCS-readiness' provisions of Directive 2001/80/EC (Article 33) in order to further encourage the deployment of CCS.

CCS-Readiness (CCS-R) is intended to make clear to companies building thermal generation plants now that grandfathering will not apply to them. They are knowingly constructing plants that will be commercially and operationally affected by CO_2 limiting legislation, be that the increasing price of EUA or other measures. It is important that CCS-R provides a clear signal that investment decisions should fully reflect the eventual necessity to install CCS at thermal generation plant. A failure of thermal power plant operators to fully implement CCS-R will result in investments in potentially future stranded assets.

It would be useful to clarify the following points:

- Authorities need further clarity what is required to fulfil the conditions set to availability of storage, the feasibility to establish transport and the requirements to capture readiness.
- If the conditions to CCS readiness are not met, it should be clarified that the competent authorityshall not grant the power plant an operating license.
- Authorities should more rigorously enforce the existing CCS-R requirements, using tools such as litigation provided by the CO_2 storage Directive.

The Bellona report "CCS readiness at Šoštanj: Ticking boxes or preparing for the future?" describes the existing failings in implementation of CCS-R[5].

D4. In light of the slow progress of CCS demonstration in Europe, do you think is it needed, practicable and justifiable to establish mandatory Emission Performance Standard (EPS) requirements for fossil fuel power plants? *[Yes, No, Don't know]*

Yes.

Comment

An EPS sets a clear and unambiguous framework for what form and method of thermal generation investment is feasible. An EPS sets a clear signal for investors, operators and technology vendors. At present no EU wide legislation or sufficient CO_2 price signal exist to dissuade investment or reinvestment in CO_2 intensive generation capacity. Under the existing framework of a generally unenforced CO_2capture ready requirement and a poor outlook for the CO_2 price, investments in CO_2-intensive generation capacity are little affected by EU climate policy. This is resulting in investments now leading to carbon lock- in and eventually costly stranded assets.

[5]<http://bellona.org/publication/ccs-readiness-sostanj-ticking-boxes-preparing-future>

Bellona in partnership with twelve prominent European environmental NGOs support the rapid application of an EU wide EPS[6].

- In every economy-wide decarbonisation study, early decarbonisation of electricity supply is the linchpin for cost effective cross-sector decarbonisation.

- The ETS will likely not provide a sufficient price signal in the near term, failing to prevent the construction of new high-carbon assets, which will put pressure on the carbon price later: the worst of both worlds. This may unsettle political support for the ETS, as well as negatively impact European competitiveness. An EPS provides an earlier, more stable, signal - smoothing the ETS price trajectory.

- None of the proposed reforms to the EU ETS right now would be sufficient to ensure a complete shift away from coal and lignite. The International Energy Agency has explicitly stated that non-price measures are required in tandem with a CO_2 price.

- An EPS would not replace the carbon price but would complement it by providing a safeguard that encourages investment flows only to energy resources that can contribute to achieving EU decarbonisation objectives.

- The coal and lignite power plants being built today have a lifetime of at least 40 years. CO_2 capture readiness requirements are a cosmetic measure that will not prevent coal emissions.

- An EPS for existing plants should also be introduced. This could be done in line with existing timetables under the Industrial Emissions Directive, allowing newer, more efficient and flexible plants to operate for a limited timeframe, but removing older, inefficient and inflexible plants from the system.

In the EU the UK already has an EPS in place for thermal electricity generation at (450 g CO_2/kWh), while the European Bank for Reconstruction and Development also applies an EPS to its investment decisions.

Internationally emissions performance standards have been implemented to help promote CCS deployment in both Canada and the United States. In 2012 the Canadian government finalised performance standards affecting coal electricity generation. All new coal facilities post-2015 and existing facilities over 50 years will be mandated to reduce CO_2 emissions to the level of Combined Cycle Gas Turbine (CCGT) (420kg/MWh),

[6] EPS Coalition position paper <http://bellona.org/assets/sites/6/Emissions-Performance-Standard-%E2%80%93-a-key-to-countering-the-EU%E2%80%99s-coal-addiction.pdf>

requiring the application of CCS. This EPS was a critical policy in the delivering the Boundary Dam CCS facility in Saskatchewan Canada (as the Canadian EPS is retroactive – applying to plant 50 years old). This CCS facility was retrofitted to an existing lignite fired plant that would otherwise have been forced to retire. The Canadian EPS has also resulted in the Thunder Bay generating station in Ontario to be converted from coal to biomass.

D5. Do you think that mandatory EPS runs the risk of having conflicting objectives with emissions trading, which could in turn have negative consequences for CCS? *[Yes, No, Don't know]*

No.

Comment

The Emissions Trading System (even with significant and effective reform) is not likely to incentivise the timely deployment of CCS necessary to reach EU 2050 climate abatement targets. Therefore, no negative conflicts are likely to arise in respect to CCS deployment. An EPS provides a much more effective and tangible signal to investors. It should be noted the Large Combustion Plant Directive (LCPD) has been successful in mandating the reduction of SO_2 and NOx emissions.

D6. When do you think EPS should become mandatory for new large combustion electricity generating plants? *[As soon as possible, From 2020, From 2025, From 2030, Should not be mandatory, Don't know]*

As soon as possible.

Comment

Due to the insufficient price signal from the ETS and a poor outlook due to continued oversupply of allowances, CO_2 intensive generation such as coal and lignite facilities are being planned or refitted around Europe now. The continued operation of such facilities or investment in new plants is not compatible with the EU climate goals.

An emissions performance standard (EPS) should therefore apply, with immediate effect to all new generation capacity to ensure that new investment is compatible with medium and long term carbon reduction goals.

An EPS should not grandfather existing plants. It is necessary for an EPS to apply to existing plants to avoid perverse incentives that would support the continued operation of old and inefficient plants.

D6.1. What could be a practical level of EPS (in g CO_2 / kWh)? *[<300, 300, 350, 400, 450, 500, >500]*

<300

An EPS trajectory would provide investors with much greater market foresight and investor confidence about when carbon intensive generation will need to shut down, reduce operating hours or be fitted with CCS technology. This greater certainty would not only reduce the risk of stranded assets but would also drive the development of CCS supply chains. It is important therefore that an EPS design be aligned with interim power sector decarbonisation targets reducing over time toward the near total decarbonisation goal for the power sector in 2050, in accordance with the European Commission's 2050 Energy Roadmap. An EPS trajectory that ratchets down over time in alignment with the sector's decarbonisation strategy can be determined through modelling. A long term EPS trajectory will give investors more certainty about whether a plant can fully recover fixed costs before CCS is required to be fitted, whether or not it will be economically viable to fit a plant with CCS or whether it will be more profitable to invest in alternatives.

The Zero Emissions Platform (ZEP) in co-operation with the Norwegian University of Science and Technology (NTNU) produced a report that modelled the effect of an EPS on generation capacity deployment throughout Europe to 2050[7]. Even with an EPS modelled as a simple non flexible instrument (e.g. no averaging of annual emissions) the EPS proved effective in deployment of CCS and most critically in reducing emissions. The modelling shows that an EPS set below 300g/kWh rapidly advances CCS deployment and prevents the construction of unabated coal or gas fired plants.

"The modelling shows that an EPS at 225g/kWh in 2030 disincentives gas without CCS. In the short term, it results in a shift to increased wind, nuclear and solar in 2020. By 2025, it already advances CCS on lignite coal and gas. Beyond 2030, the modelling shows a wider deployment of CCS on new-build coal and all gas plants which would result in greater CO2 reductions in 2050."

"Sensitivity cases with the EPS made effective from 2015 produced a very similar result to the case where it is effective from 2030."

E. STORAGE

[7] http://www.zeroemissionsplatform.eu/library/publication/240-me2.html

These questions cover progress and scope of the aspects of the Directive specifically related to CO_2 storage.

E1. One of the original objectives of setting up the EU regulatory framework for CCS, was to ensure that this novel technology would be deployed in an environmentally safe way (Recital 9 of the CCS Directive). What is your view, on the following statements on whether geological storage of CO2 leads to permanent containment of CO_2 in such a way as to prevent and reduce as far as possible negative effects on environment and human health, and any resulting risks for environmental and human safety? *[Agree, Disagree, Don't know]*

There is a lack of consensus on the definition of "permanent" containment of CO_2

Disagree.

Comment

The main evidence to confirm that geological storage is a safe technology comes from relevant analogue subsurface industrial activities. This includes almost 100 years of natural gas storage, more than 35 years of experience with CO_2 enhanced oil recovery (EOR), and more than 15 years of experience at dedicated CCS projects in the North Sea. This is further demonstrated by a number of pilot injection demonstration projects that have been carried out at several sites around the world since even before the CCS Directive was adopted.

Demonstration projects within the EU are still necessary for project developers in order to become acquainted with the process of site selection, licensing, monitoring operation, closure and post-closure activity under a clearly defined regulatory regime.

The term 'permanent' should be replaced by a number of years like 500 or 1000 years

Disagree.

The Directive should make a distinction between the risk of minor leakage and major leakage

Agree.

Comment

The Directive does not need to make this distinction explicit but there needs to be room for Member States to allow for differentiation. This will be apparent for example in the mitigation-action plan where different scenarios of seepage to full blowout, require different mitigation actions. Insignificant seepage which does not have significant negative impacts on the local or global environment should therefore be treated differently than a major leakage, and should not become an unnecessary barrier to transfer of responsibility.

Other?

-Blank-

E2. Article 18 of the CCS Directive relates to the transfer of responsibility for a storage site. *[Yes, No, Don't know]*

Do you think the criteria for the transfer of responsibility are sufficiently well defined?

Yes.

Do you think the criteria laid down under Article 18 effectively address the transfer of responsibility of a storage site?

No.

Comment

The EU subsidiarity principle should be used to define criteria for transfer of responsibility. Where national authorities have the experience and competence Member States should be able to define the the post closure period.

Are the criteria established for the transfer of responsibility workable, given the current level of knowledge on the performance of underground storage projects?

Yes.

Comment

The criteria included in the Directive are workable in instances where the competent authority at Member State level take a pragmatic and facilitative approach to implementation of the Directive.

Are the recommended default periods for the post-closure pre-transfer phase and for the absence of significant irregularities practicable?

No.

Comment

The EU subsidiarity principle should be used to define periods for the post-closure pre-transfer phase. Where national authorities have the experience and competence Member States should be able to define the post closure period.

Given that no CCS site has yet been transferred, is it possible to highlight any parts of Article 18 that would benefit from a revision – such as the following?

Definition of 'complete and permanent containment'

No.

Definition of 'minimum period'

Yes.

Contents of the transfer report

No.

Other?

Article 18.7

E3. Do you have any experience of the application procedures for approving exploration permits for storage sites? *[Yes, No, Don't know]*

No.

E4. Are there any challenges associated with the application procedures for approving exploration permits for storage sites? *[Yes, No, Don't know]*

Yes.

E5. Do you have any experience of the application procedures for approving storage permits for storage sites? *[Yes, No, Don't know]*

Yes.

If yes, how would you rate the ease of application for a storage site?

There has only been one storage permit approved so far in the EU through the ROAD project in the Netherlands. National Grid, in the UK, is currently in the process of applying for the second storage permit for the White Rose project. This will be the first saline formation CO_2 storage permit in the EU. Experience from the UK suggests that the UK regulator and European Commission could work more closely to ease the application process. There also seems to be a lack of experience sharing on behalf of the Commission and its approval of the first permit (ROAD).

E6. Are there any challenges associated with the application procedures for approving storage permits for storage sites? *[Yes, No, Don't know]*

Don't know.

If yes, how could these challenges be addressed?

There is a need for greater and earlier coordination between the Member State competent authority, the applicant and the European Commission in order to facilitate information sharing and to ensure that all parties learn from the experiences of previous applications (successful or unsuccessful).

The application process more generally should become easier as FOAK issues are addressed and precedents set; this will be to the benefit of all parties involved in the permitting procedure. In the meantime, greater information sharing, including making applications available in more than one language (the ROAD permit is currently only available in full in Dutch), would help applicants to better identify and address challenges.

E7. What is your view of using the criteria for the characterisation and assessment of the potential storage complex and surrounding area referred to in Article 4(3) and as outlined in Annex I of the CCS Directive? *[Strongly agree, Agree, Neutral, Disagree, Strongly disagree, Don't know]*

The criteria are not strict enough and should be tightened.

Disagree.

The criteria strike a good balance and are ok.

Agree.

The criteria are too rigid and could be an important constraint on CCS take up.

Neutral.

The criteria need to be adjusted to allow for them to be practically enforceable.

Agree.

Other? [free text]

-Blank-

E8. What is your view on the following statements relating to the criteria for establishing and updating the monitoring plan referred to in Article 13(2) and for post-closure monitoring plans pursuant to Annex II of the CCS Directive? *[Strongly agree, Agree, Neutral, Disagree, Strongly disagree, Don't know]*

The criteria are not strict enough and should be tightened.

Disagree.

The criteria strike a good balance and are ok.

Agree.

The criteria are too rigid and could be an important constraint on CCS take up.

Disagree.

The criteria need to be adjusted to allow for them to be practically enforceable.

Disagree.

Other? [free text]

-Blank-

E9. In the last five years (since the entry into force of the CCS Directive), how well do you think knowledge has progressed on the following CO_2 storage issues? *[Very good progress (world class), Some progress, Minor progress, No progress (since 2009), Don't know]*

Data collection

Some progress.

Three dimensional static geological earth models

Very good progress (world class).

Characterisation of the storage dynamic behavior

Very good progress (world class).

Sensitivity analysis

Very good progress (world class).

Risk assessment methodologies

Very good progress (world class).

Monitoring technology

Some progress.

Corrective measures

Some progress.

Other? [free text]

-Blank-

E10. What is your view on the following statements relating to the provisions on the financial security and financial mechanism for the storage sites (Articles 19 and 20 of the CCS Directive)? *[Strongly agree, Agree, Neutral, Disagree, Strongly disagree, Don't know]*

The provisions are not strict enough and should be tightened.

Disagree.

The provisions strike a good balance and are ok.

Agree.

The provisions are too rigid and could be an important constraint on CCS take up.

Neutral.

The provisions need to be adjusted to allow for them to be practically enforceable.

Agree.

Other? [free text]

-Blank-

E11. Which areas of the environmental risk management framework for CO_2 storage as set out in the CCS Directive do you think need to be revised? *[Yes, No, Don't know]*

The threshold of 100kT for R&D projects

No.

Risk assessment provisions

No.

Monitoring provisions

No.

Corrective measure provisions

No.

Transfer criteria

Yes.

If yes, what revision would you propose?

Financial Security (FS) ensures that adequate provisions are established to cover the operator's obligations throughout the life cycle of a CO_2 storage site. Specifically the FS ensures that pre-closure, closure and post-closure obligations can be met. This includes obligations arising from the inclusion of CO_2 storage sites into the EU ETS Directive and the obligation under the CCS Directive to take corrective measures in case of seepage or significant irregularities.

The Commission's Guidance Document 4 on FS expresses a preference for a highly liquid FS to be established for each of the obligations before the storage operations commence. The FS has to be updated to take operational and financial changes into consideration. Such as an increase in injected volumes or increase in the price of allowances.

This may potentially and unnecessarily increase the costs of storage operations. It will be challenging to fund the FS costs over a very long period from a relatively

limited revenue stream likely to be received by storage providers. This could dissuade investment in CO_2 storage capacity, limiting the deployment of CCS in Europe.

Additionally few commercial organisations can accept the potentially unlimited liability associated with an unlikely event such as a large geological leak of CO_2. This is because the FS and liability are not linked and so do not limit the storage provider's or investor's potential financial exposure.

The cost of the FS and the uncertainty over the size of the liability act as a disincentive to prospective CO_2 storage operators to invest in CO_2 storage facilities and represents a significant barrier to the deployment of CCS in Europe.

Member states should be free to implement what level of FS is suitable on a project by project basis, taking into account local geologic conditions and experience.

Reporting provisions

No.

Post closure provisions

Yes.

If yes, what revision would you propose?

The CCS Directive requires the operator to retain the responsibility and liability for a storage site until the Transfer of Responsibility of that storage back to the competent authority (Article 18). To enable the Transfer of Responsibility to occur the operator must satisfy a number of requirements including;

- Evidence showing that the stored CO_2 will be completely and permanently contained.
- A minimum period of 20 years has elapsed. The competent authority can permit a shorter period if they are convinced that evidence of permanent containment has been demonstrated.
- A financial obligation to cover the cost of monitoring for at least a period of 30 years after responsibility is transferred.

Member states should be free to implement minimum period for transfer of responsibility, taking into account national expertise, local geologic conditions and experience with CO_2 storage projects. Transfer of responsibility should be solely based on the performance-based test of permanent storage. The monitoring plan, when accepted by the competent authority, should be sufficient to deliver all available evidence.

Other?

-Blank-

E12. In light of the growing amount of knowledge and data on capacity estimates for CO_2 storage in Europe and need for understanding the CCS upscaling potential, do you think there is a need to establish an improved EU atlas of storage capacity of CO_2 across Europe? ***[Yes, No, Don't know]***

Yes.

Comment / justification

The provision of secure and accessible CO_2 storage capacity in key European regions would greatly reduce uncertainty for future CCS investments, while providing an anchor for shared infrastructure and CO_2 capture facility development. The use of public resources to selectively characterise and bank more than one CO_2 storage complex maximises the skills developed while enabling the provision of frontloaded storage capacity for initial capture and transport infrastructure.

E13. Guidance Document no 1 on the Storage Directive defines risk management as the identification, assessment, and prioritisation of the risks to secure storage, together with the application of resources to prevent, monitor, and correct leakages or significant irregularities throughout the project life cycle. Do you have any experience of the risk management framework for CO_2 storage operators (e.g. via demonstration projects – as an operator or competent authority)? ***[Yes, No, Don't know]***

If yes did you find the framework legally practicable?

Don't know.

Has the interaction between competent authorities and operators worked well?

Don't know.

E14. Are you aware that a procedure is in place for the Commission to review of draft storage permits (Article 10)? *[Yes, No, Don't know]*

Yes.

If yes - do you believe that this review can be effective in fostering a uniform implementation of the requirements of the Directive across the Community?

The Commission must ensure that when a review is undertaken adequate in-house capacity is available. Due to the absence of full scale CCS demonstrations in Europe, there is still little experience with CO_2 storage in Europe and it may be appropriate to maintain a review of draft storage permits and decision on transfer of responsibility in order to ensure a consistent application of the Directive across the EU, increase confidence in the safety and security of the storage sites and build public confidence in the technology.

E15. Do you believe that this procedure can help enhance public confidence in CCS?

Don't know.

Comment

Arguably, if the Commission's review of storage permits can increase the deployment of CCS, then there is potential that it can enhance public confidence. Real world projects are necessary to build public support in a technology.

FINAL QUESTION

Do you have any other comments on the CCS Directive which you have not been able to express in this questionnaire? Please be as brief and specific as possible. *[Free text]* *(Specify word limit – 1 side A4, about 500 words)*

Policies to actively facilitate deployment is the central requirement of CCS development in Europe.

There exists a single primary cause for the slow progress of CCS in Europe: lack of or lack of anticipation of any legislative driver to develop, deploy or operate a CCS facility. The price signal set from the EU's Emission Trading System (ETS) is currently and will continue to be insufficient to affect the operational economics of fossil fuel electricity generators for years to come. Thus at

present the deployment of CCS as a technology has no commercial basis in Europe, as unabated and polluting solutions continue to be rewarded by market conditions and the extant policy framework. If CCS is to be deployed in Europe in line with the 2050 energy roadmap this greater policy failure needs to be addressed.

An energy and industrial framework to enable the deployment of CCS is necessary to develop skills, expertise, infrastructure and CO_2 storage capacity to ensure the rapid growth in CCS deployment that is envisioned post-2030. A failure to build the foundations of a CCS industry in Europe now will greatly increase cost and potentially retard CCS deployment in the future – with adverse results for EU climate, industrial and energy policy.

Alongside this review process attention therefore needs to be paid to delivering CCS projects and Bellona continues to address this in relation to, amongst others, the 2030 framework and ETS reform. Bellona encourages a number of support measures and political mechanisms to spur CCS development in Europe: A CO_2 price ramp driven by a tighter ETS cap, public grants to subsidise capital and operating costs as well as a mix of feed-in-tariffs/premia, CCS certificates and a strict Emission Performance Standard (EPS). Redesign of the electricity market would also be necessary.

Experience with incentives for applying CCS on installations combusting biomass (Bio-CCS)

Bio-CCS is the only technology currently available that can remove large amounts of CO2 from the atmosphere, providing carbon negative solutions. The combination of sustainable biomass and CCS is the only currently available technology that can generate 'negative emissions' on scale. The IPCC fifth assessment report highlighted the need for Bio-CCS and carbon negative solutions; however at present there is no EU policy instrument that incentivises negative emissions. If the climate benefits of carbon negative solutions are to be realised, EU and MS policies instruments will need to be developed and enacted. One potential reform could be that the EU ETS Directive be revised to incentivise the use of biomass and CCS in power plants and industrial applications**.**

Ratification of the London Protocol amendment to Article 6 to allow cross border sea transportation of CO2 for sub-seabed storage.

There is an urgent need for ratification of the London Protocol amendment to Article 6 to allow for the cross-border transportation of CO2 for the purposes of sub-seabed storage. Firstly this is critical in enabling ship transport of CO2 for injection testing and characterisation of offshore CO2 storage capacity. The use of shipping allows for a single CO2 source to be used in the

provision of large volumes of bankable CO2 storage capacity. The amendment is also critical for member states that lack sufficient storage capacity or are unable to store onshore within their own territories due to public or political concerns.