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GLOBAL CCS INSTITUTE SUBMISSION TO:

**THE EUROPEAN COMMISSION'S CONSULTATIVE  
COMMUNICATION ON THE FUTURE OF CARBON  
CAPTURE  
AND STORAGE IN EUROPE**

**July 2013**

This submission is made on behalf of the Global Carbon Capture and Storage (CCS) Institute in response to the European Commission's *Consultative Communication on the Future of Carbon Capture and Storage in Europe*.

The Global CCS Institute is an independent, not-for-profit company registered under the (Australian) *Corporations Act 2001* (Cth). It seeks to accelerate the development, demonstration and deployment of CCS globally through knowledge sharing activities; fact-based influential advice and advocacy; and work to create favourable conditions to implement CCS.

The Institute has around 370 Members from more than 40 countries, and offices in Australia, China, France, Japan and the United States. The Institute's diverse membership, which includes national governments, global corporations, small companies, environmental non-government organisations, research bodies and universities, covers more than 80 per cent of the world's carbon dioxide emissions from energy and industrial sources.

The comments contained in this submission are independent to the Institute, and do not necessarily represent the collective views of the Institute's membership; nor do they pre-empt the decisions of Members on any related matter.

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# Contents

Executive summary .....	4
Introduction .....	6
What the European Commission is seeking .....	6
Latest status of CCS in Europe.....	7
Funding commitments within the European Union .....	8
Restructuring the Emissions Trading Scheme .....	10
Permitting challenges.....	11
Who should pay for demonstration activities .....	12
Other activities to underpin demonstration activities.....	13
References.....	14

## Executive summary

Under the *Energy Roadmap 2050*, the European Commission (EC) envisions the broad scale deployment of carbon capture and storage (CCS) technologies in Europe from 2030 onwards. However, in response to challenges in successfully establishing any large-scale demonstration projects in the European Union (EU), the EC has released a *Consultative Communication* (the *Consultation*) seeking advice on how to reinvigorate the CCS demonstration program, with a view to achieving earlier deployment of CCS.

The Global Carbon Capture and Storage Institute (the Institute) considers CCS to be the single most promising set of technologies capable of bridging the dual objectives of cost effective large-scale abatement and security of supply in a carbon constrained environment. The Institute acknowledges challenges will arise in undertaking initial commercial-scale demonstration activities for such a transformational clean energy solution, particularly with regard to permitting the initial projects as well as bringing the local community along with the project.

It is important to recognise that, to a very large extent, the proposals examined in the *Consultation* will take effect in the medium to long term. While long-term signals are important in giving visibility to project proponents, there is an urgent need to address the short-term funding issues (both CAPEX and OPEX) facing projects here and now.

It is clear that the way CCS is currently promoted in Europe needs enhancing and the Institute agrees with the EC assessment that the 'available funding is not sufficient' to support an effective demonstration program. This submission explains the Institute's preferred approach to supporting CCS in Europe and makes the following recommendations:

### *Funding commitments with the European Union*

The EC and the Member States should:

- identify the suite of CCS projects necessary to provide sufficient knowledge creation for CCS technology development, cost reductions and identification of workforce requirements to support decarbonisation of the energy sector (and, in the long run, the industrial sector), including the deployment of CCS by 2030, if not earlier.
  - This may be enhanced through the use of national roadmaps or energy strategies.
- identify the quantum of funding necessary to support the demonstration program above and beyond the support provided by the EU Emissions Trading System (ETS).
  - The required level of funding should, at a minimum, reflect earlier commitments.

### *Restructuring the ETS*

- improve the design and operation of the EU ETS by drawing upon past experiences and lessons learnt from other market-based pollution reduction schemes. This will reduce the costs of achieving abatement targets and enhance the role of the ETS in supporting technology innovation and development.

### *Permitting challenges*

- in analysing the CCS Directive, the EC consider how increasing the flexibility of permitting requirements may lower certain barriers to CCS projects.
- consider how to appropriately manage the liabilities arising from an accidental release of CO<sub>2</sub> identified in the methodology developed by Industrial Economics. The case study used to explore the methodology demonstrates that managing all liabilities effectively, including climate liability, is unlikely to impede the development of a CCS project.

*Should fossil fuel owners be required to contribute to CCS demonstration activities?*

- That consideration be given to assessing the extent to which fossil fuel resource owners in the EU may receive net economic benefits as a result of the deployment of CCS together with the extent to which economic welfare is improved through coordinating a scheme that raises additional funds to support CCS research, development and demonstration activities from the owners of fossil fuel resources.

Noting that the *Consultation* is not intended to be a comprehensive consideration of all relevant issues to address the prime challenge of re-invigorating near-term investment, the Institute makes the following suggestions in support of a robust CCS demonstration process:

- strengthen the legal provisions to remove any unreasonable barrier to the integration of CCS in the EU energy system—this could include permitting arrangements for CCS assets and common-user infrastructure and conditions for the transboundary movement of CO<sub>2</sub>.
- formally embed a definition of CCS Ready requirements in the CCS Directive (as currently exists in the EU ETS Guidelines).
- ensure that if expectations of a high enough CO<sub>2</sub> price threshold are not (or cannot) be reached under the EU ETS over the medium term, other sufficient market incentives exist to enable CCS to be deployed in a timely manner (for example, operational support to allow projects to compete in wholesale electricity markets).
- ensure Member State transposition of the CCS Directive and encourage ratification of the Article 6 Amendment to the London Protocol to provide for the transboundary movement of CO<sub>2</sub>.
- promote energy and climate change ‘literacy’ to the broader community, communicate the need for CCS in future low-carbon development strategies, and clarify the technical risks and uncertainties specific to health, safety and environmental issues.
  - The operation of several demonstration projects will be central to establishing a positive perception and understanding of CCS.
- continue to promote the exchange of CCS best practice through the EU CCS Network, the Global CCS Institute and the International Organization for Standardization Technical Committee (ISO/TC265).
- ensure that, overall, new EU, national and sectoral measures do not fragment or undermine the efficiency of the EU ETS or establish a less than level playing field across the portfolio of complementary low-carbon technologies.

## Introduction

The Global Carbon Capture and Storage (CCS) Institute (the Institute) considers CCS to be the single most promising set of technologies capable of bridging the dual objectives of cost effective large-scale abatement and security of supply in a carbon constrained environment

The Institute is well placed to offer expert views to the European Commission's (EC) *Consultative Communication on the Future of Carbon Capture and Storage in Europe* (the *Consultation*). The Institute is fully aware of all CCS and related activities in Europe and is actively engaged in such activities. The Institute also has the benefit of a global reach into CCS policy and regulatory developments, and access to project experiences more broadly, which provides for comparative assessments of the current European situation.

By enabling regional expertise to lead on localised matters, and drawing on and leveraging its global presence, the Institute is strongly positioned to service the needs of key stakeholders such as the EC. An example of the Institute's commitment to facilitating CCS projects in Europe is its management of the European CCS Demonstration Project Network. The Network aims to further internationalise knowledge by helping develop skills and expertise through the deployment of a small number of first generation CCS projects.

As a legal not-for-profit entity, the Institute brings together the public and private sectors to build and share the know-how and expertise necessary to ensure that CCS can significantly reduce the world's greenhouse gas emissions. The Institute also connects parties around the world to solve problems, address issues and learn from each other. It accelerates the deployment of CCS projects by:

- sharing knowledge (collecting information to create a central repository for CCS knowledge, and creating and sharing information to fill knowledge gaps and build capacity)
- fact-based advocacy (informing and shaping domestic and international low-carbon energy policies, and increasing the awareness of the benefits of CCS and the role it plays within a portfolio of low-carbon technologies)
- assisting projects (tackling specific barriers, particularly among early movers, and bridging knowledge gaps between demonstration efforts).

## What the European Commission is seeking

The *Consultation* notes that:

*It is important that CCS deployment is adequately prepared by a robust demonstration process. Policy options therefore need to be taken into consideration in order to enable as soon as possible large-scale demonstration with a view on further deployment and rollout.*

The *Consultation* seeks advice on the best policy framework to ensure that the demonstration and further deployment of CCS, if proven commercially and technically viable, takes place without further delay.

The EC notes that CCS is at a 'crossroad', implying that CCS may be reaching a critical threshold point in its development in the EU. Further, the Consultation states that delays in the development of CCS will 'likely lead to greater costs for decarbonising the electricity sector in the longer term' and that 'CCS is ... necessary ... in industries with process emissions that cannot be avoided'. In other words, substantial costs will be incurred in those non-electricity sectors of the EU economies that are large consumers of energy if CCS is not available.

The Institute acknowledges significant challenges will occur in undertaking initial commercial-scale demonstration activities for such a transformational clean energy solution. However, it is clear that the way CCS is currently being promoted in Europe needs enhancing and the available funding is not sufficient to

support an effective demonstration program. Nonetheless, it is worth noting the role the EU has taken in both managing the risks of climate change and supporting CCS.

- The EU is leading the global effort to both curb emissions and address climate change more broadly. It considers, with enthusiasm, ambitious and increasingly stringent emissions reduction targets and has taken on a leadership role in international climate negotiations and developed a range of policy approaches through EC actions.
- The EC has been at the forefront of action to facilitate the commercial deployment of CCS through an array of measures already in place. However, as responsibility for implementation ultimately lies with the Member States, the application of these measures is proceeding at differing rates. This reflects individual country circumstances and political will, resulting in very little progress toward any commercial-scale demonstration over the past four years despite significant effort by all parties.

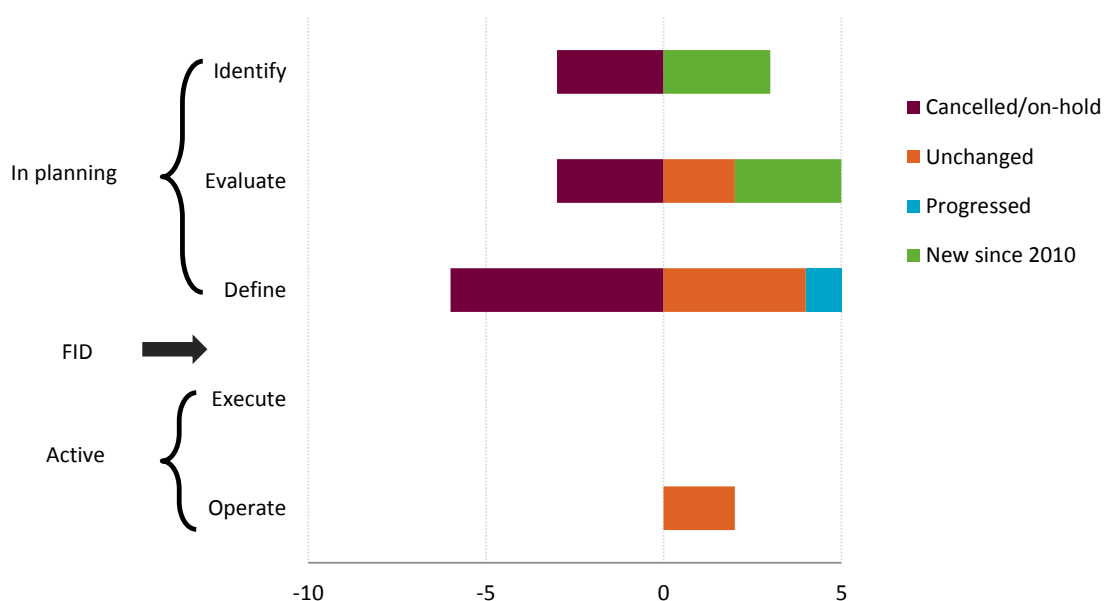
The Institute believes that the ‘business-as-usual’ commercialisation pathway for CCS will likely fail to achieve the EU’s climate change obligations and energy decarbonisation objective. Even an accelerated commercialisation pathway with ambitious policy settings would require significant investments from government and industry, as well as time and consistency in policy frameworks matching the CCS development cycle.

The Institute strongly supports a position of policy parity for CCS with all other clean energy options (including renewable energy), especially in an effort to address the hurdles currently faced by CCS projects in the demonstration and deployment phases.

## Latest status of CCS in Europe

The Institute tracks CCS projects around the world and monitors the progress through the development cycle of each project. Of the 19 projects at various stages of planning in 2010 in the EU, 12 have been cancelled or put on hold and six have not progressed through a development gateway in nearly four years. Over the same period, only one project has progressed to an advanced stage of planning; none has commenced construction or operation (Figure 1).

**Figure 1: How CCS projects have progressed in Europe: comparing 2010 and 2013**



This lack of progress and level of project churn is in stark contrast to the EC commitment, reconfirmed in the *Consultation*, that explicitly re-endorses the importance and urgency of CCS solutions to deliver the EU's low-carbon strategy. This reinforces the challenges to CCS projects in the EU identified in the *Consultation*.

The *Consultation* suggests that the onus to make CCS projects happen rests equally with industry as with governments in realising their share of financial commitment. The EC notes that industry experience from the NER300 to date indicates that as long as the private sector's expectations for strong carbon prices remain low, CCS developments will increasingly depend on material contributions of public funds. This is despite fossil fuel providers and users maintaining a strong interest in the successful development of CCS to reduce the uncertainty of their future economic prospects.

## Funding commitments within the European Union

The imminent challenge is the need to underpin the business case that supports CCS demonstrations through funding arrangements that will complement a longer term policy environment driven by market determined carbon prices. Specifically, funding support for the EU demonstration program must be restored to a level commensurate with the original commitments and decisions by the European Parliament and Member States to avoid substantial costs associated with decarbonising the European energy sector this century.

Given current forecasts for European Union Allowance (EUA) prices, the Institute estimates that the highest amount of funding any single CCS project could receive from the NER300 program is about €290 million.<sup>1</sup> Further, given the rules of the program, the Institute estimates that, at most, two CCS demonstration projects could be funded. This outcome is likely to support only limited progress toward establishing a CCS demonstration project and is well below initial expectations that the program would underpin up to eight demonstration projects.

Issues remain about the competition process itself that will influence whether projects are able to successfully meet the requirements. In the first call, projects were required to be operational by 2015—within three years of the award decision announcement. If such a requirement remains and a CCS project is selected in the second round, it could be required to be operational by 2017. Given the time required for a CCS project to proceed from a decision to commence construction through to operation, this is likely to prove a challenge for many large-scale demonstration projects currently in development in Europe.

In the absence of urgent action by Member States to address the issues previously raised by the EC, including the need for sufficient support for projects within their State, or by the Commission to reassess the policy settings of the NER300, the first round challenges faced by demonstration projects will remain in the second round. In these circumstances, the opportunity to provide CCS demonstration projects with the sound financial foundation necessary for proponents to commit to an investment decision will be significantly impeded.

The value of the EU and Member States' commitment to a functioning CCS demonstration program is a matter for domestic policy deliberations. However, it is worth noting that the United States (US) Government's 'Interagency Working Group on Social Cost of Carbon' recently revised its estimates on the social cost of carbon. The social cost of CO<sub>2</sub>, or SCCO<sub>2</sub>, measures the net present value of the extra damage caused by the emission of an additional tonne of CO<sub>2</sub> today. As such, SCCO<sub>2</sub> provides guidance on the level for explicit or implicit carbon prices that policies should create and to which technology suppliers should respond.

In the Working Group's 2013 report, the estimates from three peer reviewed integrated assessment models are used to provide a range of projections of SCCO<sub>2</sub> under a number of discount rate assumptions. The average value and the 95<sup>th</sup> percentile value from model runs are presented in Table 1. The 95<sup>th</sup> percentile

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<sup>1</sup> This includes the carryover from the first round and accounts for estimated fees from the European Investment Bank for conducting the second round of the NER300 program.



value represents the higher-than-expected economic impacts from climate change as represented in the distribution of the possible costs resulting from CO<sub>2</sub> emissions.

**Table 1: Social Cost of CO<sub>2</sub><sup>1</sup>**

Year	Average €/tonne <sup>2</sup>	95th percentile €/tonne
2015	29	82
2020	32	97
2030	39	119
2040	53	166

1. In 2007 US dollar terms using a 3% discount rate.

2. Converted to € using €0.75/US\$

The key requirement in supporting the demonstration program is revenue certainty. The revenue levels should be guided by expectations of the value of both mitigating carbon emissions in the future and anticipated social spillover benefits derived from a demonstration program. That is, the average values presented in Table 1 (or other estimates of the SCCO<sub>2</sub> considered credible by the EC) should represent the minimum price path necessary to support future revenue requirements of CCS demonstration projects. Considering the risks faced by first movers and the potential spillover benefits to others, it is likely that the appropriate (and economically efficient) implicit carbon price to support demonstration projects is higher than the average presented in Table 1.

In designing a funding program for demonstration projects, the challenge will be to integrate EU ETS carbon price path expectations with anticipated benefits from the demonstration program (lessons learnt and emission reductions) into lump-sum values that share the public and private risks appropriately. There are a number of policy mechanisms that can deliver this value to demonstration projects.

The *Consultation* requests assessment of certain policy mechanisms to underpin the demonstration process to ‘pave the road towards early deployment’. These include CCS certificates, auction recycling, emission performance standards and other policies.

The Institute makes the following brief comments in response to this request.

- To the extent that the EU ETS remains a residual carbon market, given strong policy action on renewable obligations and constrained and uncertain economic growth, mechanisms that rely on revenue recycling are likely to continue to be subject to relatively high levels of price volatility.
- An emissions performance standard could be an important policy to enhance the credibility of EU commitments to decarbonising energy consumption. However, it would not provide direct support to CCS demonstration projects; and it would provide only limited, if any, support to bring forward the early deployment of CCS projects.
- A CCS certificate system is a mandatory CCS program that provides flexibility on the supply side in that specific technological solutions need not be prescribed, and may possibly minimise the funding requirements necessary to a given number of projects. However, given the long timeframe involved in developing a CCS project, the uncertainty of funding availability at the time an investment decision is to be made, may render the policy ineffective.
  - A related program has been implemented in the US. Among the various instruments applied in the US is a production tax credit for CO<sub>2</sub> storage (known as ‘45Q’ tax credits). This is not a mandatory CCS policy, but disposal of CO<sub>2</sub> in secure geological storage that is not used for enhanced hydrocarbon recovery is provided a tax credit of US\$20/tonne. For enhanced hydrocarbon recovery, the tax credit is US\$10/tonne. The total tax credit available is for the storage of 75 million tonnes.

- Project proponents in the US have indicated that the scheme does not support increased debt or equity capital as there is no guarantee that the funding will be available at the time the tax credit is requested, especially given that other producers may also seek the credits. To date, the Institute has not located any public information indicating the allocation of 45Q tax credits to any project.
- The Institute understands that no project based in the US considers revenue from potential 45Q allocations as contributing to any investment decision.

During the past five years, the EU and Member States have indicated a preparedness to provide direct funding support in the order of up to €8 billion across a range of programs. To date, significantly less than €2 billion has been allocated, or even appears to be available, to CCS demonstration projects. The key challenge for the EU and Member States is to devise programs to provide an equivalent (or more) support in a manner that supports project development. The nature of the policy chosen should reflect the ability to provide revenue certainty, with issues about the economic efficiency of increasing the funding for a limited number of demonstration projects a second-order consideration.

### **Recommendation:**

The European Commission and the Member States should:

- identify the suite of CCS projects necessary to provide sufficient knowledge creation for CCS technology development, cost reductions and identification of workforce requirements to support the decarbonisation of the energy sector (and, in the long run, the industrial sector), including the deployment of CCS by 2030, if not earlier.
  - This may be enhanced through the use of national roadmaps or energy strategies.
- identify the quantum of funding necessary to support the demonstration program above and beyond the support provided by the EU ETS.
  - The required level of funding should, at a minimum, reflect earlier commitments.

## **Restructuring the Emissions Trading Scheme**

CCS technologies, like many low-carbon technologies, are characterised by capital-intensive cost structures that have very long economic lives. This applies to both the power and the industrial applications of CCS. Investment in technologies with these characteristics depends, to a significant extent, on two key parameters: long-term expectations of possible future carbon price paths; and the risk profile around those expectations. In turn, these parameters are strongly influenced by the credibility of long-term policy commitments to emission reductions.

The ETS is the cornerstone of long-term emissions reductions in the EU. The EU's commitment to deep reductions in CO<sub>2</sub> emissions over the next 40 years provides some guidance to likely carbon price paths—albeit price paths that may be considerably higher than occur in the rest of the world based on similar commitments arising from the Copenhagen Accord (see for example McKibbin, Morris and Wilcoxon, 2012).

The current inability of CCS demonstration proponents to establish an appropriate 'business case' to justify investment will be influenced by the EUA price volatility, the current low EUA prices, and longer term price expectations that are likely to emerge, in addition to the level of public funding support for CCS.

A key challenge in designing policy to influence long-term expectations is the need for resilience in the policy to manage and survive the effects of external shocks. In a macroeconomic context, the design of the current ETS has some of the positive characteristics of automatic stabilisers in that the price signal driving carbon adjustment falls in response to a slump in total economic demand. However, it is not clear that this characteristic is effectively balanced against the need to maintain credible long-term price expectations to

underpin the rate of change in energy technologies necessary to support the level of energy decarbonisation desired by 2050.

In interviews with European project proponents earlier this year, several noted that the current low, and projected to remain low, EUA prices and ongoing price volatility were affecting the development of a suitable business case that could support a final investment decision. Reducing carbon price volatility may bring forward investments that would otherwise not be made due to the strong incentives to delay investment in the face of carbon price uncertainty. Examples of comments include:

- *The uncertainties related to the evolutions of the carbon price endanger the prospected revenues from auctions. The EC's proposal of intervention on the market during the third period of ETS doesn't give any guarantees that the price will increase or to establish a level of carbon price for ... CCS demonstration projects.*
- *Moneys and subsidies available are not enough to make a CCS project financially viable. It seemed good in 2008/2009, but now with low ETS price the business case is not sound. The current mechanisms did not foresee a highly volatile CO<sub>2</sub> market and the current low prices result in a lower net present value for the project now than four years ago. The latter makes private investments in CCS very difficult.*
- *... the low price of allowances is a barrier in combination with poor design of NER300 ... the CO<sub>2</sub> allowances system is not working properly and there is no incentive in the system to capture CO<sub>2</sub>.*

In pure pollution trading schemes, price volatility and significant uncertainty about future price levels is often a challenge, and managing price volatility is important. Reducing the volatility of carbon prices increases incentives to invest in new technologies as well as in technology innovation over and above those already induced by the market price itself.

There are several mechanisms that can enhance pollution trading schemes, such as price ceilings and floors, variable permit supply in response to market prices, and fixed price models. These are choices for EU decision makers as each has advantages and disadvantages. There is now extensive literature that considers these options, a select list of which is provided in the Reference section at the end of this submission.

With careful design improvements to the ETS policy framework, the cost of achieving emissions reductions in Europe may be reduced while still managing to achieve international linkages to other carbon markets, inter-temporal flexibility and support for the development of financial instruments.

**Recommendation:**

- Improve the design and operation of the EU ETS by drawing upon past experiences and lessons learnt from other market-based pollution reduction schemes. This will reduce the costs of achieving abatement targets and enhance the role of the ETS in supporting technology innovation and development.

## Permitting challenges

A CCS project requires permits at various levels, from plant to transport to injection operations together with the long-term storage of CO<sub>2</sub>. The ROAD project has stated that 'CCS projects face a complex and time consuming permitting process, linked to the provisions of the CCS Directive and the wide range of permitting authorities involved'. (Jonker, 2013)

The EU CCS Directive is the most important piece of legislation with regard to the storage of CO<sub>2</sub>. While the EU analysis of the CCS Directive transposition and implementation will examine a range of issues, the following points can be made (drawing on the Jonker analysis).

- The full permitting requirements in the CCS Directive are not aligned well with the commercial realities of undertaking a final investment decision (FID). The level of detail required in the plans for monitoring, corrective measures and so on, together with the associated resources required to deliver the detailed plans, would not be available until after an FID had been made. As such, increased flexibility in permitting requirements prior to commencement of operation may lower certain barriers to CCS projects.
- Although CCS projects face several legal liabilities that may be 'show stoppers' for projects in the EU, ROAD concluded that the climate liability for storing CO<sub>2</sub> was the main risk for CCS projects.

The Institute, along with a diverse group of organisations from industry, government, and the environmental community, sponsored Industrial Economics (IEc), an expert in environmental economics and natural resource damage assessment, to develop and test a model approach for valuing the economic damages arising from accidental release of CO<sub>2</sub>. IEc was also asked to develop a case study by applying the model to a 'real world' CCS project.

From the study, the sponsor group concluded that the tools do exist to estimate prospective financial damages at CCS projects around the world, drawing on generally accepted practices within the financial and insurance industries. The study provides insights into the magnitude and timing of dollar amounts likely to be at risk and the conditions under which they may be at risk at a well-sited and appropriately managed CCS project.

In 2011, the Government of Alberta commissioned a detailed review of the existing CCS regulatory framework in Alberta and a range of recommendations was provided to it in late 2012. Members of the review steering group have indicated that the IEc study was very influential in formulating recommendations for the management of climate liabilities, including how to value them, how to charge for them and how the joint CCS project climate risks should be managed. Lessons from both the Alberta regulatory assessment and the IEc study may provide guidance to the EC in considering climate liability issues.

**Recommendation:**

- In analysing the CCS Directive, the EC consider how increasing the flexibility of permitting requirements may lower certain barriers to CCS projects.
- Consider how to appropriately manage the liabilities arising from an accidental release of CO<sub>2</sub> identified in the methodology developed by IEc. The case study used to explore the methodology demonstrates that managing all liabilities effectively, including climate liability, is unlikely to impede the development of a CCS project.

## Who should pay for demonstration activities

Firms in the energy supply sector, particularly equipment suppliers, undertake significant research and development (R&D) programs in existing and new technologies, including CCS technologies. Governments also support the R&D efforts of private firms through tax arrangements and other opportunities, as well as funding much of the so-called 'basic research' that occurs in universities. The policy rationale for this funding is the existence of 'spillovers' from research—that is, benefits to society from innovation that cannot be fully captured by those undertaking costly R&D. Investments in innovation generate knowledge that spills over to other firms and users, reducing the returns to innovators and hence the incentives to marshal sufficient resources to fully support innovation in new technologies. This leads to underinvestment in R&D for new technologies and a slower and less efficient path of innovation.

Consequently, governments are provided a rationale to increase the total flow funds to support innovation activities through the use of taxation revenues or concessions. A key challenge in designing policies to support innovation is to encourage private investments that would not otherwise occur and that generate

total returns (private and societal) that are sufficiently positive to exceed the costs associated with the policy measures.

In the absence of policies that effectively address this market failure, the challenge of addressing the risks of climate change would lead to higher total costs to society, particularly if innovation in low-carbon technologies is left solely to incentives associated with pricing carbon through market measures to reduce greenhouse gas emissions. This has been the standard rationale underpinning the provision of government support to CCS demonstration activities.

In a world where there is global, or even partial, policy action that constrains CO<sub>2</sub> emissions, CCS technologies increase the demand for fossil fuels relative to the absence or reduced availability of the technology. To the extent that the increased demand creates, or increases, any economic surplus associated with the production of fossil fuels, this can create an incentive for owners of fossil fuel resources to also contribute to innovation activities for CCS, including demonstration activities. Under the current 2°C scenario to 2050 produced by the International Energy Agency, fossil fuel consumption would be approximately 14 per cent higher as a result of the availability of CCS technologies when compared with scenarios where CCS development does not proceed.

In ensuring sufficient resources are directed to support research and demonstration projects, an issue arises over the extent to which coordinating payments from beneficiaries of research or demonstration outcomes can be improved through government involvement, leading to more efficient outcomes overall. One example of funding by owners of fossil fuel resources is the COAL21 fund established by the Australian Coal Association in 2006. Through a voluntary levy on the production of black coal, the industry aims to raise approximately AU\$1 billion over 10 years. As at April 2013, about AU\$265 million had been committed to demonstration projects as well as a national research program managed by Australian National Low Emissions Coal Research.

As an extractive resource industry, there is also potential to draw on any resource rents generated in the industry without altering either the production or use of fossil coal and gas resources as a potential funding source for innovation activities. At the same time, the changing patterns of resource extraction in anticipation of future changes in consumption patterns, due to both climate change policy and the developments of competing renewable technologies, presents challenges in identifying whether changes to those arrangements will result in improvements to the industry and to the community more generally.

**Recommendation:**

- That consideration be given to assessing the extent to which fossil fuel resource owners in the EU may receive net economic benefits as a result of the deployment of CCS together with the extent to which economic welfare is improved through coordinating a scheme that can raise additional funds to support CCS research, development and demonstration activities from the owners of fossil fuel resources.

## Other activities to underpin demonstration activities

The *Consultation* is not intended to be a comprehensive consideration of all issues that will address the prime challenge of stimulating investment in CCS. Nonetheless, there are policy initiatives that will either reduce the costs of accelerating CCS demonstration activities in Europe or enhance the credibility of EU commitments to long-term policy action to manage the risks of climate change:

- strengthen the legal provisions to remove any unreasonable barrier to the integration of CCS in the EU energy system—this could include permitting arrangements for CCS assets and common-user infrastructure and conditions for the transboundary movement of CO<sub>2</sub>.
- formally embed a definition of CCS Ready requirements in the CCS Directive (as currently exists in the EU ETS Guidelines)

- ensure that if expectations of a high enough CO<sub>2</sub> price threshold are not (or cannot) be reached under the EU ETS over the medium term, other sufficient market incentives exist to enable CCS to be deployed in a timely manner (such as operational support to allow projects to compete in wholesale electricity markets).
- ensure Member State transposition of the CCS Directive and encourage ratification of Article 6 Amendment to the London Protocol to provide for the transboundary movement of CO<sub>2</sub>.
- promote energy and climate change ‘literacy’ to the broader community, communicate the need for CCS in future low-carbon development strategies, and clarify the technical risks and uncertainties specific to health, safety and environmental issues.
  - The operation of several demonstration projects will be central to establishing a positive perception and understanding of CCS.
- continue to promote the exchange of CCS best practice through the EU CCS Network, the Global CCS Institute and the International Organization for Standardization Technical Committee (ISO/TC265).
- ensure that, overall, new EU, national and sectoral measures do not fragment or undermine the efficiency of the EU ETS or establish a less than level playing field across the portfolio of complementary low-carbon technologies.

As these issues are well canvassed and prosecuted in a range of different forums, the Institute provides only a list of the issues without elaboration, but is willing to provide additional information if requested.

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