

2nd International CCS Regulators' Network Meeting 20-21 January 2010

Summary Document

Executive Summary

On the 20-21st of January 2010, the second meeting of the International Energy Agency's (IEA) International CCS Regulators' Network (Network) was held at the IEA offices in Paris, France. The aim of the meeting was to provide an update on the current status of carbon capture and storage (CCS) legal and regulatory development in a number of key CCS regions across the world and to look at how CCS legal and regulatory development can be fast-tracked in the developing world.

From the presentations and discussion during the meeting, it is clear that a lot of progress has been made on the development of CCS legal and regulatory frameworks across the world. Such frameworks are in place in multiple OECD regions, with clear paths outlined for framework implementation in many others. There is however a need to transfer this learning to developing, non-OECD countries as they will be crucial to the deployment of CCS and the meeting of climate change targets. There is currently a lot of interest in CCS amongst most of the key regions of the world, however this interest does need to be converted into concrete progress as soon as possible.

Over the course of the second meeting of the Network, a number of ideas were put forward on how the Network can better address the needs of CCS legal and regulatory development around the world and in particular in these key developing regions.

These ideas included:

- Continuation of the Network's Webinar programme. The programme, which is discussed under 'Background' below, is seen as a good way of reaching key government stakeholders who find it difficult to travel.
- As regional and national initiatives on CCS regulation are completed, the Network and the Webinar process could both be useful tools for the peer review and dissemination of findings.
- The IEA CCS Roadmap outlined the key steps in regulation development. These recommendations could be expanded into a Roadmap that specifically deals with CCS regulation.
- The Model CCS Legal and Regulatory Framework (Model Framework) that builds on existing legal and regulatory frameworks is due for release in April 2010 and will be a very important reference in the development of regulation in developing countries.
- The Model Framework could be enhanced through the testing of the framework in a number of case studies in developing countries.
- It would be very useful if there were a regularly released document presenting the current status of CCS regulatory development in different regions of the world. The Network could facilitate the production of such a document.
- Given the position the IEA holds in the CCS community it could play a key role in coordinating CCS capacity building across multiple areas in close cooperation with other international efforts.

Introduction

On the 20-21st of January 2010, the second meeting of the IEA International CCS Regulators' Network (Network) was held at the IEA offices in Paris, France. The aim of the meeting was to provide an update on the current status of carbon capture and storage (CCS) legal and regulatory development in a number of key CCS regions across the world. Presentations were given by representatives of regions and countries that currently have the most developed frameworks including the EU, UK, Germany, Netherlands, Poland and Norway from Europe, the USA and Canada from North America and also Australia, followed by presentations from key CCS stakeholders, including industry and an environmental NGO.

Presentations were also given by key developing countries including China, Brazil, India, Indonesia and South Africa. Following the presentations and related discussion there was a panel session including all the developing countries who presented as well as the Organisation of Petroleum Exporting Countries (OPEC), the Asian Development Bank (ADB) and Shell, which looked specifically at how CCS legal and regulatory development can be fast-tracked in the developing world.

The purpose of this document is to summarise proceedings at the 2nd International CCS Regulators' Network Meeting.

Background

For a number of years, the IEA has incorporated CCS into its broader energy analysis, including as part of its flagship publications, the World Energy Outlook and Energy Technology Perspectives (ETP). In addition to these broader energy publications, the IEA has also produced a number of CCS specific documents. These include *Prospects for CCS* (2004), *Legal Aspects of Storing CO₂* (2007), *CCS: A Key Abatement Option* (2008) and most recently, the *IEA CCS Roadmap* (2009).

The IEA's main area of input into CCS discussions has been with respect to the legal and regulatory aspects of the technology. This focus led the IEA to the creation of the Network. The Network was launched at the IEA Secretariat in Paris in May 2008 with the objective of providing a neutral forum for CCS regulators/policy makers and other stakeholders to share updates and views. The Network was set up with the support of the University College London – Carbon Capture Legal Programme (UCL – CCLP) and the IEA Greenhouse Gas R&D Programme (IEA GHG). The two entities continue to play a crucial role within the Network.

The Network consists of CCS stakeholders interested in the status and development of CCS legal and regulatory frameworks. Today the Network has over 750 members with 40% being from all levels of government, 40% from industry and the remaining 20% coming from NGO, Academic, Legal, Finance and Media institutions. The Network has members from over 35 countries including 14 developing countries. Network members from developing countries represent around 20% of the total Network membership.

The Network's activities to date have included circulation of major news items, topical web-based seminars (or webinars) and face-to-face meetings. The Network has also been used on occasion to provide comment on documents under development by other Network members. The Network also provided the impetus for the development of the Model Framework, which is discussed in further detail below.

The Network's webinar series commenced in July 2008, with the most recent event held in January 2010. The webinars usually involve 3-4 speakers who present different perspectives on a given

topic. Attendees can listen to the presentation while following the PowerPoint presentations online. The webinars also include a discussion session where attendees can write in questions to the panelists. The webinars are free to join and have generally attracted between 100 and 150 attendees. The topics covered to date have included:

- CO₂ pipeline regulation
- Regulation for early demonstration projects
- Long-term liability
- Financing/integration with ETS
- Public consultation
- Site handover
- CCS outcomes from Copenhagen

To date there have been two face-to-face meetings of the Network, both held at the IEA Offices in Paris. The first meeting of the Network was held in May 2008 on the launch of the Network and provided an update on CCS legal and regulatory development in key regions including North America, Europe and Australia. The meeting also had a more focused discussion of a number of key issues to be addressed in order to facilitate framework development. The issues discussed in more detail included monitoring and verification of stored CO₂, property rights/access issues for CO₂ storage and CO₂ pipeline safety.

1. Welcome

The meeting was opened with three welcoming presentations, firstly from Bo Diczfalusy, who is the director of the IEA's Sustainable Energy Technology Policy Directorate, which is the IEA directorate responsible for CCS, Brendan Beck, who manages the Network, and Ian Havercroft from the UCL – CCLP. Bo's presentation highlighted the importance that the IEA places on the development of CCS technologies, as one of a portfolio of options required to meeting CO₂ mitigation targets, noting that in the ETP BLUE Map Scenario, CCS contributes almost 20% of total CO₂ mitigation in 2050. To achieve this contribution, however, the presentation stressed that urgency will be required across a number of CCS areas, one of which is the development of legal and regulatory frameworks to support the technology.

Following Bo's presentation, Brendan provided some background about the Network and discussed in more detail the agenda of the meeting. Brendan also thanked the participants and supporters of the Network for their contribution in the one and a half years that the Network has been operating. In particular thanks went out to the UCL – CCLP and the IEA GHG who have been key contributors to the Network from the start. Ian then provided a welcome on behalf of the UCL – CCLP, including highlighting the collaboration that the IEA and UCL – CCLP has had within the Network and also with respect to the UCL – CCLP website.

2. International CCS Legal & Regulatory Developments

Following the welcome, Brendan Beck from the IEA presented an **overview of CCS legal and regulatory developments** world wide, with Luke Warren from the Carbon Capture and Storage Association and Tim Dixon from the IEA GHG providing an update on recent developments in international law and processes affecting CCS.

In 2008, the IEA released its most recent edition of the ETP report which included an updated BLUE Map Scenario. The BLUE Map Scenario provides a cost-optimised assessment of how energy

technologies may be transformed by 2050 to achieve a 450ppm CO₂ stabilisation level in the atmosphere, which equates to a 2°C temperature rise from pre-industrial levels. The scenario relies on CCS to contribute one-fifth of required reductions and finds that without CCS, the cost of emissions stabilisation at the level required rises by 70%.

More recently, the IEA CCS Roadmap was released, which sets out the deployment pathway required for CCS to achieve the BLUE Map Scenario results, including a number of legal and regulatory milestones. In particular, the roadmap recommends that existing domestic legal and regulatory frameworks should be reviewed and adapted for CCS demonstration by 2011 in OECD countries and 2015 globally, with comprehensive CCS legal and regulatory frameworks, consistent with the large scale deployment of CCS, to be in place by 2020. Such frameworks will need to address, amongst other things, key CCS topics such as CO₂ stream composition, project boundary definition, monitoring and verification requirements, closure/ post-closure obligations including long-term liability for stored CO₂ and competition with other resources.

Work is underway to implement legal and regulatory frameworks into national laws however this is currently only occurring in developed countries. For CCS to occur at the level required, developing countries will also need to implement legal and regulatory frameworks for CCS.

The deployment of CCS will also require a review of international legal issues, which has already commenced. A number of international legal measures have already been taken, including amendments to the London Protocol and OSPAR convention, however further action is required. In particular, amendments made to the London Protocol must be ratified to enable transboundary transfer of CO₂, international protocols for monitoring and verification of CO₂ storage sites should be developed and IPCC Inventory Guidelines approved.

Following the overview presentation was a presentation on CCS within the **United Nations Framework Convention on Climate Change (UNFCCC)** by Luke Warren from the Carbon Capture and Storage Association. This presentation addressed two principal issues in the context of the UNFCCC: the IPCC Inventory Guidelines, and support for the deployment of CCS under the Kyoto Protocol. The latest edition of the IPCC Inventory Guidelines in 2006 (Guidelines) included an accounting methodology for CCS. This methodology states that if monitoring does not detect any leakage from a CO₂ storage site then the CO₂ injected at the site can be considered as not being emitted. This is of course dependant on the CO₂ monitoring at the site meeting required thresholds. The Guidelines are yet to be formally adopted, however Annex-1 (developed) countries are obliged to use them already. In fact, Norway is currently using the Guidelines in the accounting for the Sleipner and Snøhvit projects which are already in operation. To allow similar accounting in non-Annex-1 (developing) countries, the current CCS chapter of the Guidelines should be maintained and the Guidelines adopted at the earliest opportunity.

Concerning CCS deployment under the Kyoto Protocol, as mentioned above Annex-1 countries are currently using CCS to meet their CO₂ reduction targets, however CCS cannot currently be incentivised in non-Annex-1 countries as CCS is currently not eligible under the Clean Development Mechanism (CDM). This is inconsistent with the need for CCS technologies to be rapidly deployed in developing countries. The debate on the inclusion of CCS under the CDM has been protracted and does not look any closer to being resolved, with a small number of countries strictly opposed to its inclusion. Negotiations on this subject should continue with outstanding issues to be resolved. In addition to CCS under the CDM the presentation also suggested looking at alternative mechanisms including under the Nationally Appropriate Mitigation Actions process.

To close this session, Tim Dixon from the IEA GHG presented on the developments with the **London Protocol and OSPAR Convention**. It has long been acknowledged that amendments to the London Protocol and OSPAR Convention would be required for the legal storage of CO₂ offshore and for the transboundary transportation of CO₂. To allow for the legal storage of CO₂ offshore, amendments were made to Annex 1 of the London Protocol, however Article 6 of the Protocol still had the effect of prohibiting transboundary transport of CO₂ for geological storage. Amendment of the article was agreed in October 2009 to enable export of CO₂ for disposal in accordance with Annex 1, subject to an agreement or arrangement between the countries concerned. The amendment does however still need to be ratified and currently does not have force of law. With respect to the OSPAR Convention, amendments to allow offshore storage of CO₂ previously prohibited under the Convention were adopted in June 2007. The amendments require ratification by 7 parties, and have currently been ratified by 1 party, with a further ratification pending.

3. European CCS Legal & Regulatory Developments

The second session of the meeting looked at CCS legal and regulatory developments in **Europe**. There were six presentations in this session starting with Raphael Sauter from the European Commission presenting on the EU CCS and Emission Trading System (ETS) directives which provide the framework for CCS legislation and regulation in EU Member States. Following this presentation a number of Member States presented on their status for the transposition of the EU CCS Directive into their own national system. Presenting were David Rutland from the UK Department of Energy and Climate Change, Øyvind Christophersen from the Norwegian Climate and Pollution Agency, Gabriela von Goerne who is an advisor to the German Ministry of Environment, Annemarieke Grinwis from the Dutch Ministry of Economic Affairs and the Ministry of Environment and Piotr Kisiel from the Polish Ministry of Economy.

The **EU CCS Directive** (2009/31/EC) sets environmental rules and liability requirements for the geological storage of CO₂. It covers all key issues in relation to CO₂ storage including site characterisation and selection, CO₂ stream composition, monitoring and verification, measures in case of leakages or significant irregularities, closure and post-closure obligations, transfer of responsibility, and financial security. The EU CCS Directive needs to be transposed by EU Member States into national law by 25 June 2011. The European Commission is currently developing guidance documents which will elaborate key issues of the CCS Directive. These guidance documents are expected to be published around October 2010.

Art. 33 of the EU CCS Directive 2009/31/EC amends the EU Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants ("LCP-Directive"). It requires that operators of all combustion plants with a rated electrical output of 300 MW or more for which the original construction licence or, in the absence of such a procedure, the original operating licence is granted after the entry into force of Directive 2009/31/EC have assessed whether the following conditions are met: a) suitable storage sites are available, b) transport facilities are technically and economically feasible, and c) it is technically and economically feasible to retrofit for CO₂ capture. If this assessment is positive, the competent authority shall ensure that suitable space on the installation site for the equipment necessary to capture and compress CO₂ is set aside. This assessment is required with the entry into force of the Directive and the provision therefore applies from 26 June 2009.

The **EU ETS Directive** (2003/87/EC) has now been amended to allow the full inclusion of CCS into Phase III of the system. Under the ETS Directive, CO₂ captured, transported and safely stored is considered as not emitted. Amendments to the Monitoring and Reporting Guidelines of the ETS Directive have been agreed to address CO₂ capture, transport and geological storage. These amendments should be formally adopted soon. As a full installation under the directive CCS projects

will stand to benefit from the fact that they have significantly lower emissions than conventional plants and so will not have to purchase as many allowances at auction. As part of the amendments to the ETS Directive, the EU also announced that 300 million allowances of the New Entrants Reserve (**NER300**) will be set aside for CCS and innovative renewable energy technology projects. It is intended that a total of eight CCS projects and thirty-four renewable projects will be funded from the allowances, with each Member State hosting a minimum of one and maximum of three projects. The awarding of the allowances will occur in two phases: 200 million allowances will be awarded at the end of 2011, with the remaining 100 million being awarded at the end of 2013. The level of support will depend on the carbon price at the time of monetisation, but at current carbon prices around €4bn would be available.

In addition to the NER 300 in the ETS Directive, there has been another recent development from the EU to support the financing of CCS demonstration plants. As part of the **European Economic Recovery Programme** they have allocated €1.05 billion for the support of CCS demonstration. The six projects that will each receive €180 million are¹ the Jaenschwalde project in Germany, Porto-Tolle project in Italy, Rotterdam project in the Netherlands, Belchatow project in Poland, Compostilla project in Spain and the Hatfield project in the UK. The aim of both funding mechanisms is to facilitate the demonstration of CCS at a large-scale in Europe by 2015.

The **UK** is well underway in the process of transposing the EU CCS Directive into national law. The UK's interest in CCS stems from its commitment to reduce CO₂ emissions by 80% by 2050, in the context of its continued reliance on fossil fuel generated electricity. In the transposition process, storage was identified as the main gap in existing regulatory frameworks. Consultation has occurred on a number of high level operational issues, including transition from petroleum production to storage and competing uses of the seabed, transfer arrangements and financial security, and licensing arrangements, and the transposition is almost complete.

In **Germany**, draft federal CCS legislation responding to the EU CCS Directive was postponed in July 2009 due to concerns about public acceptance. The proposed legislation included a national storage site potential analysis, licensing process, CCS storage site operator obligations, conditions for decommissioning and long-term monitoring and a proposed liability regime. In October 2009 the German coalition government agreed to the short-term implementation of the EU-CCS Directive in a national framework, together with an information campaign to enhance public acceptance. This may mean that a number of previously proposed provisions are amended to promote public acceptance, such as provisions relating to site owner rights, compensation etc.

The **Dutch** government considers CCS a must in addressing climate change and aims to have large scale demonstration projects operational between 2015 and 2020, with commercial deployment of CCS from 2020. The EU CCS Directive will be transposed into Dutch Mining Law from December 2010 at the latest, with complementary amendments to be made by lower level legal instruments (decrees, ministerial regulation). CCS regulation will be spread across a number of authorities at different levels of government (central government, at province level, and local government).

The transposition of the CCS Directive into **Polish** law is not as advanced as the other European countries present. This in part relates to challenges they see in deploying the technology as a whole. Current challenges in relation to the adoption of CCS technology in Poland include public acceptance, options for CO₂ transport, suitable geological storage for CO₂, commercial utilisation of CO₂ and financial support for demonstration projects. The EU CCS Directive will be implemented by

¹<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/09/542&format=HTML&aged=0&language=EN&guiLanguage=en>

amending the Geological and Mining Law under the responsibility of the Environment Ministry. The draft amendments are expected in the second or third quarter of 2010. The Environment Ministry is also undertaking a special program for geological research of suitable CO₂ storage sites, to be completed by 2010. Two demonstration projects are currently under construction at Belchatow and Kedzierzyn with Belchatow selected to receive EU funding already. Poland is also developing a Polish Clean Coal Technology Program, which will support CCS development in the country.

Norway has two operational CCS projects, Sleipner (1996) and Snøhvit (2008), with a number of further projects upcoming. CCS is currently regulated by the Pollution Control Act, which addresses amongst other things capture unit emissions, storage site characteristics, CO₂ stream characterisation, injection project design and operation, and monitoring plans. It is also possible to require capture readiness under the Act.

4. North American CCS Legal & Regulatory Developments

CCS legal and regulatory development is also well underway in the USA and Canada. Unlike Europe however, developments are occurring in a more fragmented way with federal government and state government both working along a parallel path, particularly in the US. CO₂ injection has been occurring in the USA and Canada for a number of decades however traditionally it has occurred as part of enhanced oil recovery processes (EOR). There are major differences between CO₂ injection regulation for EOR and for CCS, in particular, monitoring requirements, accounting requirements and long-term liability. Given the different jurisdictions associated with CCS legal and regulatory development in North America a number of different perspectives were presented, including from Sarah Forbes from the World Resources Institute who presented on US Federal legislation, Kevin Bliss from the Interstate Oil & Gas Compact Commission (IOGCC) and Bob Van Voorhees from the Carbon Sequestration Council, who gave different perspectives on the developing State legislation and Sandra Locke from Government of Alberta who gave both a Canadian and Alberta specific perspective.

There are a number of elements to the **US Federal** approach to climate change and CCS. At a Federal Level, the regulation and permitting of CCS is being developed by the Environmental Protection Agency (EPA) through amendments to the Underground Sources of Drinking Water (USDW) Act: the EPA is currently in consultation around its Draft Rule for CCS regulation. At the same time, the EPA has been granted the authority to regulate CO₂ emissions more generally, which will be likely to promote the deployment of CCS. In addition, there are efforts being made for Congress to pass a climate and energy bill that will use a cap-and-trade system to reduce CO₂ emissions.

The EPA Draft Rule was first proposed in July 2008 and provides the regulatory basis for CCS. It also establishes a new well class under the Underground Injection Control programme for the injection of CO₂ for storage. Consultation is ongoing with a final Rule expected to be in place in late 2010 or early 2011. In regards to CO₂ regulation, the EPA has recently been granted the authority to regulate CO₂ under the existing Clean Air Act after a court ruling that CO₂ emissions posed a threat to human health. This finding has empowered the EPA to regulate both mobile and stationary sources of CO₂, including by defining the Best Available Control Technology (BACT) to be considered in mitigating CO₂ emissions from these sources. CCS is currently under consideration under BACT but would need to be deemed available, achievable and cost effective to qualify. Availability of storage sites would also need to be demonstrated. In addition to a BACT ruling, the EPA could also promote CCS technologies through tools such as CO₂ performance standards for given plant types.

As mentioned there is also a parallel effort ongoing in Congress to pass a Bill to limit CO₂ emissions. The most successful of the Bills to date has been the Waxman-Markey Bill which passed the House of Representatives and is now being debated in the Senate. The Waxman-Markey Bill, also known as the American Clean Energy and Security Act (ACESA) includes a cap on CO₂ emissions that will result in significant CO₂ emissions reductions in 2050. The ACESA requires plants permitted between 2009 and 2020 to achieve a 50% reduction in annual emissions by 2025 or earlier, and plants permitted from 2020 to achieve a 65% reduction. It also sets out a bonus allowance regime to support technologies such as CCS that are important to meeting the set reduction targets. For CCS specifically it proposes a sliding scale of support with larger bonuses for early action and greater percentages of capture with total support being up to \$96 per ton of CO₂ for first phase of deployment. It is however very unlikely that this Bill will pass the Senate in its current form and there are a number of alternate proposals also being discussed in the Senate. Unfortunately however not all of the proposals specifically mention CCS and those that do often link onset to a future year or deployment trigger, which leaves a lot of uncertainty as to when, and to what level CCS will be deployed.

While things are progressing slowly at the federal level, many **US states** have chosen to move ahead with their own CCS regulation. Currently there are sixteen US states that are developing or have adopted CCS legislation and/or regulations. A lot of this work has been supported by the IOGCC, which brings together domestic and international oil and natural gas regulators. In particular the IOGCC's CCS Regulatory Task Force, which is funded by USDOE/NETL and works closely with the seven DOE Regional Carbon Sequestration Partnerships, has produced a Model Statute and Rules for the regulation of CCS. These Model Statute and Rules form the basis for many states' legislation and regulations.

In addition to the Federal and State Governments, a number of other **US stakeholders** are involved in the regulatory development process. One such group of stakeholders is the Geological Sequestration Multi-Stakeholder Discussion Group which is made up of US organisations representing a broad array of interests in issues arising out of geologic sequestration rulemaking. It was formed in 2008 to develop consensus for comments on the EPA's Draft Rule. In a recent letter to the EPA it addressed 4 major issues: enhanced recovery of oil or natural gas and geological sequestration of CO₂, injection pressure limitations, project/site closure standards and the need for adequate government implementation resources. The Group will continue to be involved in the process as the Draft Rule is finalised and implemented.

In **Canada**, CSS development is occurring at both Federal and Provincial Government level, however for the most part, CCS will be the responsibility of Provincial Governments. One of the more proactive Provinces in Canada has been Alberta, whose recent initiatives include a CCS Funding Act and assurance review targeted at public acceptance, and the development of a risk management framework. Alberta has not yet implemented legislation aimed at the regulation of CCS however as it is developed it will have to coordinate with existing Environmental Legislation, the Mines and Minerals Act and Energy Resources Conservation Act. Financially Alberta has committed \$2 billion to large scale CCS projects through the CCS Funding Act and has signed letters of intent for 4 projects.

5. Australian CCS Legal & Regulatory Developments

Bob Pegler from the Global CCS Institute, and formally the Australian Government, presented on the **Australian** CCS Regulatory developments on behalf of the Australian Government. A legislative framework administering access to and usage of CCS storage sites is one of number of complementary measures introduced in Australia to encourage CCS. Under Australia's federal system of government, the Australian Government has jurisdiction over offshore areas, while the

States and Territories have jurisdiction over onshore areas and coastal waters. Legislation is currently in place for offshore areas, and onshore for a number of States, with legislation being developed in other jurisdictions. Australian governments have worked together to develop 'Australian Regulatory Guiding Principles', to attempt to ensure consistency across legislation.

The offshore legislation uses Australia's offshore petroleum legislation as a platform. Main features include a title system similar to that used for petroleum, and mechanisms to deal with safe and secure storage, managing interactions with the petroleum industry, site closure and treatment of long-term liability. State onshore legislation is generally consistent with the Australian Government offshore legislation. Other Australian CCS initiatives include the National Low Emissions Coal Initiative, the CCS Flagships Program, and the Global CCS Institute.

6. Stakeholder Perspectives of CCS Legal & Regulatory Developments

In the development of CCS legal and regulatory frameworks it is crucial to involve key CCS stakeholders to ensure the framework developed serves its purpose as effectively as possible. Two of the most important stakeholders to involve are industry and environmental NGOs (ENGOs). Industry stakeholders are critical as they will be the ones who have to interact and work with the framework on a day to day basis. Without industry acceptance the frameworks created are unlikely to achieve the results desired. Jim Lorsong from BP Alternative Energy gave an industry perspective. BP operates one of the largest CCS projects currently being undertaken – the In Salah project in Algeria. BP also has CCS projects under development in multiple locations around the world. ENGOs are pivotal in ensuring the environmental integrity of government and industry and are extremely influential when it comes to shaping public opinion. Mark Johnson from WWF presented an ENGO perspective.

For CCS projects to develop at the scale required, **industry**, including CCS project developers, will need a CCS legal and regulatory framework that provides certainty for themselves and their investors. They will also need incentives that reward the mitigation of CO₂ and allow them to offset the additional cost of CCS. To provide certainty, frameworks will need to cover all aspects of CCS including capture, transport and storage. They must also deliver access to subsurface pore space, a transparent permitting process governing CO₂ injection, certification of storage suitable for atmospheric carbon abatement, a legal standard for site closure and a basis for long-term stewardship of the stored CO₂. In the near-term it is likely that revenues will have to come from a combination of product sales (e.g. electricity, CO₂ for EOR), carbon price/ emissions credits and policy support.

To give an **ENGO** perspective is very difficult as there is no archetypal position. WWF is however one of the largest and most influential of all ENGOs and is very concerned about the divergence of climate change policy and climate change science. Current policies are likely to lead to a 3-4°C temperature rise which is well above the 2°C level that scientists say is the maximum that can be sustained without significant negative impacts. Accordingly, they stress the need to strengthen climate change policy to bring it in line with the relevant science. In respect to CCS, WWF accept the technology in principle and are willing support specific projects under the right circumstances. They do however feel that the current schemes that provide public funding to CCS need to be refined such that for a project to receive funding the company involved must not continue building unabated fossil fuel plant without a commitment to installing CCS at sometime in the future.

7. CCS Legal & Regulatory Developments in Key Developing Regions

The deployment of CCS in developing countries is critical as seen in the IEA CCS Roadmap which shows that by 2020, half of all CCS project will need to be in developing countries with this figure increasing to 65% in 2050. It is therefore essential that parallel efforts for CCS deployment occur across both developed and developing areas. Understandably however, progress in implementing CCS legal and regulatory frameworks in developing countries is not as advanced as in developed countries. From the presentations given however, it is clear that there is a lot of interest in CCS and in developing the required frameworks to regulate its operation. This can be seen in particular in Brazil and China where pilot projects are under construction or already operating. It is also visible in South Africa where they have a CCS roadmap that outlines the development of CCS in the country, culminating in a demonstration project in 2020. Indonesia is also looking to quickly advance its understanding of CCS in the near future. India differs somewhat from the other countries presented. To date, India has shown little interest in the development of CCS domestically, however in recent months it has been suggested that this may be starting to change.

To summarise their current status, Andrew Gilder from IMBEWU Sustainability Legal Specialists presented on South Africa, Marcelo Ketzer from the Brazilian Carbon Storage Research Center (CEPAC) presented on Brazil, Didier Bonijoly from BRGM and the EU-China StraCO₂ project presented on China, Mr Hadiyanto from the Indonesian Ministry of Energy and Mineral Resources presented on Indonesia and finally Pradeep Kumar Daditch from The Energy and Resource Institute (TERI) presented on India.

South Africa has been looking at CCS for a number of years, commencing in 2004 with the release of the Council for Scientific and Industrial Research's report on 'The Potential for Sequestration of Carbon Dioxide in South Africa'. Most recently, the South African CCS Centre was established in early 2009. Included in this work has been the development of a CCS roadmap that looks at how South Africa can move toward commercial deployment of CCS. The major milestones of the roadmap include the Council for Geoscience's South African Carbon Capture & Storage Atlas, which will report on the results of storage-potential evaluations for onshore and offshore basins in South Africa, and is expected to be released in the first half of 2010. This will be followed by a proposed CO₂ test injection by 2016 and a fully integrated demonstration project to occur by 2020. It is then the aim that full-scale industrial operation will be possible by 2025.

Existing legislation and regulation may be sufficient to enable the test injection, however a more comprehensive CCS framework will be needed for the full-scale demonstration. There is currently no CCS regulatory development underway in South Africa. Under the current environmental legal regime, CCS projects will be likely to require a suite of environmental legal authorisations, across different levels of government. The CCS Atlas and model framework are likely to be useful indicators of the future direction of CCS and CCS regulation in South Africa.

Brazil is in a unique situation in regards to the deployment of CCS. Their electricity sector has very low carbon intensity due to a significant amount of hydro-electric power and their CO₂ emissions profile is dominated by deforestation. Brazil does however have a number of potential sources for CCS from within industry and they are looking at building new coal power plants, which will also contribute to their CCS applicable emissions. The country is also likely to have growing emissions from its oil and gas operations, in particular offshore, where they are looking to develop the Pre-Salt gas field which contains relatively high amounts of CO₂. Currently Brazil is very active in CCS R&D. Petrobras is also operating a number of CCS and EOR projects with more planned in the near future. These projects are however regulated under existing oil and gas regulations as there is currently no CCS specific regulatory framework in Brazil. To develop a framework in Brazil, existing petroleum, mining and environmental laws will have to be considered.

China is also very active on CCS development with a number of R&D and demonstration projects planned and in operation. There are currently significant policy gaps for CCS development in China, including a lack of long term national CCS support plans, sufficient funding and emphasis on CCS technology development. There is also a lack of CCS-related legislation. It is also likely that there will be issues with jurisdictional overlap in terms of CCS regulation, public acceptance, property rights and a lack of CO₂ sequestration-related incentives. China has recognised the strategic importance of CCS and is starting to consider policies to encourage CCS development, noting that a number of barriers and issues remain to be addressed.

Indonesian CCS initiatives to date include a preliminary study to estimate CO₂ Potential Storage and Incremental Oil Recovery in East Kalimantan & South Sumatra, conducted by the Ministry of Energy and Mineral Resources between 2003 and 2005, the execution of a number of MOUs with CCS stakeholders, founding membership of the Global CCS Institute and a joint study with the UK Government that concluded in November 2009. The joint study was the first comprehensive study to identify potential CCS deployment opportunities in Indonesia, addressing the technical, commercial and regulatory aspects of deploying CCS. Deployment will be constrained in Indonesia to tectonically stable regions (South Sumatra, East Kalimantan and Natuna). A national CCS regulatory framework is yet to be developed.

India has a long-term history of climate change initiatives and has invested heavily in this area due to its historic vulnerability to climate variability (2.63% of GDP in 2006/2007). Its involvement in CCS activities is more recent: Cabinet approved India's participation in R&D activities related to CCS in December 2009; the Indian Government has been a member of the IEA GHG R&D Program since 1998 and is a member of the Global CCS Institute and TERI is a part of the IPAC-CO₂. In addition, Oil and Natural Gas Corporation Limited has an EOR project that will soon be operational, and the National Geophysical Research Institute is carrying out experimental studies in injecting CO₂ in basalt in Western India.

8. Fast-tracking legal and regulatory development in key CCS regions – panel session and discussion

Following the presentations from both developed and developing countries and from key CCS stakeholders, there was a panel session that looked at how the development of legal and regulatory frameworks could be fast-tracked in developing countries. The panel included each of the developing countries that gave presentations. It also included a representative from OPEC, ADB and Shell. To commence the panel session, these three organisations were given an opportunity to introduce their interest in this area.

All forecasts for future energy demand under credible and equitable scenarios show fossil fuel use continuing for decades however **OPEC** realise that this energy use must be compatible with environmental protection. All OPEC countries are non-Annex-1 which means they do not have a cap on their CO₂ emissions, however their commitment to environmental protection was demonstrated by the Riyadh Declaration in 2005 which outlined OPEC's long-term strategy for this issue. To improve their ability to meet their environmental goals, OPEC has a history of intra-OPEC cooperation and CCS is a key area for strategic cooperation between countries. OPEC countries are very interested in CCS given their extensive storage reservoirs and the potential for EOR. OPEC is a member of the IEA GHG which looks specifically at CCS. Currently there is no development of CCS legal and regulatory frameworks within OPEC countries, however it has been discussed by the organisation. Two crucial issues that will have to be considered in implementing CCS in the region are the protection of oil/gas interests and the protection of groundwater.

In regards to fast-tracking CCS legal and regulatory development it was re-emphasised by the OPEC representative that developing countries are crucial to CCS deployment. It was suggested that there are three characteristics of developing countries that may change the way they view CCS and may change the emphasis of CCS regulation. The three characteristics are: 1 - countries with large indigenous CO₂ emissions; 2 - countries with large storage potential; 3 - countries with early opportunities for CCS. Characteristic 1 countries might focus on large-scale CCS deployment, 2 on long-term liability and cross-boarder transport and 3 on short term incentives. These characteristics are not mutually exclusive however.

A number of OPEC members will fall primarily into category 2 with significant storage potential. The question for these countries would be what sort of arrangement would be required to import CO₂ for storage? Would it just be a commercial arrangement or would it need to be arranged between governments? Also, who would assume long-term liability? Would it be national governments, through international arrangements or through another method? It is the opinion of OPEC that national governments in developing countries would be reluctant to assume long-term liability: if they were to do so, they would need financial security, and would be likely to delay assuming responsibility as long as possible.

The **ADB** is a financier and a development institution. ADB's work is generally project based. ADB's interest in CCS has been driven through its involvement with China on the GreenGen CCS demonstration project. The GreenGen project is a 250MW IGCC demonstration project. ADB have given a grant of US\$130 million for additional R&D focussing on financial, technical and regulatory issues around the project. Accordingly, ADB's CCS focus has been primarily on China. Recently the Global CCS Institute has given Aus\$20 million to the ADB fund for technical assistance. With this expanded capacity, ADB are now looking to move forward with CCS work in Indonesia, Thailand, Vietnam and the Philippines.

To address the implementation of legal and regulatory frameworks in developing countries, it has to be approached in a country specific way and address the individual regulatory landscape of each country. It must be acknowledged that there are some significant differences with governmental processes in developing countries, including corruption and political and regulatory capture that can't be ignored. There will also be a need to coordinate developing country support, both at a financial level and a technical level, and the IEA are in a good position to support this effort.

Shell has had a continued interest in CCS for a number of years and as an oil and gas company has a very good understanding of the skills and technology required to implement the technology. Shell considers that the key to implementing CCS is as part of a broader policy on GHG and CO₂ reduction. Without such a policy framework, the reasons to regulate and incentivise CCS are not clear. This policy ideally comes from the host country, in the context of the panel session, a developing country. It was also highlighted that historically OECD countries have been responsible for developing guidelines and non-OECD countries have been expected to follow: however, given the early stages of CCS legislation and regulation, non-OECD countries continue to have the opportunity to be involved in the process from early on. Accordingly it is important to involve non-OECD countries now through projects and case-studies.

Following the introduction from these three organisations, the floor was opened for a broader discussion. A number of different topics were covered in the discussion including long-term liability, how to approach regulatory development, EOR and CCS related to industrial CO₂ sources and the need for capacity building.

Long-term liability for stored CO₂ is a crucial issue that must be addressed in CCS regulation irrespective of whether a country is developing or developed. It may however be more complex in developing countries, especially if the CCS is being funded by a developed country. Despite this, it was still generally the opinion of both developed and developing country representatives that the host country is in the best position to look after long-term liability, but that developing countries would need funding to cover long-term monitoring and potential remediation. This is especially in the case of the larger developing countries who will be the first to deploy CCS. For the smaller developing countries, more novel methods for long-term liability may be required including perhaps international funds or mechanisms.

It was also thought that the framework for long-term liability would be much the same as in developed countries, i.e. after X years and the meeting of criteria A, B, C then hand over can occur along with Z dollars for long-term monitoring and remediation. It was however noted that working out the detail and implementing the process would be a lot more complicated.

As the discussions progressed it was suggested that we need to be clearer about what liability we are talking about. Are we talking about the liability for the costs of the CO₂ stored if it leaks out? Are we talking about the liability for the impacts to the atmosphere of any CO₂ leakage? Or are we talking about the potential impact on human health of possible leakage? If we are talking about CO₂ price liability then this is not an issue in regions without a CO₂ price. If we consider liability for damage to the atmosphere or to human health then EOR operators today seem comfortable with assuming this liability. Therefore, the main liability concern appears to be CO₂ price liability and liability for remediation.

It was also pointed out that given most storage sites are going to be relatively large, the first instances of site closure might not happen for another 50 years with an additional 20-50 years of post closure liability covered by the operator. This means that the long-term liability and site handover issue might not be realised for another 70-100 years.

Before looking at how to implement CCS legal and regulatory frameworks in developing countries, the issue of why they would implement such frameworks needs to be addressed. This was discussed in the context of **drivers for CCS legal and regulatory development**. Irrespective of the country, it will be national interest that drives the development of CCS legal and regulatory frameworks. This national interest may be a desire to reduce emissions, attract foreign investment in CCS technology or to use CO₂ for EOR, for example. In each case however it will be important to assess CCS capacity first in order to establish if there is any benefit in pursuing CCS development in the relevant country. It was said by the South Africa presenter that work on CCS will stop if the CO₂ storage atlas does not find sufficient capacity.

Accordingly, there needs to be an initial technical review of CCS potential in regions that are looking at developing CCS. It was suggested that a good way to achieve this is through the development of a demonstration project. If there is interest in deploying a demonstration project then there is a reason for a government to set up a framework. The framework and the project can then be developed in parallel. It is however often suggested that companies need the certainty of regulatory frameworks before they embark on a project. This is why the process must be in parallel, such that some amount of certainty can be offered to the project developer.

This could be seen in the US with the FutureGen project. When the project was announced, the states interested in hosting the project competed against one another. This competition included being very quick to implement state regulations for CCS. They competed because they thought it was in their interests to host the project, because it would bring with it jobs and investment.

In addition to the regulatory drivers, the options in regards to **regulatory approach** were also discussed. A number of key principles were touched upon in this discussion. Firstly it was highlighted that the development of a legal and regulatory framework will be easier if you start with existing laws rather than try to create a new framework. It was suggested that this would make CCS regulation easier to implement given the familiarity a government would have with existing frameworks. It was also suggested that it will be crucial that key stakeholders are involved in the regulatory process. Without this input, regulators are likely to proceed with the writing of regulation in a vacuum, which will present the risk that the resultant framework does not meet the needs of those who need to use it. The idea that different approaches are needed for the regulation of demonstration projects and commercial projects was also reiterated.

The relationship between **CCS regulation and incentives** was covered in the discussion with the question as to which is the best approach. It was submitted that regulation and incentives cannot be separated as they rely on one another and are both aimed at the same purpose. The CDM was shown as an example where regulation and incentivisation could be achieved in developing countries with the one mechanism. The CDM has the systems in place to provide guidance on deployment, authorisation, verification and incentivisation, it is just unfortunate that CCS is currently not eligible.

The question was asked about how **EOR** could be dealt with and if any of the developing frameworks account for the re-entering of a site post-closure for the purpose of additional oil recovery. The EU CCS Directive does address EOR however not the issue of re-entering a closed reservoir. It was noted that it is situations like this make it important to ensure that CCS and EOR are dealt with in the same regulations to allow a project to go back and forth between the two.

In addition to all the specific issues mentioned there is also a general need for **CCS capacity building** in developing countries. This includes government, industrial and academic capacity. This has to start with an increase in general awareness but will need to move on such that there is the expertise across the CCS chain to design, deploy, operate and regulate CCS projects. This can be encouraged in multiple ways, including linking it to the regulatory process. In Brazil there is a law currently that petroleum operators need to invest in research. This initiative could be expanded in Brazil to cover CCS and also implemented in other countries to formalise the capacity building process.

With the assumption that developed countries would be able to assist developing countries in fast-tracking regulatory development it was noted that developed countries have made progress but are still themselves learning about regulating CO₂ storage. Experience with regulatory development can be shared but there is no experience of regulatory implementation. To ensure this sharing of knowledge, UK projects are based around knowledge transfer and publicly funded projects must share experience on the regulatory process. In the same context the EU's Project Network aims to facilitate knowledge sharing among CCS projects in EEA countries. It was also suggested that everyone, including developed countries, need capacity building if the CCS industry is going to deliver the CO₂ mitigation required.

9. IEA CCS Model Legal & Regulatory Framework

The final session of the workshop before the wrap-up was a presentation of an IEA initiative to support the development of legal and regulatory frameworks in developing countries. The initiative is the Model Framework and was presented by Brendan Beck.

The Model Framework is aimed at supporting rapid CCS deployment, consistent with IEA CCS Roadmap targets, by providing governments with 'lessons learnt' from current national legal and regulatory frameworks. It will be drawn from developments in Europe, Australia, the USA and elsewhere. It will be structured around 30 key CCS regulatory issues and will comprise, for each issue, a brief description, model text, an explanation of the approach adopted in the model text and alternative approaches where relevant.

The Model Framework is being prepared under the guidance of an Advisory Committee comprising a number of governments and CCS stakeholders. The Model Framework is being prepared based on local, national and international legislation and regulations, guidance documents and legislation and regulation input documents from the WRI, IOGCC, CCSA and ZEP. Currently it is envisaged that the first draft of the Model Framework will be completed by mid-March 2010, with the final draft to be completed by April 2010.

9. Wrap-up

From the presentations and discussion during the meeting, it is clear that a lot of progress has been made on the development of CCS legal and regulatory frameworks across the world. Such frameworks are in place in multiple OECD regions, with clear paths outlined for framework implementation in many others. There is however a need to transfer this learning to developing, non-OECD countries as they will be crucial to the deployment of CCS and the meeting of climate change targets. There is currently a lot of interest in CCS amongst most of the key regions of the world, however this interest does need to be converted into concrete progress as soon as possible.

Over the course of the second meeting of the Network, a number of ideas were put forward on how the Network can better address the needs of CCS legal and regulatory development around the world and in particular in these key developing regions.

These ideas included:

- Continuation of the Network's Webinar programme. The programme, which is discussed under 'Background' below, is seen as a good way of reaching key government stakeholders who find it difficult to travel. Accordingly, future Webinars should be themed specifically around key issues relevant to government capacity development.
- As regional and national initiatives on CCS regulation are completed, the Network and the Webinar process could both be useful tools for the peer review and dissemination of findings.
- The IEA CCS Roadmap outlined the key steps in regulation development. These recommendations could be expanded into a Roadmap that specifically deals with CCS regulation.
- The Model CCS Legal and Regulatory Framework (Model Framework) builds on existing legal and regulatory frameworks is due for release in April 2010 and will be a very important reference in the development of regulation in developing countries. It should however ensure that it is relevant to multiple governmental structures and avoids being prescriptive about the way CCS regulation should be implemented.
- The Model Framework could be enhanced through the testing of the framework in a number of case studies in developing countries. These case studies could involve nationally led working parties tasked with looking at how the framework could be implemented in a particular country. This would serve the dual purpose of helping refine the framework and commencing the regulatory implementation process in the relevant country.

- It would be very useful if there were a regularly released document presenting the current status of CCS regulatory development in different regions of the world. The Network could facilitate the production of such a document.
- Given the position the IEA holds in the CCS community it could play a key role in coordinating CCS capacity building across multiple areas in close cooperation with other international efforts. This could include facilitating knowledge transfer on technical and regulatory matters and coordinating the efforts of organisations looking to assist in the CCS capacity building arena.