

# 7<sup>th</sup> IEA International CCS Regulatory Network Meeting

*Project permitting, enhanced oil recovery  
and the 'Road to Paris'*

*Tristan Stanley*

## INTERNATIONAL ENERGY AGENCY

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- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
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## Acknowledgements

This workshop was organised by the International Energy Agency (IEA) Carbon Capture and Storage (CCS) Unit. Tristan Stanley organised the meeting with support from Sean McCoy, Sally Wilkinson and Juho Lipponen. Tim Dixon (IEAGHG) and Ian Havercroft (Global CCS Institute) provided input to shape the agenda. Tristan Stanley was the lead author of this workshop report.

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The IEA would like to thank all the session chairs, presenters and participants for their contribution which made the workshop such a success.

The IEA would like to acknowledge the financial support of the Global CCS Institute and the Alberta Government for this event and the broader work of the CCS Unit.

## Introduction

On 22-23 April, the International Energy Agency hosted the 7<sup>th</sup> meeting of the IEA International CCS Regulatory Network in Paris, France. The meeting brought together 35 representatives of national and sub-national governments, industry and the research and academic community.

The Regulatory Network was launched in Paris in May 2008 to provide a neutral forum for regulators, policy makers and stakeholders to share updates and views on developments in the regulation of CCS activities, with a focus on the geological storage of CO<sub>2</sub>. Over the past seven years, hundreds of people from dozens of countries – developed and developing – have participated in Network activities.

Over the past few years, a number of early mover CO<sub>2</sub> storage projects have gone through the permitting process providing opportunities to test the regulatory frameworks in the various jurisdictions. Meanwhile, other governments have continued to explore and analyse how CCS permitting and regulation can best be fit within existing legal frameworks.

This year's meeting of the IEA CCS Regulatory Network was an opportunity to review the experiences of projects and regulators in applying for and issuing permits; and for general knowledge sharing to support jurisdictions along the full spectrum of regulatory framework development. The meeting also explored issues relating to the regulation of existing Enhanced Oil Recovery (EOR) projects for CO<sub>2</sub> storage, and the interaction of CCS regulation with broader emissions reduction schemes, both domestically and internationally.

The first day focused on updates on recent progress from the governments around the table as well as other international processes with a bearing on CCS laws and regulations. The second day was arranged thematically with sessions comparing the permitting processes in different jurisdictions, reviewing the regulation of EOR projects in the United States, and discussing the interaction of CO<sub>2</sub> regulation and emissions reduction schemes.

## Day 1

### Welcoming remarks

Philippe Benoit, head of the Environment and Energy Efficiency Division of the IEA, opened the meeting and welcomed participants.

Since the Network was conceived in 2008, participating jurisdictions have developed laws and regulations at different paces reflecting their individual contexts. As a result, Network participants now span a wide range of stages of regulatory development, from gap analysis to implementation and to the review of existing regulations. The Network offers an opportunity for jurisdictions to discuss challenges they currently face as well as learning from the experiences of those who are further advanced. The wide distribution of participants also emphasizes that the regulatory development process is in fact a cycle in which reviews of experiences influence the design of new legislation and regulations or the refinement of existing ones.

The pace of CCS deployment to date has been much slower than was originally anticipated when the network was conceived, and which was outlined as necessary by the IEA CCS Roadmaps in 2009 and 2013. Over the past few years we have begun to see the first projects go through the permitting processes in different jurisdictions around the world. The experiences of these projects are an invaluable reference for governments currently designing or refining the permitting pathway for CO<sub>2</sub> storage projects.

## Session 1 – Long term liability workshop review

During the two days preceding the meeting, the **IEA** and **Global CCS Institute** co-hosted an expert workshop on managing long term liability for CO<sub>2</sub> storage. The Network meeting opened with a presentation from Sean McCoy (IEA) and Ian Havercroft (Global CCS Institute) on the outcomes of that workshop, followed by a discussion.

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The objective of the workshop was to review the latest research and experiences relating to long term liability; re-evaluate the nature and magnitude of the problem and potential solutions; and develop recommendations for governments.

The key findings from the workshop were that liability remains a critical issue for storage projects; there is a difference in perception of risks associated with storage and the reality; and, good site selection, driven by a solid regulatory framework, is fundamental.

There was much discussion around why CCS should be considered any differently to any other large project, the impacts from which have the potential to outlast the entity responsible for its construction and operation. The discussion focused on the unique aspects of CO<sub>2</sub> liability which meant it couldn't be dealt with under normal or existing liability frameworks. An example of a unique liability is that created by the potential for leakage of the stored CO<sub>2</sub> to the atmosphere under emissions reductions frameworks that penalise such emissions, commonly referred to as "climate liability".

A separate workshop report on the meeting that summarizes discussion and findings of the workshop is forthcoming.<sup>1</sup>

## Session 2 & 3 – Country updates

In the second and third sessions, governments from various jurisdictions were invited to present and discuss the most recent progress in the development of legal and regulatory frameworks. There were presentations from:

- Maria Velkova, European Commission
- Elzbieta Wróblewska, Ministry of Economy, Poland
- Tony Ripley, Department of Energy and Climate Change, UK
- Ana Picado, National Laboratory on Energy and Geology, Portugal
- Kathryn Gagnon, Natural Resources Canada, Canada
- Jordan Kislear, Department of Energy, United States
- Moon-Hyun Koh, Soongsil University, Korea

Maria Velkova provided an update on broader policy developments pertaining to CCS, the implementation of the EU Directive 2009/31/EC on the Geologic Storage of Carbon Dioxide (CCS Directive), and the recent CCS Directive review. The **European Commission** sees a reformed EU Emissions Trading System (EU ETS) as the major driver for the deployment of clean energy technologies, including CCS, in the EU. This is discussed in more detail in the later section regarding emissions reduction schemes.

The Commission is building on the existing New Entrants Reserve funding scheme (NER 300) to create a follow up programme with 400 million allowances – the future Innovation Fund, which will make additional funds available for technology innovation in the areas of innovative

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<sup>1</sup> The workshop report can be downloaded from the [IEA event page for the workshop](#).

renewables and CCS. One of the key differences to the NER 300, the Innovation Fund (NER 400) will expand the scope for eligible technologies to breakthroughs in industrial sectors.

As of 2013, all EU Member States (MS) have notified the Commission of measures transposing the EU CCS Directive into their national legislation. All but one of these have now been deemed complete in terms of coverage. The Commission is currently undertaking the third and final step of implementing the CCS Directive, a full conformity check of the MS transposition instruments. The goal of this check is to ensure that MS implementation of the CCS Directive is in compliance. As of May 2013, six Member States were confirmed to be fully compliant.

The Commission recently concluded a review of the CCS Directive. The review primarily considered whether the CCS Directive was fit for purpose and whether it could be refined based on the experiences to date. The review found that CCS deployment in the EU has been slower than was originally hoped and planned, with only one project sponsor and one MS having direct experience of permitting under the CCS Directive. The lack of project experience to draw from was a key methodological challenge for the reviewers. The general consensus that emerged from the review and associated stakeholder consultations was that the CCS Directive is fit for purpose; and, while a number of articles could be usefully refined, initiating a process of modifying the CCS Directive would create uncertainty and thus potentially negatively impact CCS projects.

Elzbieta Wróblewska reminded participants that **Poland** implemented the CCS Directive in 2013 primarily through an amendment to the Geological and Mining law. The relevant CCS legislation will be overseen by the Ministry of the Environment and will only apply to large-scale demonstrations (over 250 MW).

The CCS amendment to the Geological and Mining law primarily concerns exploration for CO<sub>2</sub> storage sites. A new body is to be established, The National Administrator of Underground CO<sub>2</sub> Storages (KAPS CO<sub>2</sub>), to administer the regulation and permitting of CO<sub>2</sub> storage exploration. Unlike in most other EU MS, entities undertaking CO<sub>2</sub> storage activities in Poland, including exploration, will be required to pay a fee, 60% of which will go to the local administrative authority, and 40% to fund the KAPS CO<sub>2</sub> body.

The Ministry of the Environment will grant licenses for CO<sub>2</sub> storage operations once an appropriate local administrative body has given a positive opinion of a project. Once the permit is issued, a CO<sub>2</sub> storage operator will be required to post a financial security instrument to cover the costs of monitoring as well as decommissioning costs of the storage site.

The Polish legislation calls for a review in 2024 of the current approach to CCS development. Amendments to the legislation could be proposed and adopted at that point to reflect progress in CCS development.

The **United Kingdom** is supporting the deployment of CCS in the electricity sector through its Electricity Market Reform (EMR) process and GBP 1 billion of capital funding in the CCS commercialisation program. For renewables, nuclear and CCS, EMR has introduced a new type of feed-in-tariff that is combined with a contract-for-difference (CfD) to account for variations of market prices. Tony Ripley noted that two projects in the UK, White Rose and Peterhead, have been named preferred bidders under the commercialisation program and are currently undertaking FEED studies. Final investment decisions (FID) on these projects are expected to be taken in early 2016.

The CCS Directive was transposed into **Portuguese** law in 2012 under the Directorate General for Energy and Geology. While Ana Picado noted that CCS is not seen as a policy priority in Portugal, there is currently some activity particularly around developing a roadmap and identifying storage resources.

The Portuguese National Low Carbon Roadmap<sup>2</sup> was launched in 2012 and identified CCS as an important mitigation technology in the power and industrial sectors. More recently, the Seventh Framework Program (FP7) project, COMET reiterated that CCS could play a key role in reaching Portugal's emissions reduction targets.

In Portugal, four reservoirs within three basins have been identified as potential storage sites. It is estimated that there is around 7 140 Mt of CO<sub>2</sub> capacity across the four reservoirs, with 95% of the capacity offshore.

**Canada** is one of the leading nations in CCS deployment with four projects currently in operation or under construction. In 2014, the Boundary Dam project in Saskatchewan was commissioned, becoming the world's first large-scale application of CCS at a power station. Kathryn Gagnon reminded the participants that, in Canada, provinces have jurisdiction over onshore CO<sub>2</sub> storage options and are therefore responsible for permitting and regulation.

The Canadian Province of **Alberta** is the home of the two Canadian projects currently under construction. CCS in Alberta is regulated under a 2010 amendment to the Province of Alberta Mines and Minerals Act. The Amendment sets out that pore space ownership rests with the Crown; establishes the Post Closure Stewardship Fund (PSCF); and defines CO<sub>2</sub> storage tenure agreements and long term liability arrangements.

Alberta has also put a framework in place to address issues related to the long-term liability of storage sites. Over the operational phase of a CO<sub>2</sub> storage project in Alberta, liabilities will reside with the lessee and operator of the project. During operations, however, the operator will pay a fee into the PSCF per tonne of CO<sub>2</sub> to cover the costs of post-closure monitoring and certain other activities. After the cessation of injection, and appropriate closure of the site, the lessee will be able to apply to the Government of Alberta for a closure certificate. Once a closure certificate has been issued, Alberta becomes the owner of the stored CO<sub>2</sub>, assumes obligations as set out under various pieces of provincial legislation, and indemnifies the operator against any future tort damages.

In the **United States**, the Environmental Protection Agency (EPA) is continuing to finalise rules being developed under Clean Air Act section 111(d) and 111(b) on existing and new fossil fuel-based power generation. The Clean Power Plan is being finalised under Rule 111(d), and would call on states to develop and implement strategies to reduce power-related emissions by 30% across the United States.

Jordan Kislear briefly reviewed the proposed Clean Power Plan, noting that the EPA had proposed to set individual targets for each state based on potential estimated reductions from four key building blocks: Improving thermal efficiency of units, adjusting dispatch of electricity to reduce emissions, expanding zero or low carbon emissions generation, and through increased demand side energy efficiency. CCS was not considered as one of the available building blocks in the determination of the targets; however, states could use CCS to meet their targets.

The Clean Power Plan under Rule 111(d) regulating existing generation fleet would only come into force once new build units are regulated under Rule 111(b).

The rule promulgated under 111(b) would regulate newly built fossil fuel generation capacity. The proposed regulation would require new coal units to emit less than 500 gCO<sub>2</sub>/kWh, and new gas units to emit less than 453 gCO<sub>2</sub>/kWh.

Both of the rules being developed under 111(d) and 111(b) are expected to be finalised by the end of 2015.

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<sup>2</sup> The National Low Carbon Roadmap is available at <http://ccsroadmap.pt>.



In the United States, each well drilled for CO<sub>2</sub> injection must receive a permit from the EPA under its Underground Injection Control (UIC) program. A specific well class, Class VI, has been introduced for the geological storage of CO<sub>2</sub>. This differs from wells drilled to inject CO<sub>2</sub> for EOR, which are Class II wells. To date, six Class VI well permits have been granted across two projects. The FutureGen project, for which government funding has now been cancelled, was granted four permits and two projects at the Archer Daniels Midland (ADM) plant in Decatur, Illinois have each been granted a permit.

**Korea** has set a goal of a 30% reduction in business as usual emissions in 2020, equating to a reduction of 243 MtCO<sub>2</sub> per year from expected emissions. Of this, around 2 Mt per year is expected to come from CCS in 2020. Prof. Moon-Hyun Koh noted that Korea has a CCS roadmap and is now running several R&D streams as well as investigating the potential for geological storage. Based on the exploration results to date, Korean storage capacity is estimated to be between 1.9 GtCO<sub>2</sub> and 5.1 GtCO<sub>2</sub>.

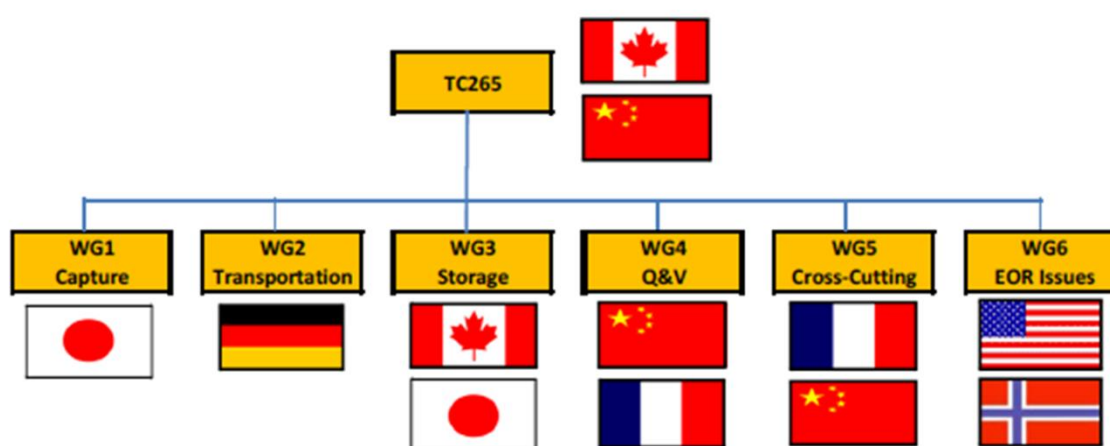
## Session 4: International activities

There are a number of international processes underway which have an impact on domestic CO<sub>2</sub> storage regulation. The fourth session provided an update on two of the international processes underway. There were presentations from:

- Sean McCoy, IEA
- Tim Dixon, IEA Greenhouse Gas Programme

The **International Standards Organisation** (ISO) convened Technical Committee 265 (TC265) to develop ISO standards for carbon dioxide capture, transportation and geologic storage. TC265 is chaired by Sandra Locke, Assistant Deputy Minister for International Relations for the Province of Alberta and the role of secretariat is shared between the Standards Council of Canada (SCC) and Standardization Administration of China (SAC). As shown in Figure 1, the TC has organized its work into six working groups covering different issues in CCS. The national flags shown in the Figure 1 indicate the nationality of the convenors.

Figure 1. The organisation of ISO TC 265 on Carbon Capture and Geological Storage.



Sean McCoy explained that participating countries in TC265 generally have national mirror committees which participate in the TC265 decision making process on the international standards instruments considered for approval. At the level of working groups, however,

discussions are largely technical in nature and primarily informed by the expertise of the individual participating technical experts (i.e., without regard to nationality or employer).

As of mid-2015, TC265 is developing:

- A technical report on capture technologies (WG1)
- An international standard on CO<sub>2</sub> transport by pipeline (WG2)
- An international standard on geologic storage of CO<sub>2</sub> (WG3)
- A technical report on quantification and verification (WG4)
- A technical report on lifecycle risk management for integrated CCS projects (WG4)
- An international standard on vocabulary for CCS (WG5)
- An international standard for geologic storage of CO<sub>2</sub> associated with CO<sub>2</sub> EOR (WG6)

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The draft technical report on capture technologies is nearly complete and is expected to be presented to TC265 for approval during 2015. Based on this report, the capture WG has identified areas for standardization and, following completion of the report, intend to develop a proposal (for the consideration of TC265) for one or more international standards on performance metrics for post-combustion capture systems. In addition, a preliminary committee draft of an international standard for pipeline transportation of CO<sub>2</sub> has gone to ballot and is expected to lead to a publically available draft international standard by fall 2015.

The London Protocol is an international treaty administered by the **International Maritime Organisation** that protects the marine environment from pollution from dumping of waste and other matter. In 2009, an amendment was passed to allow for the export of CO<sub>2</sub> for storage under the seabed. In order for this amendment to enter in to force, it needs to be ratified by two thirds of all parties to the convention. Tim Dixon reminded participants that, at present, there are 43 parties to the Protocol, however only two have ratified the CCS amendment and another five are in the process of ratification. In addition, the approval process is complicated by new parties adopting the London Protocol, a step that increases the needed number of ratifications. This amendment will be critical for the development of CCS in a few regions including Europe.

## Day 2

### Session 5 – Permitting processes: project and regulator perspectives

A first batch of projects in different jurisdictions has now been granted CO<sub>2</sub> storage permits. The fifth session featured presentations from a selection of these projects discussing the process of permitting.

- Scott McDonald, Illinois Industrial CCS (IICCS) project, ADM, United States
- J.P. Jepp, Quest CCS project, Shell, Canada
- Ward Goldthorpe, the Crown Estate, United Kingdom
- Victoria Mendes da Costa, CarbonNet, Australia

The **Illinois Industrial CCS (IICCS)** project in Decatur, Illinois is one of two projects to be granted a Class VI well permit under the EPA UIC program. The project involves the capture of around 1 MtCO<sub>2</sub> per year from the ADM biofuels plant in Decatur, Illinois which is then stored in the Mt. Simon sandstone basin.

The IICCS project is closely related to the **Illinois Basin Decatur Project (IBDP)**, which was a large scale geologic storage test program at the same location. This project injected 1 MtCO<sub>2</sub> over a three year period, ceasing in 2014. The IBDP project is now under post closure monitoring. This pilot project, funded in part by the United States Department of Energy, formed the basis for the IICCS project.

Under its UIC Class VI permit conditions, ADM is required to undertake detailed modelling, and monitoring of the near surface and of the deep sub-surface to ensure the integrity of the storage structure. In addition to the modelling and monitoring required by its Class VI permit, ADM has undertaken geomechanical modelling and will monitor shallow subsurface during injection.

The standard post injection site closure (PISC) period under the UIC is 50 years; however, ADM was granted a reduction of the PISC period to 10 years. This reduction was granted because ADM was able to demonstrate that after 10 years, the pressure in the reservoir will likely return to pre-injection levels and that the plume will have stabilised.

One challenge for ADM has been interpreting the EPA requirement to demonstrate non-endangerment in the site closure process and PISC period. ADM is one of the first projects to be granted a Class VI permit and therefore there is not yet any precedent for what will satisfy the EPA requirement for non-endangerment.

The **Shell Quest** project in Alberta, Canada is currently under construction and Shell are hoping it will start operating in autumn 2015. The Quest project will capture CO<sub>2</sub> that would otherwise be emitted from the H<sub>2</sub> production facility of Shell's Scotford upgrader, where oil sands bitumen are converted to synthetic crude oil, and store it in a saline aquifer at a depth of over 2 000m.

The Quest project is the first CCS project to be regulated under the Alberta CCS regulatory framework, and as such faced many challenges often encountered by first mover projects. There was no clear regulatory pathway for the Quest project until the Alberta Mines and Minerals Act was amended by the CCS Statutes Amendment Act in 2010. The Amendment Act clarified the ownership of the pore space and enables the Albertan Government to issue tenure agreements, assume liability for stored CO<sub>2</sub> and establish the Post Closure Stewardship Fund (PCSF). This act was followed by the more detailed Alberta Carbon Sequestration Tenure Regulation in 2011, which established the administrative details for carbon sequestration leases and requirements for measurement, monitoring and verification (MMV) and closure plans.

The tenure agreement for the Quest project includes the pore space in the storage reservoir and the caprock, and covers parts of more than 39 townships (about 3 700 km<sup>2</sup>). The Sequestration Lease Area (SLA) extends to the edge of the pressure front which prevents the pressure fronts from neighbouring projects interfering. Alongside its application for tenure, Shell also submitted its initial closure plan, which is to be updated every three years – as required by the Regulation

As of early-2015, Shell and the Alberta Government are currently determining the project-specific PCSF rate for Quest.

In the UK, the Department of Energy and Climate Change (DECC) and the Crown Estate are responsible for the approvals necessary to undertake CO<sub>2</sub> storage projects. DECC issues a Carbon Dioxide Storage License which covers the area of exploration from the surface to beneath the potential reservoir. The Crown Estate issues an agreement for lease which is an exclusive time limited lease over an area of pore space within the subsurface.

If a suitable resource is identified, DECC can issue a Carbon Dioxide Storage Permit which covers the activities associated with injection and monitoring. Once FID is taken and the project has a Carbon Dioxide Storage Permit, the project can exercise their option and be granted a storage

Lease by the Crown Estate. Interestingly, the boundaries of the granted leases are flexible and can be altered if the plume migrates beyond the initial borders.

There are two CCS projects in the UK currently being developed, **Peterhead** and **White Rose**, which have both secured an Agreement for Lease for their respective storage sites.

In Gippsland, Victoria, Australia, the **CarbonNet** “hub-style” project is seeking to build the infrastructure to underpin a multi-user CCS network. The project is still in the feasibility stages, but is moving along the regulatory pathway by securing permits for offshore storage exploration. The Gippsland Basin was selected as it was assessed to have the best and largest CO<sub>2</sub> storage reservoirs of 25 basins around Australia. The Gippsland is home to a number of large coal-fired power plants and other industries which could provide CO<sub>2</sub> to a storage site.

On the regulatory side, projects in Victoria face a challenge as there are three different primary greenhouse gas storage Acts sets of legislation that could potentially apply to a CO<sub>2</sub> storage project. The Victorian and Australian Federal Government have both developed comprehensive legal frameworks for CCS. However, there are some inconsistencies between them. These differences may be challenging for projects which straddle jurisdictional boundaries in Australia as there is one set of regulations for projects onshore in Victoria, another for projects in Victoria’s territorial waters offshore and yet another for storage in the Commonwealth jurisdiction, which begins three nautical miles from shore.

As an illustration, one such difference between the Commonwealth and Victorian legislation is in the treatment of long term liability. Under the Victorian legislation, the Victorian Government assumes ownership of the injected CO<sub>2</sub> once the site is closed, beyond this provision however, there are no specific provisions regarding other liabilities which may be transferred upon surrender of an authority. In contrast, the Commonwealth does not after site closure assume ownership of CO<sub>2</sub> from projects within its jurisdiction, but may indemnify a former licensee where there is a liability for damages and certain circumstances exist.

## Session 6 – Operation and regulation of CO<sub>2</sub>-EOR

CO<sub>2</sub> has been injected underground for decades in the United States for the purposes of enhancing oil recovery. The industry has, historically, been regulated to ensure the efficient recovery of fossil fuel resources and to minimise the environmental impact of operations. Session 6 explored the nature and regulation of enhanced oil recovery (CO<sub>2</sub>-EOR) operations. There were presentations from:

- Neils Peter Christensen, Gassnova
- John Harju, University of North Dakota
- Richard Macrory, University College London

CO<sub>2</sub>-EOR is a tertiary recovery option that can unlock an additional 10-15% of the original oil in place. The process involves injecting CO<sub>2</sub> (often alternating with water) into an oil reservoir which then mixes with the oil, causing the oil to swell, reducing its viscosity, and sweeping it towards production wells. The CO<sub>2</sub> is produced with the oil, reducing its viscosity, and allowing it to be swept it towards production wells. Some of the CO<sub>2</sub> is produced with the oil, separated from it, and re-injected in to the reservoir. Over time, increasing amounts of the injected CO<sub>2</sub> are trapped in the reservoir and remains there permanently.

Almost all CO<sub>2</sub>-EOR to date has been undertaken in the United States and Canada. However, there are a few projects in Brazil, Eastern Europe and Turkey. Niels Peter Christensen reported that in the US through 2009, 570 MtCO<sub>2</sub> has been used for CO<sub>2</sub>-EOR, of which 63 MtCO<sub>2</sub> was from

anthropogenic sources. Over the same period, U.S. CO<sub>2</sub>-EOR projects have produced in excess of 1.2 billion incremental barrels of crude oil.

As discussed earlier, operations injecting CO<sub>2</sub> for the purposes of geologic storage are regulated differently than those injecting CO<sub>2</sub> for enhanced oil recovery. In North Dakota<sup>3</sup>, regulation of CO<sub>2</sub>-EOR is focused on ensuring the greatest economic recovery of oil while minimizing the associated environmental impacts. In contrast, the UIC Class VI regulations and associated Clean Air Act Greenhouse Gas Reporting Rule for CO<sub>2</sub> storage in saline aquifers are focused on ensuring the CO<sub>2</sub> remains underground permanently.

To regulate Class VI wells, North Dakota has implemented its own regime for managing the long term liability associated with stored CO<sub>2</sub>. The State has established two funds which storage projects will pay into on the basis of a set fee per tonne of CO<sub>2</sub> stored. The CO<sub>2</sub> Storage Facility Administrative fund will fund the administration and monitoring of operating projects; while the CO<sub>2</sub> Trust fund will fund the long term management of storage sites once they have been closed.

In many jurisdictions the regulation of EOR falls under different agencies and supervisory bodies than CO<sub>2</sub> storage projects. As such, activities which in practice are very similar can be treated quite differently.

These differences may become challenging if the line between CO<sub>2</sub> EOR and CO<sub>2</sub> storage becomes blurred. In particular, issues may arise if projects seek to transition from CO<sub>2</sub> EOR to CO<sub>2</sub> storage; or when CO<sub>2</sub> suppliers seek to claim credit for the incidental permanent storage of CO<sub>2</sub> that occurs in association with CO<sub>2</sub> EOR projects.

Different jurisdictions have dealt with these issues in different ways. In the UK, the Secretary of State has the power to apply the CCS regulatory regime to any EOR projects. In Australia, the intention of the injection determines whether or not the activity is covered by the greenhouse gas storage legislation. In the US, a Class II well operator who transitions to injecting carbon dioxide for the primary purpose of long-term storage into an oil and gas reservoir must obtain a Class VI geologic sequestration permit when there is an increased risk to protected groundwater as compared to Class II operations. The draft guidance on transitioning from a Class II well to a Class VI well states that no single factor should be relied on to make a determination on risk.

## Session 7 – Interaction of CCS regulation and domestic and international emissions reduction schemes

There are a number of regional or economy wide emissions reduction schemes which have been introduced and are operating, and several more expected in the near future. There are a variety of different approaches, but they are mostly, by their nature, top down measures. CO<sub>2</sub> storage regulation has generally been project specific and bottom up in its approach. This session examined the integration of CCS specific regulation and economy wide or regional emissions reduction schemes; and how CCS is likely to feature in any global agreement signed at the UNFCCC Conference of Parties in Paris. There were presentations from:

- Paul Zakkour, Carbon Counts
- Jesse Scott, IEA
- Tim Dixon (prepared with Ellina Levina, IEA), IEA Greenhouse Gas program

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<sup>3</sup> North Dakota has primacy in regulating class II wells. Primacy means that North Dakota has put in place state specific regulations which, at a minimum, fulfil all the requirements of the EPA UIC regulations and therefore, projects only require a permit from the North Dakota Industrial Commission.

One of the first challenges in integrating CCS regulation and emissions reduction schemes is ensuring the integrity of the CO<sub>2</sub> accounting. The challenge is exacerbated when dealing with CO<sub>2</sub> storage from an EOR project. Paul Zakkour outlined greenhouse gas emissions accounting approaches for CO<sub>2</sub>-EOR, and highlighted a key issue as being whether and how to account for emissions arising from the processing and combustion of incrementally produced oil from EOR occurring outside the EOR site boundaries. This was presented as an “emissions leakage” problem on the basis that: (a) an incentive may be applied for reducing emissions by geologically storing CO<sub>2</sub> in conjunction with EOR in one jurisdiction, whilst (b) simultaneously creating emissions from processing and combustion of the incrementally produced crude oil in another.

Emissions leakage is unlikely to occur where the produced oil is processed and refined in a jurisdiction with economy-wide emission controls in place. On the other hand, it could occur where the crude oil is shipped to jurisdictions without stringent, economy-wide, emission controls in place; in such circumstances, the supply of oil could add to overall emissions.

Arguably, CO<sub>2</sub>-EOR produces oil which would otherwise have stayed underground. However, this additional oil may, to some extent, displace more expensive oil which would otherwise have been produced. On the other hand, it may just be used to reduce oil prices and therefore create new demand and/or meet suppressed demand. Two questions that need to be resolved are: does incremental oil from CO<sub>2</sub> EOR displace other oil, and if so, to what extent? And what is the net abatement effect of displacing other sources of crude oil?

Jesse Scott pointed to the **EU ETS** as an example of a regional emissions reduction mechanism. The CCS Directive has been explicitly designed to complement the EU ETS, but providing the legal basis for a CCS-equipped facility to be exempted from purchase of ETS certificates. Any issues in the integration of the two directives may emerge when the first projects are deployed in Europe. The prices for certificates in the EU ETS have not been high enough to significantly improve the economics of CCS.

The **United Nations Framework Convention on Climate Change** (UNFCCC) 21<sup>st</sup> Conference of the Parties (COP21) in Paris in late 2015 is widely expected to produce an agreement on a global approach to reducing CO<sub>2</sub> emissions. The Intergovernmental Panel on Climate Change (IPCC), the scientific advisory panel to the UNFCCC, in its Fifth Assessment Report again reaffirmed the need for CCS in addressing climate change. The report found that many of the global models could not reach the necessary cuts to emissions without CCS being available. Of the models that could reach the necessary reductions, the median increase in cost resulting from removing CCS as an option was 138%.

Specific technologies such as CCS are not expected to feature in the text of the agreement, as the agreement will largely be based on voluntary commitments from countries, called Intentional Nationally Determined Contributions (INDCs). Nevertheless, CCS can be facilitated by several of the UNFCCC mechanisms including the Green Climate Fund, the Technology Mechanism, defined Nationally Appropriate Mitigation Actions (NAMAs) or in individual INDCs.

## Concluding remarks

This meeting report is intended to be a summary of the discussion, drawing out particularly relevant and interesting discussion points, rather than a point by point record of the meeting. For more information on any of the topics discussed, please see the presentations posted on the meeting webpage.<sup>4</sup> Alternatively, please feel free to contact us here at the IEA Secretariat.

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<sup>4</sup> The meeting page is at <https://www.iea.org/workshop/7th-ccs-regulatory-network-meeting.html>

As always, we are eager to hear your views on issues of interest which the Regulatory Network could explore and how the Regulatory Network can be of the most value to participants.

To share your views, please contact Mr Tristan Stanley at the IEA Secretariat: [tristan.stanley@iea.org](mailto:tristan.stanley@iea.org).

## Annex 1: Meeting Agenda

### 7<sup>th</sup> IEA International CCS Regulatory Network Meeting, 22-23 April 2015, IEA Paris

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#### Day 1: Wednesday, 22 April 2015

08:30	Registration	
09:00	<b>Opening Session</b>	
	Welcome and opening remarks	Philippe Benoit, IEA
	Scene setting for meeting	Tristan Stanley, IEA
09:30	<b>Session 1: Long term liability workshop review</b>	
	Sean McCoy, IEA	
	Ian Havercroft, Global CCS Institute	
10:30	Coffee	
11:00	<b>Session 2: Country updates</b>	<b>Chair: Richard Macrory, University College London</b>
	European Commission	Maria Velkova, European Commission
	Poland	Elżbieta Wróblewska, Ministry of Economy
	United Kingdom	Tony Ripley, Department of Energy and Climate Change
	Portugal	Ana Picado, National Laboratory on Energy and Geology
12:45	Lunch	
13:45	<b>Session 3: Country updates</b>	<b>Chair: Tim Dixon, IEA GHG</b>
	Canada	Kathryn Gagnon, Natural Resources Canada
	United States	Jordan Kislear, Department of Energy
	Korea	Koh, Moon-Hyun, Soongsil University
15:30	Coffee	
16:00	<b>Session 4: International activities</b>	<b>Chair: Tristan Stanley, IEA</b>
	ISO/TC 265	Sean McCoy, IEA
	London Protocol	Tim Dixon, IEA GHG
17:00	<b>Closing remarks</b>	
19:30	Dinner	



**Day 2: Thursday, 23 April 2015**

<b>09:00</b>	<b>Session 5: Permitting processes: project and regulator perspectives</b>	<b>Chair: Bob Van Voorhees, Carbon Sequestration Council</b>
	Illinois Industrial Carbon Capture and Storage Project	Scott McDonald, Archer Daniels Midland
	Quest CCS Project	J.P. Jepp, Shell
	UK CCS competition projects	Ward Goldthorpe, UK Crown Estate
	CarbonNet Project	Victoria Mendes da Costa, CarbonNet
<b>11:00</b>	Coffee	
<b>11.30</b>	<b>Session 6: Operation and regulation of CO<sub>2</sub> EOR</b>	<b>Chair: Paul Zakkour, Carbon Counts</b>
	CCS & CO <sub>2</sub> EOR: comparison and standardisation	Neils Peter Christensen, Gassnova
	EOR regulation in the US	John Harju, University of North Dakota
	Regulation of EOR and the transition to CO <sub>2</sub> storage	Richard Macrory, University College London
<b>13:00</b>	Lunch	
<b>14:00</b>	<b>Session 7: Interaction of CCS regulation and domestic and international emissions reduction schemes</b>	<b>Chair: Tristan Stanley, IEA</b>
	Emissions accounting for EOR	Paul Zakkour, Carbon Counts
	Emissions trading schemes and CCS: The EU ETS	Jesse Scott, IEA
	CCS in the UNFCCC	Tim Dixon, IEA GHG
<b>15:30</b>	<b>Closing Session: Summary</b>	
	Summary and closing remarks	Juho Lipponen, IEA
<b>16:00</b>	Close	



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