International Energy Agency

# CARBON CAPTURE AND STORAGE

## *Legal and Regulatory Review*

Edition 2

May 2011

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## INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- 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.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

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The European Commission also participates in the work of the IEA.

International Energy Agency



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# Acknowledgements

This publication was prepared by Justine Garrett and Brendan Beck of the International Energy Agency's Carbon Capture and Storage Unit. Juho Lipponen, CCS Unit head, and IEA colleagues Sean McCoy, Didier Houssin, Dennis Volk, Tsukasa Yoshimura, Matthias Finkenrath and Rebecca Gaghen also provided input into the publication. The authors would like to thank Richard Macrory and Chiara Armeni from the University College London Carbon Capture Legal Programme for their support on the legal aspects of the EU CCS Directive transposition process. Thanks must also go to René Coenen from the International Maritime Organization and to Barbara Middleton and David Johnson of the OSPAR Secretariat for providing input on recent marine law developments.

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# The *Carbon Capture and Storage Legal and Regulatory Review*

The International Energy Agency (IEA) considers carbon capture and storage (CCS) a crucial part of worldwide efforts to limit global warming by reducing greenhouse-gas emissions. The IEA has estimated that the broad deployment of low-carbon energy technologies could reduce projected 2050 emissions to half 2005 levels – and that CCS could contribute about one-fifth of those reductions in a least-cost emissions reduction portfolio. Reaching that goal, however, would require around 100 CCS projects to be implemented by 2020 and over 3 000 by 2050.[1]

Such rapid expansion raises many regulatory issues, so in 2008 the IEA established the IEA International CCS Regulatory Network (Network).[2] This publication, the IEA *Carbon Capture and Storage Legal and Regulatory Review (CCS Review)*, was launched in October 2010 in response to a suggestion made at the Network's second meeting (Paris, January 2010) that the IEA produce a regular review of CCS regulatory progress worldwide. The *CCS Review* aims to help countries develop their own CCS regulatory frameworks by providing a forum for sharing knowledge on CCS legal and regulatory issues. It also identifies steps taken towards the legal and regulatory goals in the 2009 IEA *Technology Roadmap: Carbon capture and storage*. The *CCS Review* is produced every six months, to provide an up-to-date snapshot of CCS regulatory developments in contributing jurisdictions.

## Analysing trends

The *CCS Review* gathers contributions by national, regional, state and provincial governments, at all stages of CCS regulatory development. The first half of each contribution provides an overview of CCS advances over the preceding six months and those expected to occur in the following six months, with links provided to publicly available documents. The second half addresses a particular CCS legal and regulatory theme, such as financial contributions to long-term stewardship. Where a contributor is new to the *CCS Review*, an overview of CCS legal and regulatory developments to date is also provided, to give context for future editions. Each contribution is notionally limited to two pages, to ensure the information is concise and easy to consult. Where CCS legal and regulatory development has not begun or is still at an early stage, contributors provide an update on broader progress on CCS in their jurisdiction. To introduce each edition, the IEA provides a brief analysis of key advances and trends. This analysis is informed by the contributions, but the themes discussed may be relevant beyond the jurisdictions mentioned. In addition to contributions from public authorities, the *CCS Review* also includes contributions from leading international organisations engaged in CCS regulatory activities. Each contributor is given the opportunity to comment on the IEA analysis before the *CCS Review* is released on the IEA CCS website (http://www.iea.org/ccs/legal).

To help track developments in contributing jurisdictions and organisations, as well as CCS legal and regulatory themes previously addressed, each edition of the *CCS Review* includes a brief synopsis of previous editions (theme; contributing entities; key developments) (see page 105).

[1] *Energy Technology Perspectives 2010* (IEA).

[2] The Network provides a neutral forum for stakeholders to discuss global developments via topical web-based seminars and an annual meeting in Paris. As at May 2011, the Network had over 1 300 members from over 50 countries, including around 20 developing countries.

# The second edition of the *CCS Review*

The theme for this second edition of the *CCS Review* is long-term liability for stored $CO_2$. This is discussed in the second part of each contribution. Where a jurisdiction or organisation has limited potential to discuss long-term liability, broader challenges to CCS regulatory development are addressed.

For this edition, contributions were received from 28 governments and 9 international CCS organisations. Contributors that are new to the *CCS Review* are marked with an asterisk below. Contributors to this edition include:

## *Countries*

| | | |
|---|---|---|
| Australia | Japan | South Africa |
| Canada | Korea | Spain |
| Czech Republic* | Malaysia* | Switzerland |
| Finland* | Netherlands | United Kingdom |
| France | New Zealand | United States - Environmental Protection Agency |
| Germany | Norway | United States - Department of Energy |
| Ireland* | Poland* | Vietnam* |
| Italy* | Romania* | |

## *Regional jurisdictions*

| | | |
|---|---|---|
| Alberta (Canadian province)* | Queensland (Australian state)* | Victoria (Australian state)* |
| European Commission | South Australia (Australian state)* | Western Australia (Australian state)* |

## *Organisations*

Carbon Capture and Storage Association (CCSA)*
CCS Regulatory Project (CCSReg)
Global Carbon Capture and Storage Institute (Global CCS Institute)
Implementing Agreement for a Co-operative Programme on Technologies Relating to Greenhouse Gases Derived from Fossil Fuel Use (IEA Greenhouse Gas R&D Programme)
North American Carbon Capture and Storage Association (NACCSA)*
University College London – Carbon Capture Legal Programme (UCL-CCLP)
The World Bank*
World Resources Institute (WRI)
IEA

## *Further information*

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# National and regional level progress continues



The increased number of entries in this second edition of the *CCS Review* reflects ongoing progress at national and regional levels towards comprehensive CCS legal and regulatory frameworks. Seventeen government organisations from 16 countries[3] contributed to the first edition, along with five international CCS organisations, to make a total of 22 contributions. That number has increased to 38 entries in this edition, after just six months: 23 from national governments; 6 from regional governments and 9 from international organisations. In this edition we welcome for the first time the Czech Republic, Finland, Ireland, Italy, Malaysia, Poland, Romania and Vietnam; the Canadian province of Alberta; the Australian states of Queensland, South Australia, Victoria and Western Australia; and international CCS organisations CCSA, NACCSA and the World Bank. The IEA will continue efforts to involve more governments and organisations in future editions to provide a comprehensive overview of international advances.

The increase in entries enables greater insight into international trends in legal and regulatory development. Particular progress has been made in Europe, as the deadline for transposition of the EU CCS Directive[4] approaches. EU member states must complete the transposition process by 25 June 2011. Most countries are on track to meet this target, but a few will not integrate the directive into national law in time. The European Commission's enforcement powers may become relevant in this situation.

Across the Atlantic, progress is also being made towards comprehensive legal and regulatory frameworks for CCS. In the United States, the Environmental Protection Agency (EPA) has finalised two federal rules related to geological storage, under the Safe Drinking Water Act[5] and the Clean Air Act.[6] The Department of Energy reports that developments also continue at a state level: six states already have elements of frameworks in place to address geological storage. In Canada, the provinces are leading the way, with Alberta being the first Canadian jurisdiction to finalise its regulatory framework. The province is embarking on a comprehensive review process to ensure that its regulations are fit for purpose as CCS demonstration efforts ramp up in the jurisdiction.

The Australian federal government has built on its significant work to date. The government is in the process of finalising secondary legislation to support the dedicated legislation for offshore geological $CO_2$ storage that it enacted in 2008. In addition, three Australian states confirm legislation is in place to regulate onshore geological storage, with developments in a further state progressing well.

Beyond the IEA, we are pleased to have Malaysia, South Africa and Vietnam contribute to this edition of the *CCS Review*. Their contributions highlight the preparatory steps being undertaken in these jurisdictions to set the stage for framework development over the coming years.

[3] Contributions were received from two US federal government organisations: the Department of Energy and the Environmental Protection Agency.

[4] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide.

[5] 42 U.S.C. §300f et seq. (1974). Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Dioxide ($CO_2$) Geologic Sequestration Wells, Final Rule, 75 Fed. Reg. 77230 (Dec. 10, 2010).

[6] Environmental Protection Agency, Mandatory Reporting of Greenhouse Gases: Injection and Geologic Sequestration of Carbon Dioxide, Final Rule, 75 Fed. Reg. 75060 (Dec. 1, 2010).

# Long-term liability for stored $CO_2$

Long-term liability for stored $CO_2$ has been chosen as the theme of this edition because it is one of the most challenging and complex aspects of regulating $CO_2$ storage activities. Within the CCS industry, liability tends to be used as a generic term for: any legal liabilities arising from a storage site (for example, through civil law, for damage to the environment, human health or third party property); responsibility for undertaking and bearing the cost of any corrective or remediation measures associated with a storage site; and responsibility for making good any leakage of $CO_2$ to the atmosphere, where CCS operations are undertaken as part of a $CO_2$ emissions reduction scheme. "Long-term liability" is generally used to refer to any liabilities arising after the permanent cessation of $CO_2$ injection and active monitoring of the site. Where a jurisdiction allows for a transfer of responsibility, it is generally at this stage that the transfer would occur.

Discussion of long-term liability has generally focused on whether responsibility for liabilities associated with a storage site should be transferred to government or retained by operators indefinitely. The entries to this edition show a trend towards transferring liability, with Australia, the European Union and some Australian, Canadian and US states and provinces taking this approach. There is no clear consensus on this issue, however: some CCS regulation is silent on certain elements of long-term liability, which is likely to mean that the operator or related entities are liable for a storage site and the injected $CO_2$ in perpetuity. This edition demonstrates that in practice, there is much to consider beyond the preliminary question of whether liability should be transferred.

Generally, before liability is transferred from the operator, three requirements are imposed: evidence that there is no significant risk of physical leakage or seepage of stored $CO_2$; a minimum time period having elapsed from cessation of injection; and a financial contribution to long-term stewardship of the site, to minimise the financial exposure of the entity designated to take on long-term liability. There are marked differences between jurisdictions, however, on how these requirements are interpreted in legislation and the processes by which an operator can demonstrate that they have been met. The way liability is transferred also differs, with some jurisdictions transferring responsibility for certain types of liability, such as corrective or remediation measures, before liabilities arising under civil law, for example.[7] Some jurisdictions have also discussed a transfer of responsibility for certain liabilities only up to a specified threshold.

In Europe, long-term liability arrangements in EU member states are set by the EU CCS Directive. Under Article 18, all legal obligations under the directive relating to monitoring and corrective measures, the surrender of allowances in the event of leakages, and preventive and remedial action, are to be transferred to the competent authority where:

- All available evidence suggests that stored $CO_2$ will be completely and permanently contained.
- A minimum period as specified by the competent authority has elapsed (this is to be no shorter than 20 years, except where the competent authority deems that evidence of complete and permanent containment of the stored $CO_2$ is available before such period has elapsed).
- Certain financial obligations have been fulfilled.
- The site has been sealed and injection facilities removed.

Transfer of liability does not extend to cases where there has been operator fault (such as negligence or wilful deceit). All member states are obliged to transpose the provisions of the EU

[7] See, for example, the Australian federal contribution at page 23.

CCS Directive into their national law. Norway, although not formally part of the European Union, is intending to implement the EU CCS Directive as part of the European Economic Area and will also follow this approach.



In Australia, Commonwealth and state legislation generally follows principles similar to the EU CCS Directive. In most jurisdictions, transfer of responsibility extends to all liabilities associated with a storage site (*i.e.*, including liabilities arising under the common law). The exception to this is the state of Victoria, where common law liabilities remain with the operator over the long term. Given the difference in the treatment of long-term liability between certain states and the Commonwealth, there may be implications for cross boundary storage projects, an issue that is currently being considered in Australia.

As in Australia, CCS is regulated in the United States and Canada at federal and regional levels, so long-term liability is being considered across these jurisdictions. In the United States, several federal bills addressing long-term liability for geological storage have been introduced, but none have been passed by Congress.[8] The EPA is also considering a conditional exemption for $CO_2$ from federal hazardous waste legislation requirements, which could affect the magnitude of long-term liability faced by storage site operators.[9] The US Interagency Task Force for CCS has recommended that efforts to improve long-term liability and stewardship frameworks continue. As part of a series of recommendations delivered to the US President in August 2010, the task force identified four approaches on long-term liability for further consideration:

- Reliance on the existing framework for long-term liability and stewardship.
- Adoption of substantive or procedural limitations on claims.
- Creation of an industry-financed trust fund to support long-term stewardship activities and compensate parties for various types and forms of losses or damages that occur after site closure.
- Transfer of liability to the federal government after site closure (with certain contingencies).

The task force recommended that open-ended federal indemnification not be considered. At a state level, six states have enacted legislation relevant to long-term liability for stored $CO_2$, five of which provide for transfer of long-term liability to the government: Illinois, Louisiana, Montana, North Dakota, and Texas. Wyoming is the exception. In Canada, the province of Alberta has determined that it will accept long-term liability once a storage site has been properly closed and the operator has demonstrated that stored $CO_2$ is stable. Conversely, long-term liability is currently borne by individual well license holders in Saskatchewan. British Columbia is in the process of developing a long-term liability framework along with its broader CCS framework.

As well as governments, international CCS organisations are giving serious consideration to long-term liability. CCSReg in the United States, for example, is advocating the development of a federal programme to manage and limit long-term liabilities, as well as special liability arrangements for first mover projects (a "stop-gap" federal indemnity program). UCL-CCLP has highlighted the benefit of an international liability regime for the long-term stewardship of CCS projects.

[8] See, for example, the following bills which were introduced into the US Senate: 111th Congress, 1st Session, S. 1502, Carbon Storage Stewardship Trust Fund Act of 2009; 111th Congress, 2nd Session, S. 3591, Carbon Capture and Sequestration Deployment Act of 2010.

[9] See http://yosemite.epa.gov/opei/RuleGate.nsf/byRIN/2050-AG60.

## *Measuring stability*

The long-term security of storage sites is critical to the viability and environmental efficacy of CCS. To demonstrate long-term security, monitoring and verification must continue for some time after cessation of $CO_2$ injection. While the risk of unintended migration and leakage should decrease after $CO_2$ injection ceases (because it is fluid injection that causes large changes in the storage unit pressure distribution and fluid flows), injected $CO_2$ will continue to be mobile until it is eventually trapped through physical and chemical processes. Where a jurisdiction provides for transfer of liability or allows the operator to discontinue active monitoring and verification, the government needs to be confident that the site is behaving in a consistent and predictable manner and that the predicted behaviour of the site is acceptable. In general, this will require a judgement that observations and predictions of storage site behaviour (*e.g.* $CO_2$ plume movement, storage unit pressure) are converging and that the risk posed by the site is acceptable. In a jurisdiction where liability is transferred, this process will ensure that the government will not bear an unacceptable risk of storage site failure.

The contributions to this edition illustrate that, in jurisdictions that provide for transfer of responsibility, operators are generally required to demonstrate before transfer that stored $CO_2$ is behaving in a predicable manner and does not pose a significant risk to human health or the environment. Further quantitative details will vary from site to site depending on the type of formation, volume injected, the predominant trapping mechanisms, and so on. In principle, the operator will be required to monitor a storage site until the point of transfer. In Australia, however, the federal government takes on responsibility for monitoring a storage site for a minimum period of 15 years before transfer of responsibility for common law liabilities.

## *Time to hand over*

All jurisdictions require a minimum, specified time period to have elapsed after cessation of injection before liability is transferred, during which the behaviour of the site and injected $CO_2$ is monitored. This period varies considerably between jurisdictions, ranging from around 20 years to 50 years. In all cases, however, this period can be modified at the discretion of the relevant authority. This may include an extension of the time period where the $CO_2$ is deemed to not be behaving as expected or, conversely, a reduction of the time period if the relevant authority deems that all other criteria have been met before the specified time period has elapsed.

In Europe, the EU CCS Directive sets the nominal minimum time period at 20 years. The United Kingdom, Italy and Poland have all followed this guidance, directly implementing – or intending to implement – the same 20-year minimum period. Norway has also indicated that it is intending to follow the 20-year timeframe. France and Germany, on the other hand, have decided to require a 30-year minimum period before handover, to improve public confidence that the operator will not be allowed to avoid its responsibilities with respect to a storage site. At the US federal level, the EPA Class VI rule (which regulates injection of $CO_2$ for geological storage and establishes a new well class – Class VI – for wells used for this purpose) requires 50 years to have elapsed before the operator is released from post-injection site care requirements, although a different timeframe may be allowed at the discretion of the relevant authority. However, in the United States, an owner or operator may be liable for harm to underground sources of drinking water in perpetuity since the US federal government has not otherwise acted to limit this

liability.[10] Given the current lack of experience with closed $CO_2$ storage sites, many consider the imposition of a minimum time period to be arbitrary at this stage. The requirement that the $CO_2$ plume and storage site be behaving as expected could be emphasised as the more important criterion for determining when liability should be transferred.



### *Covering costs*

All governments that accept transfer of liability requires a financial contribution towards the costs of long-term stewardship of storage sites. This contribution enables the government to take on liability for the site, while covering or at least limiting its financial exposure (along with that of its tax payers). The way the contribution is collected, the amount of the contribution, and how the funds are managed vary throughout the jurisdictions that contributed to this edition. Mechanisms for accruing contributions include royalties, fees, trust funds and insurance. The trust fund is used widely, including by Alberta, Louisiana, North Dakota and Germany. The benefit of a trust fund is that it can build up over the course of a project and be used to pool risk across several projects. The US CCS Task Force is also considering a trust fund. A combination of royalties and insurance is used by Victoria in Australia to cover different parts of the CCS chain. Insurance is generally considered to only be appropriate during the operation of the plant, however, because it is difficult to insure liability indefinitely across the post-closure phase.

The entries provide little information, however, on how the amount of any financial contribution will be calculated, probably because financial security is an area of ongoing research, discussion and consultation among policy makers and stakeholders, and because several factors will vary from project to project, such as the probability of leakage events occurring, their potential magnitude and frequency, and costs of remediation. In addition, if funds are pooled, the value of the contribution required from future projects may decrease as the pool grows over time.

In many cases, the value of the contribution required will only be fully understood once more detailed secondary legislation has been completed. Germany is one of the few jurisdictions that has already specified how long-term financial security mechanisms would be structured: operators must deposit 3% of avoided emissions trading allowances each year for financial security. To support this process, studies are under way. Alberta, for example, is participating in a multi-stakeholder study led by the Global CCS Institute that aims to produce a peer-reviewed model for determining liability rates. Alberta is planning to impose a set rate per tonne of $CO_2$ injected to finance post-closure stewardship, but is currently considering how to set the rate, including whether rates should vary across projects.

## Momentum in Europe on the EU CCS Directive

As the contributions from EU member states demonstrate, efforts to transpose the EU CCS Directive have intensified across Europe as the 25 June 2011 transposition deadline approaches. Spain has now finalised transposition of the directive. The transposition process is also on track in France, the United Kingdom, Italy, Romania, Finland, and the Netherlands. France has finalised transposition of the directive's requirements into its primary legislation (the French Environmental Code) and is now focusing on implementing the directive within secondary legislation. Further work will be required to fill in certain areas not covered by the directive, such as on financial security mechanisms and calculation. The UK government is also finalising

[10] An owner or operator may be subject, after site closure, to an order deemed necessary to protect the health of persons under Section 1431 of the Safe Drinking Water Act if there is fluid migration that causes or threatens imminent and substantial endangerment to an underground source of drinking water.

implementation of the directive through secondary legislation, including *The Storage of Carbon Dioxide (Licensing etc.,) Regulations 2010*. In Italy, the Department for EU Policies, which co-ordinates the transposition of European legislation into Italian law, is currently consulting on draft CCS law finalised by the Ministries of Economic Development and of Environment. Consultation will also occur at a regional level, before the parliamentary process begins. In Romania, draft legislation was released for public consultation on 22 February 2011 and is undergoing formal government approval processes. In Finland, which expects to complete the transposition process by 25 June 2011, storage is physically impossible (*i.e.*, the country has no storage capacity), so the government need not transpose all elements of the directive. The Dutch transposition process is also on track.

Work is ongoing in Germany, Poland, the Czech Republic, Ireland and Greece.[11] The German government recently approved a draft bill transposing the directive. The bill, which was developed in consultation with the German Länder,[12] comprehensively revises the 2009 draft CCS law that stalled following public opposition in Germany. The German Bundestag (federal Parliament) still has to adopt the bill, for which it must have the consent of the Bundesrat (the German federal council, which represents the Länder at a federal level). CCS is still highly controversial in Germany, which may affect passage of the bill. Additional controversy has been generated by the inclusion of an "opt-out" clause in the draft act at the insistence of certain Länder, whereby states can designate areas as ineligible for CCS deployment, effectively vetoing CCS in those areas. In Poland, draft revisions have been made to the Geological and Mining Law and are waiting for adoption by the Council of Ministers. Following adoption, a formal act transposing the directive will be prepared for consideration by Parliament. In the Czech Republic, the Ministry of the Environment is currently considering amendments to its draft CCS law, as requested by the Czech government's Legal Council. Ireland has formed an interdepartmental committee on CCS with a view to transposition sometime in 2011; Greece is also currently forming a committee with the task of harmonising Greek law with the directive.

## *The European Commission's role in transposition*

To assist national transposition and implementation of the EU CCS Directive, the European Commission released four guidance documents on 31 March 2011, after an extended period of consultation. The documents deal with risk management across the CCS chain, site characterisation, composition of the $CO_2$ stream, monitoring and corrective measures, transfer of liability, financial security and financial contributions from operators. The provisions on financial security and contributions have generated particular interest from industry and other CCS stakeholders. The Commission will also be verifying conformity of national measures with the directive as transposition measures are officially communicated to the European Commission.

The requirement on EU member states to transpose the directive sits within a broader obligation to adopt all appropriate measures to meet obligations resulting from acts of the institutions of the European Union, including directives.[13] Directives do not automatically become part of a member state's legal system, but impose an obligation on the member state to ensure their provisions are reflected in national law. Regulations, on the other hand, automatically become part of member state law without the need for national measures. Directives are binding on member states with respect to a result to be achieved, leaving considerable discretion as to form and methods to be used for their implementation. Depending on the directive and the

[11] While Greece did not submit a formal entry to this edition, it provided a brief update on transposition status.

[12] The German states.

[13] Article 4.3 Treaty on European Union.

particularities of the relevant jurisdictions, transposition may involve a number of national implementing measures: member states may rely on existing law if it already reflects obligations under a directive, amend existing legislation or pass new legislation. Each directive specifies a time limit for transposition: this is normally around two years (as with the EU CCS Directive), but can be three years where complex administrative or legal changes are involved.



The European Commission's enforcement powers are carried out by means of infringement proceedings.[14] These powers may become relevant in the context of the EU CCS Directive, depending on progress made before 25 June 2011. There are three categories of infringement proceedings for directives: non-communication cases (member state fails to communicate transposition measures within the specified time limit); non-conformity cases (formal transposition is incomplete or incorrect); and "bad application" cases (failure to apply a directive in practice, even though there has been correct transposition). Once the deadline for transposition has passed without communication from the member state, the Commission will automatically start an infringement proceeding based on a formal failure to communicate any national measures. Formally, this process consists of three phases: letter of formal notice to the member state, which then has two months to reply; issue of a reasoned opinion if the member state's reply is not satisfactory, setting the details of the infringement and establishing a new deadline for compliance; and referral to the Court of Justice of the European Union, if the member state remains non-compliant. In practice, a good deal of informal negotiation takes place to resolve the issue during the various stages of the process and the vast majority of cases are settled without the need to refer them to the court. If a case is brought before the court and the court rules against the member state, the state must take all necessary measures to comply with the judgement.[15] If the non-compliance persists, the Commission can refer the case to the court again, recommending a financial penalty.

[14] Article 258 Treaty on the Functioning of the European Union (ex Article 226 European Community Treaty).

[15] Article 260.2 Treaty on the Functioning of the European Union (ex 228 European Community Treaty).

# Developments on the international CCS scene: London, OSPAR and Cancun

In the first edition of the *CCS Review*, we reported on progress on CCS deployment in the context of international marine laws.[16] There have been several developments since that time.



## To ratify or not to ratify: the 2009 London Protocol amendment

Article 6 of the London Protocol[17] sets out a general prohibition on the export of wastes or other matter to other countries for dumping or incineration at sea. In 2008, a CCS legal and technical working group under the London Protocol determined that Article 6 prohibits the export of $CO_2$ from a contracting party to other countries for injection into sub-seabed geological formations (irrespective of any commercial basis for the movement of $CO_2$), and that an amendment would be required to facilitate the development of CCS activities. On this basis, the contracting parties adopted a resolution in October 2009 proposing an amendment to Article 6 to provide an exception for the export of $CO_2$ streams, in certain specified circumstances. The amendment requires ratification by two-thirds of the contracting parties – effectively, 27 of the 40 countries that have ratified the London Protocol to date – to enter into force. If additional countries ratify the London Protocol, the number of contracting parties required for the 2009 amendment to enter into force will also increase.[18]

Achieving this number of ratifications will be a significant challenge. To date, only Norway has ratified the amendment to Article 6. Of the 40 contracting parties, preliminary IEA analysis suggests that only about 16 are currently pursuing CCS development and active in international CCS forums such as the Carbon Sequestration Leadership Forum, IEA Greenhouse Gas R&D Programme, Global CCS Institute and IEA. Even within those contracting parties that are actively looking at CCS and engaged in international CCS dialogue, not all are interested in offshore $CO_2$ storage or transboundary movement of $CO_2$ for offshore storage, making ratification of the Article 6 amendment a low priority. In addition, ratification of marine treaty amendments may fall outside the direct remit of energy ministers – the ministers who are most likely to be interested in facilitating CCS deployment – meaning that cross-government co-operation will probably to be required for ratification to occur. In certain countries, ratification may also be contingent on laws and regulations governing export of wastes having first been amended for CCS purposes. It is interesting to note that only one contribution to this edition of the *CCS Review* – from the Netherlands – refers to ratification of the Article 6 amendment. The Dutch are expecting to take steps to ratify the amendment over the next six months.

It seems clear that the 2009 amendment is unlikely to enter into force unless a concerted, international effort is made towards ratification.[19] While the amendment is not in force, contracting parties will be constrained in their ability to co-operate on offshore storage. Further work is needed to understand the emissions profile and potential interest in CCS of the contracting parties to the London Protocol; likely applicability of transboundary $CO_2$ transport for the purposes of offshore storage to each contracting party, either as an importer or exporter of

[16] See "Heading offshore", page 8, IEA (2010), *Carbon Capture and Storage Legal and Regulatory Review Edition 1*, OECD/IEA, Paris.

[17] 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

[18] Three countries have become Contracting Parties to the London Protocol since June 2010: Ghana, Nigeria and Yemen.

[19] Raising awareness among relevant government ministries of the importance to global CCS deployment of ratifying international marine treaty amendments, included the London Protocol Article 6 amendment, was one of eight recommendations made by the Carbon Capture, Use and Storage Action Group to energy ministers at the Clean Energy Ministerial in Abu Dhabi, April 2011.

$CO_2$ emissions, and individual CCS projects globally; and potential impact on global CCS deployment if offshore storage continues to be restricted by Article 6.

## Progress on OSPAR



Annexes II and III of the OSPAR Convention[20] were amended in 2007 to enable $CO_2$ injection into the sub-seabed under the Convention. The amendments must be ratified by at least seven parties before they will enter into force. Six have now ratified the amendments: Norway, the United Kingdom, the European Union, Germany, Luxemburg and Spain. The meeting of OSPAR contracting parties in June 2011 will consider an update from those parties yet to ratify. The majority of these countries are well advanced with their ratification processes, including the Dutch who have introduced legislation for ratification of the OSPAR amendments into the senate, and it is therefore likely that the 2007 amendments will enter into force this year.

## From Cancun to Durban: international climate change negotiations

At the "COP 16" climate change negotiations in Cancun, Mexico, in November and December 2010,[21] it was determined that CCS should be included as an eligible clean development mechanism (CDM) project activity, subject to specified issues being addressed and resolved in a satisfactory manner.[22] This is the most significant progress towards an international incentive mechanism for supporting CCS operations in developing countries over the past five years.

The Cancun decision requests the Subsidiary Body for Scientific and Technological Advice (SBSTA) to elaborate modalities and procedures for the inclusion of CCS as a project activity under the CDM, with a view to recommending a decision at "COP 17" in Durban, South Africa, in November and December 2011. The modalities and procedures are to address specified technical issues, including site selection criteria, monitoring, project boundaries, transboundary projects, accounting for project emissions, liability and risk and safety assessments. A dedicated work programme has been developed for 2011 to facilitate this process. Parties and admitted observer organisations were invited to submit views to the UNFCCC Secretariat on how the technical issues identified in the Cancun decision could potentially be addressed in modalities and procedures by 21 February 2011; the programme of work also includes a technical workshop with experts to be conducted by the UNFCCC Secretariat between June and November 2011.

The 2009 IEA *Technology Roadmap: Carbon capture and storage* suggests that around 65% of required projects in 2050 will have to occur in developing countries: the successful deployment of CCS in non-Annex 1 countries is therefore critical. To meet this challenge, large-scale funding will be required through various mechanisms, including $CO_2$ markets. As the CDM is currently the only large-scale $CO_2$ market-based funding mechanism operating in developing countries, the Cancun decision provides an important first step towards an incentive mechanism that will help finance, regulate and support CCS projects in non-Annex 1 countries. Many of the contributors to the *CCS Review,* such as Australia, Japan, Norway, CCSA, the IEA Greenhouse Gas R&D Programme, the Global CCS Institute and WRI, will be actively involved in working towards a final decision on inclusion of CCS in the CDM in Durban. Although significant progress has been made, a substantial amount of work remains before CCS projects can realise funding through the CDM.

[20] 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic.

[21] 16th Conference of the Parties and 6th Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

[22] Issues identified in Decision 2/CMP. 5, paragraph 29, as well as Decision -/CMP. 6 "Carbon dioxide capture and storage in geological formations as clean development mechanism project activities".

# Talking process: how do you develop a CCS regulatory framework?



The contributions to this edition not only demonstrate the significant progress that is being made towards developing national CCS legal and regulatory frameworks worldwide, they also provide interesting insights into the process involved in getting appropriate regulation in place. Jurisdictions implement CCS regulation in the context of different legal and regulatory environments and traditions, as well as existing resource extraction or environmental impact frameworks. This means that it is difficult to come up with universal rules on how best to develop enabling frameworks for CCS. This edition demonstrates, however, that there are common elements in the way jurisdictions are approaching the task. These trends may guide and inform national or regional governments that are setting out to develop regulation.

The IEA *Carbon Capture and Storage Model Regulatory Framework*[23] (*Model Framework*) also provides a high-level discussion of potential steps that a jurisdiction might take in implementing CCS regulation. The steps include:

- Identifying the purpose behind CCS framework development (*e.g.* will the resulting framework regulate a small number of demonstration projects, or is it intended to regulate large-scale deployment?).
- Developing an understanding of how existing regulatory frameworks address issues associated with CCS (*e.g.* to what extent do existing oil and gas, mining, waste, industrial permitting, health and safety, property rights and transportation laws already cover aspects of the CCS chain? Are any international laws, policy or commitments relevant?).
- Undertaking a "gap and barrier" analysis to compare how existing frameworks match the aims of future CCS legislation (*e.g.* are any existing provisions likely to impact on CCS deployment? What additional provisions are required to regulate CCS?).
- Determining whether existing regulation should be amended or dedicated legislation developed (*e.g.* will existing frameworks effectively regulate CCS or is a dedicated framework likely to be more suitable?).
- Potentially undertaking a review of proposed regulatory approaches (*e.g.* is CCS regulation fit for purpose?).

Several jurisdictions are taking measures to begin implementing, developing or testing CCS regulation that fall across a number of these steps.

## What comes first: regulation, or technology demonstration?

Both demonstration and deployment of CCS must be accompanied by appropriate legal and regulatory arrangements to ensure, at a minimum, the effective stewardship of $CO_2$ storage sites and the protection of public health, safety and the environment. It is less clear whether comprehensive CCS regulatory framework development should precede, run parallel with or come after pilot and demonstration projects that are intended to improve understanding of the technology. Because dedicated CCS legislation can take several years to develop, jurisdictions may prefer to develop one-off or stand-alone requirements for early projects (such as project-specific legislation or authorisations), with broader regulatory frameworks being put in place at a

[23] Available at www.iea.org/ccs/legal. The *Model Framework* was released in November 2011 and provides a practical tool that governments can use to help develop their own national regulatory frameworks.

later date. For example, the *Barrow Island Act 2003* (WA) is project-specific legislation that was enacted solely to regulate the Gorgon Project in Western Australia; the Western Australian government is now in the process of developing broader CCS regulation through amendments to the existing *Petroleum and Geothermal Energy Resources Act 1967* (WA), building on knowledge gained from the application of the *Barrow Island Act*. Alternatively, jurisdictions may review and adapt existing regulatory frameworks to govern CCS demonstration. In the Australian state of Victoria, in the absence of CCS-specific legislation the CO2CRC Otway Pilot Project was authorised under existing statutes and general approval processes, under the overarching direction of the Victorian Department of Primary Industries. The subsequent development of the *Greenhouse Gas Geological Sequestration Act 2008* (VIC) was informed, to a large extent, by lessons learnt from the Otway Project. Conversely, the implementation of the Australian state of Queensland's *Greenhouse Gas Act 2009* preceded technology demonstration.

The contributions to this entry demonstrate several approaches to the timing of broader CCS framework development vis-à-vis technological demonstration. South Korea and Poland are developing frameworks to regulate CCS demonstration first, rather than broader deployment. South Korea is undertaking a review of the existing legal and regulatory environment for CCS, which will be completed in September 2011. The outcomes of the study will provide the legal foundation to begin constructing a 10 MW pilot-scale capture plant in 2012. In transposing the EU CCS Directive, Poland has limited the application of its legislation to CCS demonstration only. After a transitional period, Poland will review the effectiveness of its CCS regulation and progress made in demonstrating CCS to determine whether commercial deployment should be allowed. In addition, both Illinois and Texas passed project-specific legislation to facilitate the development of the FutureGen project (the "Clean Coal FutureGen for Illinois Act" (2007) in Illinois and the "Act relating to the ownership and use of carbon dioxide captured by a clean coal project" (2006) in Texas).

By way of contrast, broader framework development has preceded CCS demonstration in the Canadian province of Alberta. The *Carbon Capture and Storage Statutes Amendment Act 2010*, which entered into force in December 2010, is intended to facilitate a first wave of four CCS projects in Alberta that will together store 5 million tonnes of $CO_2$ annually from 2015. The act amends several existing pieces of provincial oil and gas legislation to address regulatory barriers to CCS deployment.

In certain jurisdictions, the development of a regulatory framework for broader CCS deployment before technological deployment may be seen as a low-cost, early opportunity to build CCS capacity and understanding within government. In addition, projects may be less likely to experience unnecessary or undue delay if appropriate frameworks are put in place before deployment.

Similarly, in the United Kingdom, development of the legislative and regulatory framework is being undertaken before demonstration. The Energy Act 2008 was enacted as CCS-specific legislation to regulate the environmental impact of long-term $CO_2$ storage; the UK is currently finalising transposition of the EU CCS Directive. At the same time, the UK government has put in place a programme of publicly supported demonstration projects and announced in October 2010 GBP 1 billion in support for the first full-scale demonstration of the capture, transport and storage chain.

In both New Zealand and Switzerland, the development of regulatory frameworks for CCS is on hold pending determination of the likelihood and timing of any CCS projects.

## Co-ordinating within government: interagency working groups

Large-scale CCS projects will be among the biggest and most complex infrastructure projects ever encountered by jurisdictions, with the full CCS chain generally cutting across several existing regulatory regimes. At the domestic level, regulatory frameworks governing areas such as energy production, environmental protection, land-use planning, property rights, water and groundwater protection, waste disposal activities, health and safety, and oil and gas exploration are all likely to be relevant to development of domestic CCS regulatory regimes. In addition, international laws and policy and the international obligations of jurisdictions – such as those relating to protection of the marine environment or climate change – will also be relevant. Depending on how jurisdictions' ministries are structured and how regulatory competence is assigned, effectively regulating CCS projects is likely to require a high level of co-ordination among several government agencies. For example, a Scottish CCS Regulatory Stakeholders Group formed in 2009 to consider the permits required across the entire chain of CCS activities (capture, transport and storage through to final decommissioning) brings together seven government entities.[24]



To ensure effective communication and co-ordination between relevant governmental authorities in regulating CCS and facilitate CCS deployment, jurisdictions worldwide are establishing interagency working groups to drive and inform regulatory progress. In the United States, President Obama established the Interagency Task Force on Carbon Capture and Storage in February 2010. The Task Force brings together 14 executive departments and federal agencies and is charged with proposing a plan to overcome the barriers to the widespread, cost-effective deployment of CCS within 10 years, with a goal of bringing 5 to 10 commercial demonstration projects online by 2016. A series of recommendations were delivered to the president in August 2010.[25]

Several EU member states have also established interagency working groups to facilitate transposition of the EU CCS Directive. In Romania, transposition work started in early 2010 and is being led by the Ministry of Environment and Forests. The Ministry has set up a working group comprised of around a dozen entities, including several public authorities[26] and, to advise on certain technical aspects of transposition, industry bodies. Italy began the transposition process in September 2009 and has drafted a dedicated framework to implement storage aspects of the EU CCS Directive. The Ministry of Environment and the Ministry of Economic Development – the ministries in charge of transposition – worked in close co-operation and established a working group composed of experts from both ministries to undertake the drafting process. Ireland has also established an interdepartmental committee on CCS to co-ordinate the technical, legal and regulatory work required to implement CCS and determine an appropriate allocation of responsibilities.

Malaysia is establishing an interagency CCS Steering Committee to plan the implementation of CCS in Malaysia and drive progress. It is proposed that this committee include Petronas, Malaysia's state-owned oil and gas company.

[24] The Department of Energy and Climate Change Offshore; The Crown Estate; Marine Scotland; the Scottish Environment Protection Agency; the Health & Safety Executive and Scottish Natural Heritage.

[25] www.epa.gov/climatechange/policy/ccs_task_force.html.

[26] The Ministry of Economy, Trade and Business Environment; the Ministry of Administration and Interior; the National Agency for Mineral Resources; the National Environmental Protection Agency; the National Environmental Guard; the Romanian Energy Regulatory Authority; the Department for European Affairs; the Ministry of Justice and the Ministry of Public Finance.

## "Gap and barrier" analyses: how do existing frameworks compare with the aims of future CCS regulation?

A crucial first step in preparing to develop CCS regulatory frameworks is gaining a clear understanding of the extent to which existing frameworks at a national, regional or international level cover aspects of the CCS chain; and how these frameworks compare with comprehensive CCS legislation. In undertaking this analysis, any areas where parts of the CCS chain are not addressed represent a "gap" and any regulation that conflicts with a part of the CCS chain is a "barrier". Each existing framework should be reviewed to determine: scope and coverage (are CCS operations likely to fall within the scope of the framework?); suitability, with or without modification, to appropriately regulate CCS; whether specific derogations are required to remove any barriers to CCS and potential consequences of any modifications for existing activities and operations; and potential conflicts. Once the context is understood, any gaps in which aspects of the CCS chain are not addressed by existing laws can be identified. This process helps determine whether existing frameworks should be amended or new frameworks developed to regulate CCS.

The United Kingdom commenced development of its legislative and regulatory framework for CCS in 2007 by undertaking a review of existing regulation, to identify gaps in which aspects of the CCS chain were not addressed by existing laws. This review identified a requirement to develop dedicated legislation to regulate the environmental aspects of $CO_2$ storage, which subsequently led to enactment of the 2008 Energy Act (transposition of the EU CCS Directive in the UK builds on this act). In South Korea, the CCS regulatory development process has recently commenced with a review of relevant existing legal and regulatory systems. The review will involve three stages: first, analysis of model regulatory frameworks developed by international CCS bodies, including the IEA's *Model Framework*; second, identifying gaps between existing South Korean regulation and international best practice; and third, making recommendations on amending and/or developing CCS legislations and regulations in South Korea.

Malaysia has recently completed a Malaysia CCS scoping study that noted CCS framework development as a priority for Malaysia. Malaysia is looking to review related laws on emissions and the environment as part of this process. In developing its CCS framework, the Canadian province of British Columbia has focused on review and analysis of its existing oil and gas frameworks to identify issues, gaps and changes needed to facilitate CCS. The province has also considered regulatory models adopted in other jurisdictions and recommendations on best practice put forward by international organisations.

Finally, the World Bank has recently completed a preliminary, high-level review[27] of existing regulatory frameworks relevant to domestic and cross-regional CCS activities in the Southern African region (Botswana, Mozambique and South Africa) under its World Bank Carbon Capture and Storage Trust Fund, which was established in December 2009 to promote capacity-building in developing countries. The review found that existing regulatory systems contain elements that may be adapted to regulate CCS operations, but that there are significant gaps and legal barriers to CCS deployment.

[27] The review focused on eight specific CCS issues: classification of $CO_2$ and its legal definition; jurisdiction over the control and management of domestic and cross-boundary pipelines and reservoirs; proprietary rights to cross-boundary CCS sites and facilities; regulatory and/or licensing scheme related to storage and transportation facilities; long-term management and liability issues in domestic and cross-boundary CCS projects; third-party access rights to transportation networks, transit rights and land rights with regard to pipeline routes; regulatory compliance and enforcement schemes; and environmental impact assessment process, risk assessment and public consultation.

## Ensuring regulation is fit for purpose

Once a CCS regulatory framework is in place, jurisdictions may wish to undertake a review process to ensure regulation is fit for purpose. This may involve reviewing and updating CCS regulation based on lessons learnt from live projects, undertaking regulatory test exercises, conducting expert review processes, or similar activities. In Scotland, the government recently conducted a test exercise to assess the existing regulatory and consenting framework for CCS. The impetus for the exercise was a CCS roadmap developed by the Scottish government, which identifies as a key aim ensuring that an appropriate CCS regulatory and consenting framework is in place in anticipation of several large-scale CCS projects. As a first step, the Scottish government developed a regulatory matrix setting out key consents and licences required for a CCS project across the CCS chain, from consent to decommissioning. Over 50 separate consents were identified. The government then co-ordinated a scenario project to identify any regulatory gaps or overlaps and evaluate risks, barriers and information gaps within the existing CCS regulatory framework. This involved a two-day, "dry run" event, which used a mock CCS project application across the capture, transport and storage phases and involved all key CCS stakeholders (including industry and public interest groups). The Global CCS Institute sponsored a detailed study of the Scottish dry run and associated processes and published the *Carbon Capture and Storage Regulatory Test Toolkit* in February 2011.[28] The toolkit documents the process undertaken in Scotland to assist jurisdictions test and streamline pre-existing regulation relevant to an integrated CCS project. The Global CCS Institute intends to engage with several jurisdictions around the toolkit in 2011 and 2012, starting with Romania. In addition to undertaking the regulatory test exercise, Scotland has set up a programme monitoring board, to ensure that government, regulators and developers establish clear timeframes for project delivery that are consistent with the requirements of funders and relevant statutory processes.

Alberta has established a formal Regulatory Framework Assessment (RFA) process to undertake a comprehensive review of Alberta's CCS regulatory framework from March 2011. The process is intended to: confirm that Alberta's framework comprehensively addresses large-scale commercial deployment of CCS and is world class; determine whether CCS regulation in Alberta, which is currently dispersed over many pieces of legislation, should be consolidated to enhance transparency and utility of the regulatory regime; and enable a better understanding of the management of risks and regulatory barriers to the use of CCS technology. The RFA will be governed by a steering committee, with support from an international expert panel. Four issue-specific working groups will review existing CCS frameworks from other jurisdictions in addition to the existing regulatory regime in Alberta. Outcomes of the RFA, including recommendations on what, if any, new processes need to be put in place are expected to be delivered to the Alberta government in late 2012. This review process follows enactment of the *Carbon Capture and Storage Statutes Amendment Act 2010.*

Given the general progress in CCS technology development, jurisdictions may also wish to periodically review regulatory approaches, to ensure they are up to date and provide for effective stewardship of $CO_2$ storage sites.

[28] www.scotland.gov.uk/Topics/Business-Industry/Energy/resources/Publications/CCSRegulatoryToolkit

# Country contributions

## Australia



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### *Part 1: Developments in last six months*

Under Australia's federal system of government, the Australian Government has jurisdiction over Commonwealth waters (extending from three nautical miles offshore to the edge of Australia's continental shelf) and the states and territories have jurisdiction over onshore areas and coastal waters (up to three nautical miles). The development of legislative and regulatory systems in each jurisdiction is a matter for the jurisdiction concerned.

The Commonwealth is in the final stages of developing the *Offshore Petroleum and Greenhouse Gas Storage (Injection and Storage) Regulations 2010*, which will be the principal regulations regulating offshore injection and storage operations. A consultation draft was circulated to stakeholders and follow-up workshops were held in November 2010 to address the issues raised. The regulations are now being redrafted to reflect the key issues discussed. There was majority agreement on the regulations.

### *Developments expected in next six months*

The *Offshore Petroleum and Greenhouse Gas Storage (Injection and Storage) Regulations 2010* are expected to be finalised by mid-2011. These regulations will cover six linked elements:

- Significant risk of a significant adverse impact test.
- Declaration of a storage formation.
- The site plan for greenhouse-gas injection and storage.
- Incident reporting.
- Decommissioning.
- Discharge of securities.

### *Part 2: Long-term liability for stored $CO_2$*

Under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*, the Commonwealth will take over common law liabilities no less than 20 years after injection ceases, subject to the responsible Commonwealth Minister being satisfied as to any risks posed. This process involves:

- Once injection ceases, the title holder applies for a closing certificate. The Minister must make a decision within five years on whether to grant this certificate, and will only grant a certificate if post injection monitoring shows that the stored substance does not pose a significant risk to human health or the environment.
- A closing certificate will also require the pre-payment by the operator of monies to fund a longer-term monitoring program.

- Once the closing certificate is issued, the title holder's statutory obligations cease but common law liabilities will continue.
- At least 15 years after the closing certificate is issued, and subject to the behaviour of the stored substance being as predicted, the Commonwealth will take over common law liabilities.



There is a difference in the treatment of long-term liability between all states and territories and the Commonwealth, which has implications for cross boundary migration. The policy on cross boundary migration is currently being investigated by the CCS working group.

# Canada

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## *Part 1: Developments in last six months*

**Federal government**

On 23 June 2010, the Government of Canada (GoC) announced that it is taking action to reduce greenhouse-gas emissions in the electricity sector by moving forward with regulations on coal-fired electricity generation. These regulations, which are expected to come into effect in 2015, would require all new coal-fired units as wells as units reaching the end of their economic life to meet a stringent performance standard that would be based on parity with the emissions performance of high-efficiency natural gas generation. Under the proposed regulations, new units that incorporate technology for CCS would receive a temporary deferral from the compliance requirement until 2025.

- Speech by former Environment Minister Jim Prentice: www.ec.gc.ca/default.asp?lang=En&n=6F2DE1CA-1&news=BB5AC3DC-837A-406E-AD28-B92ED80F5A81.
- EC news release:

  www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=E5B59675-BE60-4759-8FC3-D3513EAA841C.

The GoC is working with London Protocol parties to update the guidance on the assessment and permitting of the storage of $CO_2$ streams in sub seabed geological formations, with a view to considering movement and how that should be addressed in terms of information sharing, consent, mitigation and longer term monitoring. GoC officials are engaged in Alberta's CCS Regulatory Framework Assessment.[29] The GoC is an active member of the IEA International CCS Regulatory Network and collaborates with the United States through the Clean Energy Dialogue's CCS Working Group, where one activity is working towards compatible CCS rules, standards and regulations:

- www.climatechange.gc.ca/default.asp?lang=En&n=C688B4C3-1.

**Provincial governments**[29]

British Columbia (BC) is developing a CCS policy framework. Work undertaken has focused on review and analysis of the existing oil and gas legal and regulatory framework to identify issues, gaps and changes needed to facilitate CCS project development. Research on CCS regulatory and policy models in other jurisdictions has been conducted including review of recommendations on best practices put forward by international organisations. A cross government working group has been formed to aid in review and development of policy areas. In January 2011, the Ministry of Energy and Mines facilitated a one day workshop on risk and risk assessment for CCS projects for BC government decision makers and regulators, facilitated by IPAC-CO2 Research Inc. The province is also a participant in the Alberta CCS Regulatory Framework Assessment.

[29] Alberta has submitted its own contribution to this publication, available at page 68.

CCS in Saskatchewan has been regulated under The Oil and Gas Conservation Act (the Act), enforced by the Ministry of Energy and Resources. In March 2011, the amendment of the Act passed the second reading. The amendment accomplishes the following:

- Clarifies the legal language of the Act, by changing the description of injected substance from "non-oil and gas waste" to "non-oil and gas substance". The intention of this provision is to avoid the debate about whether the injected substance is waste or a valuable commodity, such as $CO_2$, solvent, etc.
- Clauses were added to clarify the regulation of the sequestration and withdrawal of $CO_2$ and other greenhouse-gases and the disposal of other non-oil-and-gas substances (such as waste from an oil refinery).
- Expands the regulation-making power of the Ministry of Energy and Resources to properly regulate and measure the withdrawal and sequestration of substances (such as $CO_2$) from and to a well for commercial, industrial or other uses (such as enhanced oil recovery).

Bill 157, The Oil and Gas Conservation Amendment Act, 2010 can be found at the following link:

- www.qp.gov.sk.ca/documents/english/FirstRead/2010/Bill-157.pdf

Saskatchewan is also a participant in the Alberta CCS Regulatory Framework Assessment.

CCS Nova Scotia, a non-profit public-private-academic research consortium, is in the final stages of the development of a legal report (including gap analysis for legislation) plus a regulatory roadmap for implementation of a pilot CCS project in Nova Scotia.

## *Developments expected in next six months*

In BC, a draft CCS Policy Framework is expected to be completed within the next six months.

In Saskatchewan, the third reading of the Act is expected to be in the spring of 2011, with no major controversy foreseen. It is expected that the Act will be proclaimed by fall of 2011.

The expected completion date of CCS Nova Scotia's legal report and regulatory roadmap is spring of 2011, for release in summer of 2011.

## *Part 2: Long-term liability for stored $CO_2$*

In BC, a proposed CCS long-term liability model is being developed, as part of the CCS Policy Framework.

The long-term liability for storing $CO_2$ in the geo-formation in Saskatchewan is currently borne by individual well license holders, regulated under The Oil and Gas Conservation Act. When a well is abandoned, the well license holder will need to go through a proper process to abandon a well, as requested by the Ministry of Energy and Resources. After the Ministry approves the abandon plan, a letter of approval will be issued to the well license holder. The Ministry holds the right to audit the abandoned well. If remediation is required after abandonment, the Ministry will hold the last well license holder responsible. If the last well license holder is not able to afford such financial responsibility, the previous well license holder will assume such liability.

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## *Part 1: Developments in last six months*

The Ministry of the Environment submitted a proposed CCS law for approval by the government on 14 March 2011. The government's Legal Council has sent the draft law back to the Ministry of Environment for revision. Since 2011, the Ministry of Industry and Trade has been a co-sponsor of the law.

## *Developments expected in next six months*

The Ministry of the Environment will submit a revised law for transposition of the EU CCS Directive to the government. After the government approves the proposal it will be forwarded to the parliament. It is expected that the House of Representatives will approve the proposal upon first reading. After the Senate approves the proposal, it will be signed by the President and come into force.

The most promising storage sites are currently considered to be aquifers in northern Bohemia and depleted oil fields in southern Moravia. Furthermore, several options of carbon capture and use are being evaluated.

## *Part 2: Long-term liability for stored $CO_2$*

The draft Czech act is in accordance with EU CCS Directive provisions regarding transfer of responsibility (*i.e.* Article 18 of the EU CCS Directive). Long-term liability will transfer to the state 20 years after closure of a $CO_2$ storage site, provided that all prerequisites have been met:

- All available evidence indicates that the stored $CO_2$ will be completely and permanently contained.
- A minimum period, to be determined by the competent authority has elapsed. This minimum period shall be no shorter than 20 years, unless the competent authority is convinced that the criterion referred to in the previous point is complied with before the end of that period.
- The financial obligations have been fulfilled (financial contribution has been transferred).
- The site has been sealed and the injection facilities have been removed.

Transfer of liability to the state is obligatory according to the EU CCS Directive.

# Finland

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## *Part 1: Developments in last six months*

Transposition of the EU CCS Directive into Finnish legislation is being undertaken by the Ministry of the Environment, in co-operation with the Ministry of Employment and the Economy.

Transposition is relatively easy in Finland as the country does not have any suitable storage capacity. As studies indicate, underground storage requires sedimentary rocks with some porosity. These are not available inside Finnish territory. In Finland, all deep rocks are expected to be crystalline basement rock and not suitable for storage:

- Potential for CCS in the Nordic region, VTT research notes 2556, www.vtt.fi/inf/pdf/tiedotteet/2010/T2556.pdf.

## *Developments expected in next six months*

Transposition of the EU CCS Directive into Finnish legislation will be done by 25 June 2011.

Right now, there are no CCS projects in Finland (see discussion under 'Annex 1: Progress to 2011'), but the transposition of the directive is being undertaken to enable potential CCS with ship or pipe transport from Finland in the future.

## *Annex 1: Progress to 2011*

In Finland, there has been one CCS project proposed, namely retrofitting the MeriPori coal powered plant (565 MW) on the West Coast of Finland with CCS. This project was called Finncap. It would have used ship transportation and the final storage of $CO_2$ was planned to be in the depleting oil and gas fields of the Danish North Sea. The project was discontinued in October 2010, based on power company Fortum's (co-owner of the plant) updated strategy:

- www.vtt.fi/files/projects/ccsfinland/seminaari2010/12-iso-tryykari.pdf.

A small national CCS programme focusing on CCS in combined head and power and bio-CCS is starting (five years, total volume EUR 20 M):

- www.vtt.fi/files/projects/ccsfinland/seminaari2010/13-nieminen.pdf.

# France

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## *Part 1: Developments in last six months*

Over the last six months, France has been progressing on the transposition of the EU CCS Directive. The General Directorate for Energy and Climate Change[30] is in charge of this work. EU CCS Directive requirements fall within the categories of law, regulation or administrative provisions, depending upon the principles and level of details they introduce. While the entry into force of law-type provisions is now effective[31], the last six-month period was dedicated to the transposition of regulatory provisions. A first regulation has been drafted. It aims at finalising the transposition of the EU CCS Directive in accordance with the transposition deadline set by Article 39 of the directive (25 June 2011).

While finalising the transposition work, including reference to annexes, this draft regulation does not cover some of the topics unsorted by the directive itself, including the calculation method for financial security or financial mechanism, criteria for the composition of $CO_2$ stream, storage perimeter, etc. However, it brings complementary provisions related to injection tests which can take place under the exploration permit. These complementary provisions address, among other things, $CO_2$ stream quantity injection threshold and the necessary protection of underground waters. Provisions introduced by this regulation will be hosted by the Environmental Code. Provisions will also bring changes in the Mining Code. The draft regulation is not publicly available yet. It will be available within the next six months.

## *Developments expected in next six months*

The draft regulation will be presented to the State Council early summer before entering into force. In parallel, a working group started early this year, made up of public related organisations involved in geological storage of $CO_2$, is expected to hand out its work related to $CO_2$ storage risk assessment and related approaches to demonstrate the safety of a storage site. This work may contribute to revising administrative provisions for $CO_2$ storage. Such provisions will not be drafted during the next six month period.

## *Part 2: Long-term liability for stored $CO_2$*

Long-term liability provisions in France are those set by the EU CCS Directive, which means a transfer of responsibility to the state after a minimum monitoring period has elapsed and provided that the provisions of Article 18 of the directive are met, including that all available evidence indicates that the stored $CO_2$ will be completely and permanently contained. Available evidences are brought together by the operator in a report that shall demonstrate, at least:

- The conformity of the actual behaviour of the injected $CO_2$ with the modelled behaviour.
- The absence of any detectable leakage.

[30] www.developpement-durable.gouv.fr/-Energie-et-Climat,123-.html.

[31] Provisions can be found in the Environmental Code under articles L. 229-27 to L. 229-51 (www.legifrance.gouv.fr/affichCode.do?cidTexte=LEGITEXT000006074220).

- That the storage site is evolving towards a situation of long-term stability.

The public is generally reluctant to the idea of transfer of responsibility to the state, given that the state ends up with potential troubles left by the private sector. However, the true philosophy of this procedure is based on a different concept, aimed at bringing safety guaranties and confidence to the public in a sense that at any time after closure, there will be someone responsible (the state) for the storage site beyond the lifetime of the former operator.



As far as the responsibility transfer is concerned, it is worth noting that the responsibility transferred to the state only covers:

- Monitoring, prevention and corrective measures fulfilled on the basis of the post-closure plan.
- All obligations relating to the surrender of allowances in case of leakages pursuant to Directive2003/87/EC.

Environmental liability[32] still falls within 30 years to the former operator of the site.

Key transfer of responsibility provisions can now be found in the Environmental Code.[33] Complementary regulations are under preparation. They mainly consist in giving details about the transfer procedure. The end of injections and the entrance into the long lasting monitoring and further transfer of responsibility period is critical, as revenues from storage end and expenditure will continue (monitoring, reports, transfer of responsibility studies, financial mechanism ...). Financial securities bring a guarantee that the operator will face its responsibilities.

A minimum monitoring period conducted by the operator following the end of injections is set for 30 years[34]. It can be reduced down to a bottom line of 10 years under strict conditions under ministerial decision,[35] having in mind that the reduction of a monitoring period will most probably trigger the transfer of responsibility procedure.

A financial mechanism on the basis of which the operator contributes financially to the cost incurred by the transfer of responsibility to the state has been introduced. This financial mechanism encompasses costs over a 30 year period resulting from monitoring and any other necessary actions, to bring confidence that the $CO_2$ will be permanently stored. As part of the financial mechanism, the former operator shall also give to the state, on a cost-free basis, all relevant data and equipment necessary to undertake its new responsibilities.

After the transfer of responsibility, no other costs can be recovered by the state from the former operator, unless there has been fault on the part of the operator, including cases of deficient data, concealment of relevant information, negligence, wilful deceit or a failure to exercise due diligence. Financial security and the relevant storage lease will cease at the time the transfer of responsibility decision is taken. The situation where the storage permit has been withdrawn from the operator is also taken into consideration. If all available evidence indicates that the stored $CO_2$ will be completely and permanently contained, the decision to transfer is made.

Finally, transfer of responsibility is the legitimate outcome of any $CO_2$ storage. Therefore, this decision, taken at ministerial level by the Ministry of Mines and Environment, must be anticipated and prepared from the time the storage permit is instructed and granted and through continued follow up of the storage site (including update of storage permit, reporting, inspections, etc.).

[32] See article L. 152-1 of the Environmental Code : « les obligations financières liées à la réparation des dommages causés à l'environnement par les installations, travaux, ouvrages et activités régis par le présent code se prescrivent par trente ans à compter du fait générateur du dommage.»

[33] See articles L. 229-46 & L. 229-47 of the Environmental Code.

[34] Article 18 of the EU CCS Directive states that "a minimum period, to be determined by the competent authority has elapsed. This minimum period shall be no shorter than 20 years, unless the competent authority is convinced that the criterion referred to in point (a) is complied with before the end of that period".

[35] Provisions on who can take the decision to reduce the minimum period is part of the draft regulation.

# Germany

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## *Part 1: Developments in last six months*

The competent ministries have comprehensively revised the 2009 draft CCS act. Co-ordination within the federal government began in summer 2010. The draft was also forwarded to the federal Länder and relevant associations. In addition, hearings were held with the Länder and the associations.

## *Developments expected in next six months*

The new draft act is scheduled to be adopted by the federal government in the coming spring, after which the parliamentary procedure (Bundesrat and Bundestag) will be initiated. It should be borne in mind that CCS technology – and hence the draft act itself – is a highly controversial topic of discussion in Germany (see Edition 1 of the *CCS Review*).

## *Part 2: Long-term liability for stored $CO_2$*

Under the draft, the operator has liability for the storage site during the operational phase, decommissioning and the aftercare phase. Before being granted approval for storage, operators must demonstrate that they are financially robust. Furthermore, there must be financial security to cover all relevant risks. This security can take the form of insurances, guarantees and other securities, or a combination of these. Additional liability for operators of the capturing installation (*e.g.* power plant operators) is not envisaged.

Under the draft, transfer of liability to the state shall only be possible at the earliest 30 years after the conclusion of the decommissioning phase. Another prerequisite for transfer is that the operator can prove the long-term security of the storage site. In order to be able to cover any risks after the transfer of liability, the draft stipulates that the operator must save towards aftercare during the operational phase. To this end, the operator must deposit with the competent authority the equivalent of 3% of the emissions trading allowances which the storage saves each year. The amount saved plus interest is at the disposal of the competent authority for monitoring the site and repairing any damage in the time after the transfer of liability.

If the operator has given false or incomplete information in the proof of the storage site's long-term security, or if it only becomes apparent after the transfer of liability that the operator has contravened the provisions of the storage approval, the draft specifies that the competent authority shall not be restricted to the sum saved by the operator for aftercare. In such a case, the draft lays down that damages can be sought against the operator retroactively for all costs arising.

The regulations envisaged for financial security and aftercare contributions aim to prevent, as far as possible, the transfer of the financial risks to the state and consequently to the taxpayer. In addition, operators know from the beginning what costs they will incur in the context of the transfer of liability. This increases the legal and planning certainty. All in all, the planned regulations for financial security and the aftercare contribution are an expression of the polluter pays principle.

# Ireland

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## *Part 1: Developments in last six months*

The Government's Interdepartmental Committee on CCS co-ordinates the technical, legal and regulatory work that is required to implement CCS in Ireland.

Allocation of responsibilities for various aspects of CCS implementation is being finalised.

No relevant documents have been published in the last six months.

## *Developments expected in next six months*

Transposition of the EU CCS Directive is planned for 2011.

## *Part 2: Long-term liability for stored $CO_2$*

The matter of long-term liability for $CO_2$ storage is under consideration by the Interdepartmental Committee on CCS.

## *Annex 1: Progress to 2011*

Geological studies of suitable sites have been undertaken.

# Italy

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## *Part 1: Developments in last six months*

The EU CCS Directive, published on the Official Journal on June 5 2009, became effective on 25 June 2009. The Environmental Commission of the Italian parliament proposed to implement such directive – to be adopted by June 2011 - by Law "Comunitaria 2009" (all European directives are implemented in Italy by means of Law Comunitaria which is adopted each year).

Drafting work on the CCS law resumed in September 2010. The Ministry of Economic Development and the Ministry of Environment have improved the draft with regard to some legal aspects, together with the respective legal offices of the two Ministries. A final draft was sent at the end of 2010 to the Department for EU policies, which is the structure used by the Presidency of the Council of Ministers in the framework of relations between the Italian Government and the European institutions, and performs co-ordination activities in the transposition of European legislation into Italian law.

There are no publically available CCS legal and regulatory documents.

## *Developments expected in next six months*

Consultations at the Department of EU policies will continue. The final revised draft CCS law will be sent also to regional governments before the CCS law moves to the parliamentary process. The conclusion of the EU CCS Directive's transposition into the Italian legal framework is envisaged within June 2011, in time with directive's requirements.

## *Part 2: Long-term liability for stored $CO_2$*

The draft CCS law foresees that a $CO_2$ storage site can be closed after authorisation from the Ministry of Economic Development in partnership with the Ministry of the Environment, if the conditions set out in the authorisation as regards the closure are fulfilled, on the reasoned request of the operator, or in consequence of the withdrawal of the storage permit in the event of default or negligence. It is expected that in the latter case, the Ministries are responsible for monitoring and remedial action and the obligations arising out of the Decree, by recovering the costs incurred by the operator, while in the first two cases and up to the authorisation for the transfer of the responsibility of the site, the storage site continues to be the responsibility of the operator.

The operator must fulfil all obligations and actions foreseen in the plan for the post-closure phase, which is prepared in accordance with the criteria approved in the granting of storage permits. It is expected that such an interim plan is updated, if necessary, taking account of the risk analysis, best practice and technological improvements.

It is also expected that the operator has the right to call upon - after a period of at least 20 years after the closure of the site - the transfer of the site to the state, which will assume its responsibilities. The operator shall submit a detailed report demonstrating the long-term safety of the $CO_2$ storage site, the payment of a financial contribution to the post-closure phase, the

sealing of the site and the decommissioning of injection plants. The Ministry of Economic Development in partnership with the Ministry of the Environment may authorise the transfer before the period of 20 years, where the operator has met all the obligations required.

The Ministry of Economic Development provides the European Commission with reports that justify the transfer of responsibility and any other related information taken into account when approving the transfer. The Ministry also takes note of any non-binding opinion expressed by the European Commission on the approval before taking the final decision and notifying the final decision to the European Commission.



It is expected that after the transfer of responsibility, periodic inspections and monitoring can be reduced to a level that allows the recognition of leakages or significant irregularities. In case of leakages or significant irregularities, monitoring is intensified by supervisory bodies in ways that are appropriate to assess the magnitude of the problem and the effectiveness of remedial action.

It is expected that in the event of a fault of the operator, including incomplete information provided, concealment of useful information, negligence, fraud or failure to exercise due diligence, the Ministry of Economic Development recovers the costs incurred by the operator after the transfer of responsibility.

## *Annex 1: Progress to 2011*

As stated above, the EU CCS Directive is being implemented in Italy by Law "Comunitaria 2009". For different parts of the CCS value chain, the following legislation will apply:

- Capture: current legislation: DLGS n. 372 approved 4 August 1999, "Implementation of Directive 96/61/CE concerning Integrated Pollution Prevention and Control", DLGS n. 59 approved 18 February 2005, "Full implementation of Directive 96/61/CE concerning Integrated Pollution Prevention and Control".
- Transport: current legislation concerning gas transport: DLGS n. 152 approved 3 April 2006 "Environment matter laws", DLGS n. 4 approved 16 January 2008 "Further corrective and supplementary displays concerning DLGS n. 152 approved 3rd April 2006 about environment laws".
- Storage: the Ministries of Economic Development and of Environment are drafting a framework law on storage exploration licenses, according to the EU CCS Directive.

Italy's preparation for a CCS law started in September 2009. The Ministries in charge - the Ministry of Environment and the Ministry of Economic Development - worked in close co-operation and a working group composed of experts belonging to the two Ministries was established. The first draft was prepared in March 2010. The main provisions were:

- National storage site potential analysis.
- National register and data base establishment for $CO_2$ storage.
- Procedure for exploration permit (each storage site requires prior exploration).
- Licensing process through a comprehensive plan approval procedure for storage permit conditions.
- Obligations for operators of CCS storage sites (i.e. responsibilities, removal, remediation, reporting).
- Liabilities during injection, after decommissioning and up to transfer of responsibility.
- Conditions for decommissioning and long-term monitoring.

- Condition for the transfer of responsibilities from operator to state not earlier than 20 years after closure.
- Modification of existing regulatory framework for Environmental Impact Assessment; capture readiness for large combustions plants.



Consultations with main industrial and R&D stakeholders started in April 2010 and continued up to July 2010. The draft CCS legal framework was generally well-received by experts. Many CCS workshops have been organised in Italy in the last two years, with a relevant participation of main stakeholders.

# Japan

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## *Part 1: Developments in last six months*

None.

## *Developments expected in next six months*

2011: prepare technical and procedural documents for review of the environmental impact assessment report and the monitoring plan for storage permits.

- Ref: Article 18.9 and 18.12 of the Marine Pollution Prevention Law and the related ordinance

2011 – 2014: accumulate knowledge about the marine ecosystem in waters around Japan, which is essential for the environmental impact assessment review.

- Ref: Article 18.12 of the Marine Pollution Prevention Law.

## *Part 2: Long-term liability for stored $CO_2$*

2011 – 2014: discuss the long-term management system of the storage site, such as the post-injection monitoring period and liability transfer, to ensure the smooth implementation of offshore CCS.

# Korea

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## *Part 1: Developments in last six months*

Korea has undertaken a research project titled "A review on CCS legal & regulatory system" which has three phases: 1) review on standard regulatory frameworks published by the IEA (2010) and the Global CCS Institute (2009); 2) identify the gap between existing regulations (of Korea) and other model frameworks; and 3) suggest recommendations for proper CCS regulatory frameworks in Korea.

Korea has a proper regulatory system in the areas of capture, compression, and transportation. Amendments of existing regulations would be sufficient for the purpose of constructing CCS demonstration plants beginning 2012 (10MW scale, amine absorption and dry sorbent).

Korea does not have experience in injecting and storing $CO_2$ at this time. An international, collaborative storage project started at the end of 2010. Offshore storage projects are being considered for future integration with capture facilities (2017).

In September 2010, the "Marine Environment Management Law" was amended to provide a legal ground on which $CO_2$ stream produced in capture facilities can be disposed of in the ocean.

## *Developments expected in next six months*

The research project "A review on CCS legal & regulatory system in Korea" will be concluded in September 2011. Recommendations for the Korean CCS legal and regulatory framework will be suggested.

The expected outcomes of the study will be guidance on amending and/or developing CCS legislations and regulations. Also, this study will be the legal foundation for beginning construction of 10MW pilot scale capture plants in 2012.

In addition, recommendations on the financial, incentive and investment systems will be suggested to encourage investment in CCS demonstration plants.

## *Part 2: Long-term liability for stored $CO_2$*

At this time, and given that Korea does not have experience in injecting and storing $CO_2$, there is not much discussion on the long-term liability issue.

However, the Korea National Oil Corporation will be responsible for the construction and operation of offshore storage facilities in the future and long-term liability will need to be addressed at that time.

There is a possibility that a number of neighbouring Asian countries will construct and operate joint offshore $CO_2$ storage facilities. In this case, long-term liability will be one of the key issues among countries.

# Malaysia

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## *Part 1: Developments in last six months*

Malaysia undertook a scoping study for CCS in Malaysia in 2010. The study was of a preliminary nature and touched on issues relating to emissions, probable storage sites in Malaysia, transportation, costs, etc.

The study also investigated the legal and regulatory aspects of the implementation of CCS in Malaysia and reported that there was a lack of strong existing legal and regulatory structure in Malaysia to address all three components of CCS, *i.e.* capture, transport and storage.

Thus, the establishment of an appropriate legal and regulatory framework would be a primary concern before Malaysia could proceed further on CCS implementation. This would involve concerted efforts by all the relevant stakeholders in Malaysia. In this regard, international co-operation would also be necessary to build capacity in Malaysian stakeholders to prepare the framework.

In addition, Malaysia would also have to look into the other aspects of CCS implementation in the country, *i.e.* the commercial feasibility for CCS implementation in the related sectors of the economy, financing, public acceptance etc.

Thus, there is much preparatory work ahead for Malaysia before CCS can be implemented in the country.

## *Developments expected in next six months*

The Ministry of Energy, Green Technology & Water is planning to establish an inter-agency CCS Steering Committee to plan for the implementation of CCS in Malaysia.

The foremost activity of the Steering Committee will be to develop further capacity building programs in CCS for the stakeholders. In addition, there is much work to do on acceptance of CCS in Malaysia.

As the Scoping Study has implied, Malaysia also needs to establish an acceptable legal and regulatory framework for CCS in the country. This exercise would involve, amongst other things, the review of the related laws on emissions and the environment.

Malaysia is also contemplating a Storage Study with the assistance of the Global CCS Institute.

## *Part 2: Long-term liability for stored $CO_2$*

Malaysia has yet to address the issue of long term liability for storage of $CO_2$. This is an area proposed to be covered in the legal and regulatory framework to be established.



## *Annex 1: Progress to 2011*

At the UNFCCC COP-15 in 2009 in Copenhagen, Malaysia made a conditional commitment to reduce the carbon intensity of the country by 40% in 2020 based on 2005 levels.

The power sector of Malaysia is the biggest emitter of $CO_2$ in Malaysia because, as of 2010, fossil fuels accounted for about 89.6% of the fuel mix and out of that, coal represented about 32.1%. It is anticipated that coal will continue to be one of the main fuels for the power sector accounting for 41.5% of the fuel mix by 2020. Thus, CCS technology poses an attractive option to be used by Malaysia to reduce $CO_2$ emissions from coal-fired generation of electricity in the long run.

Acknowledging the future use of CCS, Malaysia joined the Global CCS Institute on 13 August 2009 and was the first governmental entity, outside of Australia, to join. Since joining the Global CCS Institute, a number of capacity building events in CCS have been held in Malaysia, with the close co-operation of the Institute.

Malaysia has also laid the foundation for CCS implementation in the country by undertaking a scoping study for CCS in Malaysia in 2010. This study is discussed under “Part 1: Developments in last six months” above.

# The Netherlands

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## *Part 1: Developments in last six months*

Over the period since July 2010 the following CCS legal and regulatory developments have occurred in the Netherlands. Two changes to the Implementation Proposal (IP) of the EU CCS Directive in the Mining Act were sent to parliament (Second Chamber) (the IP was originally sent to parliament on 17 March 2010 – implementing the EU CCS Directive, as well the OSPAR requirements). An explanatory note on the IP answering written questions of members of parliament was also sent. The IP was the subject of a plenary debate on 20 January 2011. Parliament took a positive vote on the IP on 25 January 2011. No amendments to the proposed text were accepted. Then the IP was sent to the First Chamber of Parliament.

Publically available CCS legal and regulatory documents released over the period since July 2010:

- 26.7.2010: https://zoek.officielebekendmakingen.nl/dossier/32343/kst-32343-7?resultIndex=24&sorttype=1&sortorder=4 (note containing changes to the IP).
- 26.7.2010: https://zoek.officielebekendmakingen.nl/dossier/32343/kst-32343-6?resultIndex=25&sorttype=1&sortorder=4 (explanatory note on the IP answering written questions of members of Parliament).
- 28.9.2010: https://zoek.officielebekendmakingen.nl/dossier/32343/kst-32343-8?resultIndex=23&sorttype=1&sortorder=4 (2nd note containing changes to the IP).
- 2.2.2011: https://zoek.officielebekendmakingen.nl/dossier/32343/kst-32343-A-n1?resultIndex=4&sorttype=1&sortorder=4 (the IP such as proposed to the First Chamber/Senate).

All publically available documents regarding the IP and parliamentary debate can be found using the following web link:

- https://zoek.officielebekendmakingen.nl/dossier/32343?_page=1&sorttype=1&sortorder=4.

## *Developments expected in next six months*

The IP will be first discussed in the First Chamber/Senate in a commission meeting on 15 March. The First Chamber/Senate will vote on the IP (date yet to be decided upon) after which the IP will enter into force by a date to be set by a royal decision.

To further implement some details of the EU CCS Directive the Mining Decree and the Mining regulation will be amended, as well the "*Besluit milieueffectrapportage*" (environmental impact report) and the "*Besluit emissie-eisen stookinstallaties milieubeheer A*" (emission requirements combustion plants). These changes of regulation will come into force together with the change of the Mining Act.

Regarding long-term liability in case of damage of $CO_2$ storage the Ministry of Security and Justice is currently preparing new legislation: see "Part 2: Long-term liability for stored $CO_2$".

Steps will be taken to ratify the amendment to Article 6 of the London Protocol.

In accordance with the procedures for NER300 a framework for NER300 subsidies was published end of 2010.



## *Part 2: Long-term liability for stored $CO_2$*

Under the current IP no special rules on long-term liability are introduced. Therefore, in all cases of damage caused by $CO_2$ storage the liability rules of the Civil Code (Burgerlijk Wetboek) apply. It will depend on the precise circumstance if and when damage occurs, who will be liable during the period after the responsibility for a storage location has been transferred to the state. For environmental damage, special rules are applicable on the basis of the EU CCS Directive on Environmental liability.

The Ministry of Security and Justice is currently preparing new legislation to introduce special liability rules. This will introduce a special regime for $CO_2$ storage. Expectations are that a proposal could be ready to be presented to the Council of State mid-2011.

# New Zealand

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## *Part 1: Developments in last six months*

There have been no substantial developments in the last six months.

In regards to our initial entry, we stated that CCS is contemplated as a carbon reduction activity in the NZ Emissions Trading Scheme (NZETS). The IEA have asked that we elaborate on this point in this edition of the *CCS Review*.

The NZETS recognises the removal of $CO_2$ through two mechanisms:

- Through the planting of forests.
- Producing products that either permanently embed carbon or temporarily embed carbon prior to export, or store $CO_2$ after capture (called "other removal mechanisms").

CCS is recognised in the Climate Change Response Act 2002 (the Act) as an "other removal mechanism".

Section §168 (1)(n) of the Act states that the Governor-General may, by Order in Council, make regulations prescribing criteria for registering as a participant in relation to an activity listed in subpart 2 of Part 2 of Schedule 4. Schedule 4 provides that the storing of $CO_2$ after capture will be considered a removal activity, where:

- A person is required to surrender units under the Act in respect of the emissions that would result if the $CO_2$ was not captured and stored.
- The result of the $CO_2$ being captured and stored is a reduction from emissions reported in New Zealand's annual inventory report under the Convention or Protocol or any emissions report from New Zealand under a successor international agreement.
- Any prescribed threshold is met.

Effectively, the primary legislation, the Climate Change Response Act 2002, recognises CCS as a removal mechanism (and is therefore eligible for NZU's), although the details of exactly how CCS will be managed under the regulations have not been developed. Once/if these regulations are developed, they will only become official if/when the Governor General brings them into force through an order in council.

## *Developments expected in next six months*

There are no substantial developments expected in the next 6 months (especially as New Zealand has an election tabled for Saturday 26 November 2011).

The timing of inclusion of any CCS regulations in the ETS will ultimately be determined by the likelihood and timing of any CCS project in New Zealand. At this stage, it is considered unlikely that CCS regulations will be developed in the short term.

## *Part 2: Long-term liability for stored $CO_2$*

New Zealand continues to participate in a number of international CCS collaborations. New Zealand will look to these collaborations for support and advice when it is an appropriate time to develop a regime that manages long-term liability for stored $CO_2$.

# Kingdom of Norway

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## *Part 1: Developments in last six months*

The Ministry of Petroleum and Energy and the Ministry of Labour continue to work on the new regulations on transport and storage of $CO_2$ in subsea reservoirs on the Norwegian Continental Shelf. The work has been somewhat delayed, due to internal considerations in the Ministries involved on the formulation of the draft regulations. Consequently, no draft regulations have as yet been submitted for public consultation.

## *Developments expected in next six months*

The plan is still to submit two new sets of regulations relating to transport and storage of $CO_2$ in sub-sea reservoirs on the Norwegian Continental Shelf for public consultation at the same time. These regulations will be drafted by the Ministry of Petroleum and Energy and the Ministry of Environment, respectively. The draft worked out by the Ministry of Petroleum and Energy will regulate transport and storage of $CO_2$ in relation to managing the $CO_2$ and the geological reservoirs as natural resources (resource management), as well as issues related to health, safety and work environment in this respect.

The Ministry of Environment will regulate the environmentally safe storage of $CO_2$.

The two drafts are planned to be submitted for public consultation within the next few months.

## *Part 2: Long-term liability for stored $CO_2$*

This issue has not yet been finally decided in Norway. However, the aim is to include the EU CCS Directive in the EEA (European Economic Area) Agreement and implement the directive into Norwegian law. The draft new regulations that are presently being developed are therefore based on this assumption. Thus, the draft provisions on long-term liability for stored $CO_2$ entail that the responsibility for stored $CO_2$ in sub-sea reservoirs on the Norwegian Continental Shelf will be transferred to the state twenty years after closure of the storage location, subject to the operator being responsible for at least the cost of monitoring the storage location for the first thirty years following such transfer, and subject to all conditions in respect of such transfer having been fulfilled by the operator.

# Poland

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## *Part 1: Developments in last six months*

In June 2010, a draft of assumptions to the regulation transposing the EU CCS Directive was submitted for adoption by the Council of Ministers and is now waiting for adoption. The draft establishes, among other things, that in the transitional period - to 2026 - the provisions concerning CCS will only apply to the demonstration phase. Experience gathered by this time will be used to verify the safety, suitability and effectiveness of CCS and the existing legal system and help to make the decision on whether the commercial use of CCS technology should be allowed.

Current text can be found at the website at:

- www.mos.gov.pl/kategoria/2226_ustawy/.

## *Developments expected in next six months*

In the near future it is expected that the assumptions will be adopted by the Council of Ministers. Then, on the basis of the assumptions, the Polish Government Legislation Centre will prepare a draft of an act, which will be forwarded to the parliament following government approval.

We also expect progress and initial conclusions from the national recognition programme of geological formations and structures for the safe geological storage of $CO_2$.

In the forthcoming months, development of works concerning Polish CCS demonstration projects should also be seen.

## *Part 2: Long-term liability for stored $CO_2$*

Under the proposed regulation on CCS, and in accordance with the requirements of the EU CCS Directive, when long-term stability of the storage complex has been assured and the mandatory 20-year period of monitoring has elapsed, there will be transfer of responsibility to the competent authority – the Minister of the Environment. Its task will be fulfilled by a specially appointed entity, called the National Administrator of Underground $CO_2$ Storage Sites (KAPS $CO_2$). The main task of KAPS $CO_2$ will be ensuring adequate security of the sites, that is primarily: supervision and monitoring of closed storage sites with decreasing intensity. The conditions that must be fulfilled for the competent authority to take responsibility for a site will be, amongst other things, providing a financial contribution to the competent authority towards the post-transfer phase, including funds for monitoring of the storage site for at least 30 years.

In order to provide funding to the competent authority to operate after the transfer of responsibility, the operator will need to contribute a so-called “guarantee fee” into a separate account. Other equivalent financial and insurance instruments can be also applied. Financial mechanisms will be periodically adjusted to the operation conditions.

## *Annex 1: Progress to 2011*

Following the entry into force of the EU CCS Directive the Polish Ministry of the Environment has been preparing relevant regulations transposing the directive.

The main activities undertaken for the development of CCS include:



- In 2008, a document entitled: "Ministry of the Environment actions to identify geological structures for underground storage of carbon dioxide" was adopted, indicating the main lines of action for CCS, especially identification of geological structures for underground $CO_2$ storage in the country, support for national CCS demonstration projects and identification of the degree of public acceptance for the geological storage of $CO_2$: www.mos.gov.pl/kategoria/258_kierunki_dzialan_w_zakresie_geologii/.
- Launch of a four-year (2008-2012) National Program by the Minister of the Environment - "Assessment of formation and structures for safe geological storage of $CO_2$ including monitoring plan", primarily to identify prospective locations for geological storage of $CO_2$ and implement an information campaign about CCS. More information at: http://skladowanie.pgi.gov.pl/.
- Since 2009, draft regulations transposing the EU CCS Directive are being prepared. Draft available at: www.mos.gov.pl/kategoria/2226_ustawy/.
- Preparations for the execution of at least two CCS demonstration projects under the EU flag program.

Preparation of the draft regulations transposing the EU CCS Directive:

- According to the Polish legal system, prior to the preparation of an act it is necessary to prepare assumptions to the relevant regulations. According to the above mentioned procedure, a draft of assumptions to amend the Polish Geological and Mining Law, which regulates activities related to geology and mining in Poland, and also amend some other laws, was prepared in 2009. In November and December 2009 there were public and inter-ministry consultations. Currently the draft is waiting for adoption by the Council of Ministers.

# Romania

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## *Part 1: Developments in last six months*

On 22 February 2011 the draft Governmental Emergency Ordinance on the geological storage of carbon dioxide[36] (GEO), which represents the transposition of the EU CCS Directive into Romanian national legislation, was published on the site of the Ministry of Environment and Forests for public consultation.

The draft GEO specifies the relevant competent authorities responsible for fulfilling the duties established, namely:

- The Ministry of Environment and Forests (including the National Environmental Protection Agency and National Environmental Guard).
- The Ministry of Economy, Trade and the Business Environment.
- The Ministry of Public Finance.
- The National Agency for Mineral Resources.
- The Romanian Energy Regulatory Authority.

It has to be mentioned that even if the GEO will not result in the establishment of new governmental authorities, the structure of the National Agency for Mineral Resources will need to be modified in order to extend its competence related to the geological storage of $CO_2$, namely:

- Selection of storage sites (areas at the national level which may be selected for storage sites and assessment of the available storage capacity).
- Granting/ updating/withdrawing exploration permits and storage permits.
- Checking compliance with legal requirements during the operation, closure and post-closure periods.
- Reporting and notification to the European Commission.
- Establishing and maintaining a register of granted storage permits.
- Third-party access to storage sites (specific procedures will be developed).
- Specific procedures for $CO_2$ storage activity.
- Approval of the transfer of responsibility.
- Checking the operator's financial contribution.

The draft GEO also amends a number of other pieces of national legislation, in order to establish requirements on capture and transport operation and to remove existing barriers to the geological storage of $CO_2$.

[36] www.mmediu.ro/legislatie/legislatie.htm.

## *Developments expected in next six months*

In the next six months the following actions are expected to be undertaken:

- Government of Romania:
  - Approval of the GEO at governmental level.
  - Adoption of a new Government Decision related to the organisation and the structure of the National Agency for Mineral Resources, which will replace the existing one (GD no 1419/2009).
- National Agency for Mineral Resources:
  - Develop specific procedures for issuing exploration permits (90 days after adoption of the GEO).
  - Develop specific procedures for issuing storage permits (180 days after adoption of the GEO).

These two procedures will be overseen by the Ministry of Environment and Forests.

## *Annex 1: Progress to 2011*

The EU CCS Directive was adopted on 23 April 2009 and has to be transposed and implemented into national law by EU member states by 25 June 2011.

CCS is expected to play a significant role in reducing the emissions generated by Romania's electricity sector, taking into account that coal (especially local lignite with low calorific value and carbon content) is and will be a major player in the electricity market (coal represents around 41% in 2020).

For the Romanian Government it is of paramount importance to implement a CCS demonstration project as an indispensable contribution to its $CO_2$ reduction targets, taking into account the important strategic share of domestic lignite in power plants.

Despite of all of this, for a developing country like Romania, with low GDP per capita, implementation of this kind of technology will not be possible without supporting financial mechanisms to assure the required funds.

In this context, the funds provided by Directive 2009/29/EC[37] - NER Pool - EUA 300 (NER300) was a powerful incentive for Romania, which decided to prepare an application for obtaining the NER300 funding for a Romanian CCS demonstration project.

The following measures confirm this intention:

- Action Plan to prepare Romania for "Energy-Climate Change" Legislative Package Entry into Force and Implementation (the Ministry of Economy, Trade and the Business Environment, the Ministry of Environment and Forests, the Ministry of Public Finance), July 2009.
- Action Plan to implement a Demonstration Project regarding Carbon Capture and Storage (CCS) in Romania (the Ministry of Economy, Trade and the Business Environment), February 2010.
- Order no. 323/10.03.2010 related to establish the Working Group for transposition of the EU CCS Directive.

[37] Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

- Order no. 1508/17.08.2010 related to some measures for promoting the Project regarding Carbon Capture and Storage (CCS) in Romania (the Ministry of Economy, Trade and the Business Environment).

Romania's preparation for transposition of the EU CCS Directive into national legislation started in early 2010.



The Ministry of Environment and Forests[38] is in charge on this task and has set up a Working Group which involves several authorities such as:

- The Ministry of Economy, Trade and the Business Environment.[39]
- The Ministry of Administration and Interior.[40]
- The National Agency for Mineral Resources.[41]
- The National Environmental Protection Agency.[42]
- The National Environmental Guard.[43]
- The Romanian Energy Regulatory Authority.[44]
- The Department for European Affairs.[45]
- The Ministry of Justice.[46]
- The Ministry of Public Finance.[47]

To assist in clarifying some technical aspects, Romanian companies with extensive expertise in reducing pollutant emissions from industrial activities, especially for power plants (ISPE[48]) and geological matters (GeoEcoMar[49] and the University of Bucharest[50]) were invited to participate in the Working Group also.

[38] www.mmediu.ro/.
[39] www.minind.ro/.
[40] www.mai.gov.ro/Home/index.htm.
[41] www.namr.ro/.
[42] www.anpm.ro/.
[43] www.gnm.ro/.
[44] www.anre.ro/.
[45] www.dae.gov.ro/.
[46] www.just.ro/.
[47] www.mfinante.ro/acasa.html?method=inceput&pagina=acasa.
[48] Institute for Studies and Power Engineering, www.ispe.ro.
[49] National Institute for Research and Development of Marine Geology and Geoecology, www.geoecomar.ro/website/en/index.html.
[50] University of Bucharest, Faculty of Geology and Geophysics, http://www.unibuc.ro/en/fac_fgg_en.

# South Africa

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## *Part 1: Developments in last six months*

On 10 September 2010, the South African Minister of Energy, Ms. Dipuo Peters, launched the *Atlas on Geological Storage of Carbon Dioxide in South Africa* (the *Atlas*). The *Atlas* is a public-private partnership of South African entities, namely government, state-owned entities and industry; it provides an overview of the country's economy, a roadmap on carbon capture and storage, and progress achieved. It includes geological maps with reference to the potential and estimated $CO_2$ storage capacities of the geological formations found in South Africa. The *Atlas* was supported by the South African Centre for CCS (SACCCS). SACCCS was set up in 2009 and is responsible for co-ordination of CCS activities in South Africa. The *Technical report on the geological storage of carbon dioxide in South Africa* was released in January 2011.

South Africa's Second National Communication (SNC) on national climate change development has been drafted as required by the UNFCCC, to update the Initial National Communication (INC). The country's understanding of climate change issues has developed significantly since the initial national communication. The government plans for the reduction of the country's greenhouse-gas emissions are shown in the Long Term Mitigation Strategy scenarios and the *National Climate Change Response Green Paper 2010*. It highlights the development of a legislative policy and regulatory framework to support CCS as a key action area in the energy sector.

In December 2010, the World Bank with support from IMBEWU Sustainability Legal Specialists completed a review of the legal, regulatory and institutional framework for the implementation of CCS projects in South Africa.

As a priority, the Department has officially incorporated CCS regulatory framework development in the 2011 work plan.

The United Kingdom funded a SACCCS project on "An effective $CO_2$ storage capacity assessment of the Zululand Basin". This project was started in September 2010 to establish the effective storage potential of this basin and was completed during April 2011.

A workshop, in conjunction with the IEAGHG Executive Committee meeting, was held in April 2011 to address the SACCCS work programme. The workshop was geared to get input from international experts on the scope and direction of the SACCCS work plan and to ensure that relevant stakeholders are aware of future developments.

IEA-DoE CCS Legal and Regulatory workshop was held in Johannesburg on 7 April 2011. The purpose of the workshop was to discuss CCS legal and regulatory developments and next steps for South Africa, including how international organisations could potentially provide support.

A Draft CCS Concept Note is under discussion between DoE, with support from SACCCS, and the World Bank for possible funding of the CCS activities. This document contains the list of CCS activities to be undertaken in South Africa, including the development of a CCS regulatory framework.

The following academic institutions are undertaking CCS research:

- The Council for Geoscience-Storage capacity (the *Atlas*).
- University of the Witwatersrand (Absorption of carbon dioxide onto coal and ash at high pressures [up to 190 bar]).
- University of the Western Cape and the University of Stellenbosch are also starting to address bio-char and mineralisation as a means of storing $CO_2$.



## *Developments expected in next six months*

The World Bank will host a CCS workshop: Perspectives for the Southern African Region in Johannesburg on May 31 and June 1.

The SACCCS has the following CCS projects in the pipeline:

- The Europe Aid supported the "South Africa-Europe Cooperation on Carbon Capture and Storage (SAECCS)" project. This project started in March 2011 to establish the effective storage potential of the Outeniqua Basin.
- The project, "Scoping Study for the Test Injection Experiment of Carbon dioxide into a geological formation" was started during January 2011 and is due for completion during late 2011. This is the first phase of the $CO_2$ injection experiment.
- The project "Plant Readiness" started during January 2011 and is due for completion during 2011.
- A planned CCS week is scheduled for October, 2011. This will be a CCS Conference in South Africa to build capacity on technical and legal issues.

Furthermore, South Africa will host the Conference of the Parties ("COP 17") on Climate Change in Durban from 28 November to 9 December 2011. The overall objective of the UNFCCC is twofold:

- Stabilising greenhouse-gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.
- Ensuring that the stabilisation process takes place within a timeframe sufficient to allow ecosystems to adapt to climate change, to ensure that food production is not threatened and to enable sustainable economic development.

## *Part 2: Long-term liability for stored $CO_2$*

South Africa is currently working towards reviewing the current legislative system in order to assess the framework for CCS regulation, taking into consideration other studies that have already been carried out. It is therefore still premature for a decision to be taken before the ongoing processes and engagements are finalised. The exact modalities and corresponding legislative framework need to be determined. Many unanswered questions exist, such as the magnitude of the financial burden to future governments and generations as well as that of hidden costs.

# Spain

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## *Part 1: Developments in last six months*

**Transposition into national law of directives relating CCS**

The EU CCS Directive has been transposed into national law. The 40/2010 Act, 29 December sets the regulatory framework regarding storage of $CO_2$ and offers some general principles concerning capture and transportation of $CO_2$. It does not change any existing law, because it offers new regulation across the entire life of $CO_2$ storage plants. Only available in the Spanish legal languages:

- www.boe.es/diario_boe/txt.php?id=BOE-A-2010-20049.

The Royal Decree 1733/2010, 17 December, declares in favour of the state and identifies as provisional reserve an area in the Palencia province where there is a geological structure with potential $CO_2$ storage capacity. Only available in Spanish:

- www.boe.es/aeboe/consultas/bases_datos/doc.php?id=BOE-A-2010-19695.

The first preliminary study about the $CO_2$ storage capacity of Spain was carried out in 2006-2007 by the Spanish Geological Survey (IGME) and a national research centre, the CIEMAT. The conclusion of this study was that the main storage capacity of Spain is of the saline aquifer type and is mostly situated within the principal Tertiary sedimentary basins of the Iberian Peninsula. The total capacity of these structures was estimated at approximately 45-50 Gt.

A second, more detailed study has been carried out by the Geological Survey lately. During this investigation, 103 structures suitable for $CO_2$ storage have been identified, with a total capacity of 13,4 Gt. Most of the structures are situated in the following geological units: Cantabrian Mountains and Duero Basin (34), Iberian Mountains and Tajo and Almazan Basins (31), Pyrenees and Ebro Basin (19), and Baetic Mountains and Guadalquivir Basin (19). Of the 103 studied structures, 55 have capacities higher than 50 Mt. The total storage capacity of these 55 structures is estimated to be around 12 Gt.

This figure is probably lower than the real capacity, taking into consideration that the geological data of these basins is rather scarce and unevenly distributed. Another factor to consider is the offshore capacity of the country, which was not included in either of the mentioned studies.

## *Developments expected in next six months*

The Technological Development Plant that CIUDEN is constructing at the underground structure of Hontomín (Burgos) for development of injection and monitoring techniques for supercritical

$CO_2$ (1500 m depth; on Lower Jurassic carbonate formations) will highly improve the national capacity for the evaluation of industrial storage complexes and surrounding areas, especially required by the Annex I of Law No. 40/2010.

Also, the monitoring techniques to be developed and applied to this Project will lead to the improvement of criteria for the establishment and actualisation of monitoring plans and post-closure monitoring, required by Annex II of the same Law.



These two Annexes, which require the development of standards and regulation, form the base for the fulfilment of Articles 10.2, Storage permit, and 19.2, Monitoring, respectively.

The geological formation used by CIUDEN for its experimental programme is one of the best options for geological $CO_2$ storage in Spain, and will probably be a target formation for several industrial projects, which will have to comply with Law No. 40/2010.

## *Part 2: Long-term liability for stored $CO_2$*

The 40/2010 Act, 29 December describes the regulatory permitting needed throughout the life of a storage plant. A $CO_2$ storage facility approved by the state has a 30 year operation period which could be extended to a maximum of 20 years more. When the operational period ends, responsibility is transferred to the state.

The 40/2010 Act also regulates obligations after the closure of the storage site (Article 23) and requisites for transferring responsibility for the site to the state (Article 24), both in line with the EU CCS Directive (Articles 17 and 18). In principle, a period of 20 years should elapse after the closure before responsibility for the site can be transferred. The transfer of responsibility does not operate automatically: it requires a previous resolution by the Spanish authority, after an in-depth analysis to check that the stored $CO_2$ will be completely and permanently contained.

The 40/2010 Act, 29 December describes general principles about the need for a long-term financial instrument to ensure security of $CO_2$ storage sites.

# Switzerland

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## *Part 1: Developments in last six months*

**Legal developments**

As mentioned in the first edition of the *CCS Review*, the Swiss government will develop guidelines regarding CCS if needed. Since no announcement on any specific CCS projects has been made by the Swiss energy industry so far, there is no evident need for developing such guidelines.

**Development of research activities**

A first assessment of the geological storage potential in Switzerland, commissioned by the Swiss Federal Office of Energy, was finalised in August 2010. The theoretical, effective storage capacity of the Swiss Molasse Basin is estimated to be 268 gigatonnes of $CO_2$ (based solely on geological criteria collated from the literature). This value corresponds to approximately sixty times Switzerland's annual domestic $CO_2$ emissions. The report has been published.[51]

Two studies conducted within the CARMA research project focus on knowledge and the public perception of CCS among Swiss laymen.[52]

## *Developments expected in next six months*

There are no ongoing legal or regulatory developments concerning CCS so far.

The Swiss Federal Office of Energy (SFOE) in co-operation with swiss*electric* research (an organization of Swiss electricity grid companies, http://www.swisselectric-research.ch/) has announced a CCS information event for stakeholders from the energy industry, scientific institutions and the federal administration, to take place in summer 2011. Details can be obtained from Gunter Siddiqi, SFOE Energy Economy Division (gunter.siddiqi@ bfe.admin.ch).

[51] See www.bfe.admin.ch/dokumentation/energieforschung/index.html?lang=de&project=102922#suchergebnisse and Chevalier, G., Diamond, L.W., Leu, W, (2010) "Potential for deep geological sequestration of $CO_2$ in Switzerland: a first appraisal", *Swiss Journal of Geosciences*, 103: 427–455.

[52] Wallquist, L., Visschers, V.H.M., Siegrist, M. (2010) "Impact of Knowledge and Misconceptions on Benefit and Risk Perception of CCS", *Environmental Science & Technology*, 44: 6557–6562, http://pubs.acs.org/doi/abs/10.1021/es1005412 and Wallquist, L., Visschers, V.H.M., Siegrist, M. (2009) "Lay concepts on CCS deployment in Switzerland based on qualitative interviews", *International Journal of Greenhouse Gas Control* 3: 652-657.

## *Part 2: Long-term liability for stored $CO_2$*

### General Liability

Swiss law does not provide any liability regulation that has been designed for damages resulting from stored $CO_2$ in particular. There are, however, provisions regulating environmental liability and civil liability in general:



- Environmental liability: for factories or installations representing a special threat to the environment: the Federal Act of 7 October 1983 on the Protection of the Environment (Environmental Protection Act, EPA)[53] provides general liability principles:
  - Article 59a: the operator of an establishment or an installation that represents a special threat to the environment is liable for the loss or damage arising from effects that occur when this threat becomes reality.
  - Article 59b: for the protection of injured parties, the Federal Council may require the operators of certain establishments or installations […] to provide a guarantee for their potential liability through insurance or in another manner.
- Civil liability:
  - Swiss Civil Code of 10 December 1907[54], Article 679: regulating the landowner's liability.
  - Federal Act of 30 March 1911 on the Amendment of the Swiss Civil Code (Part Five: The Code of Obligations)[55]: Article 41 to 43: general liability principles to obligations in tort (incl. negligence); Article 58, 59: liability of property owners.

### Liability under the Kyoto Protocol

Annex 1 of the Kyoto Protocol lists Switzerland as a country with a legally binding commitment to reduce its greenhouse-gas emissions. Therefore in the event of leakage of stored $CO_2$, the Kyoto rules regarding accountability will apply. In addition the IPCC guidelines regarding CCS have to be taken into account.[56]

[53] www.admin.ch/ch/e/rs/8/814.01.en.pdf, notice: English is not an official language of the Swiss Confederation. This translation is provided for information purposes only and has no legal force. For the official legal text in French, German or Italian: http://www.admin.ch/ch/f/rs/c814_01.html.

[54] http://www.admin.ch/ch/e/rs/2/210.en.pdf, notice: English is not an official language of the Swiss Confederation. This translation is provided for information purposes only and has no legal force. For the official legal text in French, German or Italian: http://www.admin.ch/ch/f/rs/c210.html.

[55] http://www.admin.ch/ch/e/rs/2/220.en.pdf, notice: English is not an official language of the Swiss Confederation. This translation is provided for information purposes only and has no legal force. For the official legal text in French, German or Italian: http://www.admin.ch/ch/f/rs/c220.html.

[56] IPCC Guidelines 2006, Volume 2 : Energy: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

# United Kingdom

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## *Part 1: Developments in last six months*

Since 2007 the UK government has introduced a range of measures to facilitate and encourage investment in CCS. This started with a review of existing regulation to identify gaps in the existing regulation. This review identified a requirement for specific legislation to regulate the environmental impact of long-term storage of $CO_2$. This was implemented in the 2008 Energy Act, and has subsequently been further developed through implementation of the EU CCS Directive. The development of the legislative and regulatory framework has progressed in parallel with arrangements to test the technology through a programme of publicly supported demonstration projects. The competition to select the first of these projects was announced at the end of 2007, and in October 2010, the new Coalition Government announced GPB 1 billion for the first full-scale demonstration of the capture, transport and storage chain. Soon after coming to power in May 2010, the Coalition Government also committed to 3 additional demonstration projects. The scope of this programme has been extended to include gas as well as coal fired power stations.

Requirements have also been put in place to ensure that new combustion power stations (>300MW) are constructed in a way that can be readily converted to CCS once it is demonstrated (carbon capture readiness or CCR) and the Coalition Government has stated that no new coal fired power station will be consented without CCS on at least 300MW (net) of its output.

In the last six months, progress has taken place across a number of areas:

**CCS Specific Regulation**

The UK government is finalising the implementation of the EU CCS Directive through a number of regulations. These are:

- The Storage of Carbon Dioxide (Licensing etc.,) Regulations 2010 www.legislation.gov.uk/uksi/2010/2221/contents/made.
- An informal consultation on $CO_2$ storage site licence termination has just closed and a government response is in the process of being prepared.
- Consultation on Third Party Access to $CO_2$ infrastructure (closed 4 February 2011): www.decc.gov.uk/en/content/cms/consultations/ccs_3rd_party/ccs_3rd_party.aspx.
- The Storage of Carbon Dioxide (Licensing etc) (Scotland) Regulations 2011:
- www.legislation.gov.uk/ssi/2011/24/contents/made.
- The Environmental Liability (Scotland) Amendment Regulations 2011:
- http://www.legislation.gov.uk/ssi/2011/116/contents/made.

**Power Station Consents**

In October 2010, the UK government published the draft National Policy Statements (NPS) for consultation, which closed 24 January 2011. The NPS is crucial for the development of a green economy and giving confidence to investors by expediting the planning process for Nationally Significant Infrastructure. The NPS place a significant emphasis on CCS and CCR, and states that all combustion power stations of at least 300 MW capacity will be required to be CCR. This is articulated in Scotland in its National Planning Framework 2.

**Electricity Market Reform**

On 16 December 2010 the UK government launched the Electricity Market Reform consultation which provided for an emissions performance standard to be applied to all newly built fossil fuel power stations. This was part of a package of measures which also includes the introduction of feed-in-tariffs, carbon price support and capacity payments.

Two proposals were put forward for the EPS, one designed to limit emissions to the equivalent of a new coal fired power station equipped with 300MW of CCS and a second option at a lower level, but with an exemption for CCS demonstration purposes.

**Pipeline Safety Regulation**

The consultation on the proposed amendments to onshore and offshore pipeline safety regulation in the UK, including the treatment of pipelines carrying Carbon Dioxide under those regulations (namely the Pipelines Safety Regulations (PSR) 1996) ended on the 1st March 2011. An analysis to the responses to the consultation and updates can be viewed on the Health and Safety Executive website.

**Relevant links**

- October 2010 Spending Review Outcome: www.hm-treasury.gov.uk/spend_index.htm.
- 2010 Annual Energy Statement: www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/237-annual-energy-statement-2010.pdf.
- Call for Evidence on Long Term Development of CCS Infrastructure: www.decc.gov.uk/en/content/cms/consultations/ccs_3rd_party/ccs_3rd_party.aspx.
- Energy Market Reform: www.decc.gov.uk/en/content/cms/consultations/open/open.aspx.
- Consultation on the Electricity Market Reform: www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx.
- Responses to the Consultation on PSR Amendments: http://www.hse.gov.uk/consult/condocs/cd228.htm.

**Scotland**

In anticipation of several large scale CCS projects coming forward in Scotland, the Scottish Government formed a Regulatory Group in 2009 to consider the various permits required across the entire chain of CCS activities from capture, transport and storage through to final decommissioning. The group continues to meet every 3 months to map the permits required and ensure the necessary legislative provision is aligned with the EU CCS Directive.

In August 2010 the Scottish Regulatory Group carried out a dry run of the regulatory system, taking a CCS project application through every stage of the approval process. This test exercise maximised learning opportunities by involving organisations, government departments, regulatory agencies and NGOs. An output report was also published. Following the success of this test exercise the Scottish Government in conjunction with the Scottish Centre for Carbon Storage published a CCS Regulatory Test Toolkit. This Toolkit was fully sponsored by the Global CCS Institute, which also proactively participated in the test event held in Glasgow. The Toolkit was endorsed by the European Commission as a model of best practice for regulation that could be used by other EU member states.

Another outcome from the Regulatory Group has been to set up a Programme Monitoring Board. This group first met in January 2011 and its overall objective is to ensure that government, regulators and developers agree a timetable for project delivery that is consistent with the requirements of funders and with the statutory processes set out in regulations. This objective will be reconciled with a strong focus on community engagement, considering and recommending how to ensure that communities affected by the project are properly engaged by developers and regulators across the whole CCS activity chain.

These are other regulatory activities have been informed by the detailed assessment of regulatory requirements that has come from the detailed design of the first demonstration project through the 'FEED' process.

**Publically available CCS legal and regulatory documents released in the last six months**

- Scottish Government response to Electricity Market Reform:
  www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Grid-Connections/EMR-consultation-UK/Initial-SG-response.
- Scottish Government Regulatory Test Exercise Output Report:
  www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/traditional-fuels/new-technologies/SGactionCCS/CCSRegulatoryExercise.
- Scottish Government CCS Regulatory Test Toolkit:
  www.scotland.gov.uk/Topics/Business-Industry/Energy/resources/Publications/CCSRegulatoryToolkit.
- Scottish Government Draft Electricity Generation Policy Statement 2010
  www.scotland.gov.uk/Publications/2010/11/17094217/0.

## *Developments expected in next six months*

It is likely that the main developments will be driven by the requirements of those projects seeking funding from the UK government and the EU. After having completed consultation on the third party access provisions of the EU CCS Directive we shall be laying legislation in June 2011 to create a regulatory framework for third party access. This is UK-wide legislation.

The UK government also launched a "Call for Evidence on the long-term development of CCS infrastructure". This consultation closed on 4 March 2011. The responses to this consultation will help the UK government decide how best to organise the long-term investment in CCS infrastructure. The government's response will be issued later this year.

Through connections set up by the Global CCS Institute, the Scottish Government will engage with representatives from Romania and Alberta, Canada who have expressed an interest in using the CCS Regulatory Test Toolkit. The Scottish Government is also working with the European

Commission (DG Energy and DG CC) to promote the Toolkit amongst other member states and amongst networks of EU energy and environment regulators.

## *Part 2: Long-term liability for stored $CO_2$*



The United Kingdom's long-term $CO_2$ liability regime will follow the requirements of the EU CCS Directive on the geological storage of carbon dioxide. This directive specifies four phases of operation for a $CO_2$ storage site: exploration; operational; post-closure; and post-handover. The UK government are currently looking at how best to take this forward.

# United States: Department of Energy

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## *Part 1: Developments in last six months*

In November 2010, the United States Environmental Protection Agency (EPA) provided guidance to owners of facilities that will be regulated under its new final Tailoring Rule for regulating emissions from major stationary sources of greenhouse-gases.[57] This guidance enumerated examples of mitigation measures that would be acceptable under the Tailoring Rule. CCS is considered to be an option for some industries under this guidance.

The EPA had issued that final Tailoring Rule in May 2010.[58] This final rule "tailors" the requirements of these CAA permitting programs to limit which facilities will be required to obtain permits. It is therefore referred to as the "Tailoring Rule." Facilities responsible for nearly 70 percent of US greenhouse-gas emissions from stationary sources will be subject to permitting requirements under this rule. This includes the nation's largest greenhouse-gas emitters—power plants, refineries, and cement production facilities.

## *Developments expected in next six months*

Regulation under the Tailoring Rule is being phased in over time. The Tailoring Rule focuses the CAA permitting programs for greenhouse-gases from January 2 2011 to June 30 2011 on the largest sources with the most CAA permitting experience. From July 1 2011 to June 30 2013, the rule expands to cover the largest sources of greenhouse-gases that may not have been previously covered by the CAA for other pollutants. The schedule is as follows:

**Step 1 (January 2 2011 – June 30 2011)**

- Only sources subject to the current permitting programme (*i.e.* those sources that are newly constructed or modified in a way that significantly increases emissions of a pollutant other than greenhouse-gases) would be subject to permitting requirements for their greenhouse-gases.
- For these projects, only greenhouse-gas increases of 75,000 tons per year (tpy) or more of total greenhouse-gases, on a CO2e basis, would need to determine the Best Available Control Technology (BACT) for their greenhouse-gas emissions.
- Similarly, for the operating permit program, only sources currently subject to the programme (*i.e.* newly constructed or existing major sources for a pollutant other than greenhouse-gases) would be subject requirements for greenhouse-gases.
- During this time, no sources would be subject to Clean Air Act permitting requirements due solely to greenhouse-gas emissions.

[57] www.epa.gov/regulations/guidance/byoffice-oar.html.

[58] www.epa.gov/nsr/actions.html#may10.

**Step 2 (July 1 2011 to June 30 2013)**

- Step 2 will build on Step 1. In this phase, PSD permitting requirements will cover for the first time new construction projects that emit greenhouse-gas emissions of at least 100,000 tpy, even if they do not exceed the permitting thresholds for any other pollutant. Modifications at existing facilities that increase greenhouse-gas emissions by at least 75,000 tpy will be subject to permitting requirements, even if they do not significantly increase emissions of any other pollutant.
- In Step 2, operating permit requirements will, for the first time, apply to sources based on their greenhouse-gas emissions even if they would not apply based on emissions of any other pollutant. Facilities that emit at least 100,000 tpy CO2e will be subject to title V permitting requirements.

EPA is committed to undertake another rulemaking, to begin in 2011 and conclude no later than July 1 2012. That action will consider an additional step for phasing in greenhouse-gas permitting, and may discuss whether certain smaller sources can be permanently excluded from permitting.

## *Part 2: Long-term liability for stored $CO_2$*

While no federal long-term liability legislation has been enacted, six states have enacted legislation covering long-term liability for stored $CO_2$:

- Illinois: under the Clean Coal FutureGen for Illinois Act, Public Act 095-0018, enacted July 7 2007, the state of Illinois assumes liability for stored $CO_2$ from the FutureGen project after injection. The liability assumption applies only to the FutureGen project. The state shall also provide insurance for the operators of the project.[59]
- Louisiana: HB 661, the Louisiana Geologic Sequestration of Carbon Dioxide Act enacted August 15 2009, establishes liability limits for operators with transfer of liability for storage operations to the Geologic Storage Trust Fund (run by the state) after a specified time.[60]
- Montana: as noted in the section below on Comprehensive State Legal Frameworks for CCS, SB 498 provides a framework for transfer of long-term liability to the state.[61]
- North Dakota: Chapter 38-22 of the North Dakota Century Code includes appropriations for a Carbon Dioxide Trust Fund and the Carbon Dioxide Storage Facility. The storage operator has title to the $CO_2$ until the North Dakota Industrial Commission issues a certificate of project completion. Responsibility transfers to the state after the issuance of the certificate of completion. S.B. 2095 also addresses other aspects of regulation of CCS, as is discussed in the section below on Comprehensive State Legal Frameworks for CCS.[62]
- Texas: two Texas laws provide for transfer of long-tem liability:
  - HB-149. Legislative Session 79(3) enacted September 1 2006, states that the Railroad Commission of the state of Texas shall acquire title to $CO_2$ captured by "clean coal" projects. This law is specifically targeted at furthering the Texas bids for FutureGen. The state is also authorised to sell the carbon and deposit revenues from the sale in a general revenue fund.[63]
  - HB 1796 covers transfer of liability for offshore storage of $CO_2$. This law requires the Texas Commissioner of the General Land Office to conduct a study and recommend suitable

[59] www.ilga.gov/legislation/95/SB/09500SB1704eng.htm.

[60] www.legis.state.la.us/billdata/streamdocument.asp?did=668800.

[61] data.opi.mt.gov/bills/2009/billhtml/SB0498.htm.

[62] www.legis.nd.gov/assembly/61-2009/session-laws/documents/MINE.pdf#CHAPTER318.

[63] www.capitol.state.tx.us/tlodocs/793/billtext/pdf/HB00149F.pdf.

offshore sites for $CO_2$ storage. The state may then establish an offshore repository for $CO_2$ and, for a fee, accept $CO_2$ for storage. Standards for measurement, monitoring and verification are to be established. The state shall acquire title to the $CO_2$ in the repository based on a determination that permanent storage has been verified and the storage location has met all applicable state federal requirements for closure.[64]

- Wyoming: HB 58 addresses ownership and liability of sequestered $CO_2$. It directs that whoever injects $CO_2$ underground is legally responsible for it, which means that the owner of the pore space will not be liable if the owner is different from the injector of the $CO_2$.[65]



## *Annex 1: Progress to 2011*

A number of US states have enacted elements of legal frameworks for CCS. These elements include comprehensive state frameworks for regulating pore space ownership, eminent domain for $CO_2$ pipelines, facility performance standards, portfolio standards, and a fund for administering state activities on CCS.

**State frameworks for regulating geologic storage**

Six states have enacted comprehensive legislation on regulation of geologic storage:

- Kansas: HB 2419, enacted in 2007 as statute 55-1638, establishes in the state treasury a $CO_2$ injection well and underground storage fund. This fund is to cover permitting costs to the state of activities to support regulation of geologic storage. These activities include permitting, compliance monitoring, inspections, well closures, underground storage closures, long-term monitoring, remediation activities and enforcement actions.[66]
- Louisiana: HB 661, the Louisiana Geologic Sequestration of Carbon Dioxide Act, enacted August 15 2009, establishes a regulatory programme for the control of injection, storage, and use of $CO_2$ under the state's Office of Conservation within the Department of Natural Resources. HB 661 also provides the authority for the expropriation of pipelines, storage facilities and other facilities necessary for carbon sequestration upon a determination of public convenience and necessity. This law also provides that $CO_2$ pipelines are not to be common carriers.[67]
- Montana: S.B. 498, enacted in 2009, regulates carbon sequestration. This act requires a permit for a $CO_2$ injection well; authorises the Montana Board of Oil and Gas Conservation to regulate the injection of $CO_2$; affirms the dominance of a mineral estate; establishes fees for administering a carbon sequestration programme and long-term oversight of wells; requires notice of $CO_2$ injection wells; requires the Board to solicit and consider comments from the Montana Department of Environmental Quality prior to issuing an injection permit and prior to issuing a certificate of completion; requires the board to solicit and consider comments from the Department of Environmental Quality prior to transferring liability to the state; requires testing after issuance of a certificate of completion and prior to transfer of liability; allows for the transfer of title to sequestered $CO_2$ to the state after board certification; and allows unitisation for geologic storage reservoirs.[68]
- North Dakota: chapter 38-22 of the North Dakota Century Code, enacted July 1, 2009, creates a regulatory framework for geologic storage of carbon dioxide and priorities in permitting $CO_2$

[64] www.legis.state.tx.us/tlodocs/81R/billtext/pdf/HB01796F.pdf.

[65] http://legisweb.state.wy.us/2009/Bills/HB0058.pdf.

[66] www.kslegislature.org/li/m/statute/055_000_0000_chapter/055_016_0000_article/055_016_0038 section/055_016_0038_k.pdf.

[67] www.legis.state.la.us/billdata/streamdocument.asp?did=668800.

[68] http://data.opi.mt.gov/bills/2009/billhtml/SB0498.htm.

geologic storage projects. This law gives the North Dakota Industrial Commission authority over the construction, operation and closure of a $CO_2$ storage facility. The law also sets out the permitting requirements, criteria, fees and process to be followed by the Commission as well as penalties for non-compliance. This law states that the storage operator has title to and liability for the injected $CO_2$ until it receives a certificate of project completion. As noted above, it also addresses long-term liability.[69]

- Oklahoma: SB610, the Oklahoma Carbon Capture and Sequestration Act, enacted in 2009, gives permitting authority for storage in fossil energy bearing formations to the Oklahoma Corporation Commission. The Oklahoma Department of Environmental Quality has responsibility for other types of formations such as saline formations. The injection facility operator has ownership of the $CO_2$.[70]
- Texas: SB 1387, effective September 1 2009, gives the Texas Railroad Commission jurisdiction over the injection and geologic storage of $CO_2$ in, and the injection of $CO_2$ into, a reservoir that is initially or may be productive of oil, gas, or geothermal resources or a saline formation directly above or below that reservoir. This law also establishes the Anthropogenic Carbon Dioxide Trust Fund to finance these regulatory activities.[71]

### Pore Space Ownership

Ownership of the subsurface in the United States is usually privately held when the surface owner is a private entity. A complex set of state laws on mineral rights has evolved over the years, with laws varying in each state. Three states have developed laws addressing pore space ownership for storage of $CO_2$.

- Montana: SB498, enacted May 6 2009 gives authority regarding underground $CO_2$ sequestration to the state land board and provides surface owners with pore space ownership.[72]
- North Dakota: SB 2139 enacted 9 April 2009 defines pore space for $CO_2$ in geological storage and establishes the pore space as property of the surface owner.[73]
- Wyoming: HB57, enacted 1 July 2009, states that a surface owner is presumed to own the geologic pore space below the surface, but adds that mining and drilling rights will be given a higher priority than geologic sequestration activities.[74]

### Eminent Domain for $CO_2$ Pipelines

Three states have acted to give rights of eminent domain to developers of $CO_2$ pipelines:

- Oklahoma: SB610, Oklahoma Carbon Capture and Geologic Sequestration Act, authorises a $CO_2$ storage or pipeline operator, after obtaining the required Oklahoma Corporation Commission and Department of Environmental Quality permits and certificates, to exercise the power of eminent domain to acquire surface and subsurface rights and property interests necessary for the purpose of constructing, operating or modifying a storage facility or carbon dioxide transmission pipeline.[75]

[69] www.legis.nd.gov/assembly/61-2009/session-laws/documents/MINE.pdf#CHAPTER318.

[70] http://webserver1.lsb.state.ok.us/textofmeasures/textofmeasures.aspx.

[71] www.legis.state.tx.us/tlodocs/81R/billtext/html/SB01387F.htm.

[72] http://data.opi.mt.gov/bills/2009/billhtml/SB0498.htm.

[73] www.legis.nd.gov/assembly/61-2009/bill-text/JQTB0100.pdf.

[74] http://legisweb.state.wy.us/2009/Introduced/HB0057.pdf.

[75] http://webserver1.lsb.state.ok.us/textofmeasures/textofmeasures.aspx.

- North Dakota: NDCC 49-19-01 et seq. is a ruling of the North Dakota Public Service Commission which specifies that $CO_2$ pipelines can be considered "common carriers" with eminent domain rights if they choose to accept the duties and obligations set out by the Commission.[76]
- Texas: H.B. 1356 gives $CO_2$ pipeline operators the option to become common carriers entitled to the right of eminent domain.[77]



**Facility Performance Standards for CCS**

Two states have facility performance standards for new coal-fired power plants that require the use of CCS:

- California: SB 1368 prohibits California electricity buyers from purchasing base load electricity on long-term contracts from coal fired plants located outside of California with $CO_2$ emissions above a performance standard. However, $CO_2$ captured from the emissions of a power plant and permanently disposed of in geological formations in compliance with applicable laws and regulations is not counted as emissions from the power plant, thereby allowing the purchase of base load electricity by California electricity buyers from out-of-state coal-fired power plants that employ CCS with performance below the emissions standard.[78]
- Montana: House Bill 25 mandates that any coal-fired electrical generation project to be built in the state after October 2007 must capture and sequester at least 50% of the $CO_2$ produced in order to be approved by the Montana Public Service Commission.[79]

**Portfolio Standards for CCS**

Three states require power generators to have a minimum mix of low-emissions generation of specified types that allow power plants with CCS to be included in that mix:

- Illinois: The Clean Coal Portfolio Standard Law, Public Act 095-1027, enacted January 12 2009 requires any new coal-fired power plants to sequester an increasing amount of its $CO_2$ emissions and also compels Illinois electric retailers to purchase up to 5 percent of their requirements from “clean coal” facilities. The law also entitles one “clean coal” facility with a final air permit, to enter into 30-year purchase agreements for sale of its output. The sequestration requirements are: 50 percent for plants starting operation before 2016, 70 percent for plants starting in 2016 and 2017, and 90 percent for plants starting after 2017.[80]
- Pennsylvania: HB1202, enacted July 10 2008, authorises the substitution of coal-to-liquids non-sulfur diesel in place of biodiesel to meet the requirements of the state’s biodiesel mandate, provided that the fuel’s carbon emissions are fully offset, either through carbon sequestration or by participation in the carbon offset programs of the state.[81]
- Utah: S.B. 202 mandates that starting in 2025, 20% of an electrical corporation or municipal electric utility's retail electric sales come from qualifying low-carbon sources such as renewables or plants utilising CCS.[82]

[76] www.legis.nd.gov/cencode/t49c19.pdf.

[77] http://bit.ly/aJWppz.

[78] www.energy.ca.gov/emission_standards/documents/sb_1368_bill_20060929_chaptered.pdf.

[79] http://data.opi.mt.gov/bills/2007/billhtml/HB0025.htm.

[80] http://ilga.gov/legislation/publicacts/95/PDF/095-1027.pdf.

[81] http://bit.ly/craCY2.

[82] http://le.utah.gov/~2008/bills/sbillenr/sb0202.pdf.

# United States: Environmental Protection Agency

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## *Part 1: Developments in last six months*

On November 22 2010, the Environmental Protection Agency (EPA) Administrator signed the Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Dioxide ($CO_2$) Geologic Sequestration Wells, Final Rule, as authorised by the Safe Drinking Water Act.[83] The final rule was published in the Federal Register on December 10 2010.[84] The rule establishes new federal requirements for the underground injection of $CO_2$ for the purpose of long-term underground storage, or geologic sequestration, and a new well class – Class VI – to ensure the protection of underground sources of drinking water from injection related activities. The Class VI rule builds on existing UIC Program requirements, with extensive tailored requirements that address $CO_2$ injection for long-term storage to ensure that wells used for geologic sequestration are appropriately sited, constructed, tested, monitored, funded, and closed. The rule also affords owners or operators injection depth flexibility to address injection in various geologic settings in the United States in which geologic sequestration may occur, including very deep formations and oil and gas fields that are transitioned for use as $CO_2$ storage sites.

On November 22 2010, the EPA Administrator also signed a final rule under authority of the Clean Air Act that requires facilities that conduct geologic sequestration of $CO_2$ and all other facilities that inject $CO_2$ underground to report greenhouse-gas data to EPA annually. The final rule was published in the Federal Register on December 1 2010.[85] This rule amends the regulatory framework for the Greenhouse Gas Reporting Program. This programme requires reporting of greenhouse-gases and other relevant information from certain source categories in the United States, including suppliers of $CO_2$. Subpart RR of this programme requires greenhouse-gas reporting from facilities that inject $CO_2$ underground for geologic sequestration,[86] and Subpart UU requires greenhouse-gas reporting from all other facilities that inject $CO_2$ underground for any reason, including enhanced oil and gas recovery.[87] Subpart RR requires facilities conducting geologic sequestration of $CO_2$ to develop and implement an EPA-approved site-specific monitoring, reporting and verification plan, and to report the amount of $CO_2$ sequestered using a mass balance approach. This rule is complementary to and builds on UIC requirements.

[83] http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm.

[84] Environmental Protection Agency, Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide ($CO_2$) Geologic Sequestration (GS) Wells, Final Rule, 75 Fed. Reg. 77230 (Dec. 10, 2010).

[85] Environmental Protection Agency, Mandatory Reporting of Greenhouse Gases: Injection and Geologic Sequestration of Carbon Dioxide, Final Rule, 75 Fed. Reg. 75060 (Dec. 1, 2010).

[86] www.epa.gov/climatechange/emissions/subpart/rr.html.

[87] www.epa.gov/climatechange/emissions/subpart/uu.html.

## *Developments expected in next six months*

EPA will continue its efforts related to the safety and effectiveness of geologic sequestration, including developing guidance materials for the Class VI rule, evaluating risks to human health and the environment, and working to address other key issues.



## *Part 2: Long-term liability for stored $CO_2$*

On February 3 2010, President Obama sent a memorandum to the heads of fourteen Executive Departments and Federal Agencies establishing an Interagency Task Force on Carbon Capture and Storage. The goal was to develop a comprehensive and co-ordinated Federal strategy to speed the commercial development and deployment of clean coal technologies. The Task Force, co-chaired by the Department of Energy and the EPA, was charged with proposing a plan to overcome the barriers to the widespread, cost-effective deployment of CCS within ten years, with a goal of bringing five to ten commercial demonstration projects online by 2016.

On August 12 2010, the Task Force delivered a series of recommendations to the President on overcoming the barriers to the widespread, cost-effective deployment of CCS within ten years.[88] The Task Force recommended that efforts to improve long-term liability and stewardship frameworks should continue. The Task Force recommended that by late 2011, EPA, Department of Energy, Department of Justice, Department of the Interior, and Department of the Treasury should further evaluate and provide recommendations to address long-term liability and stewardship in the context of existing and planned regulatory frameworks. Of the seven options identified by the Task Force, the Task Force recommended that the following four approaches, or combinations thereof, should be considered: (1) reliance on the existing framework for long-term liability and stewardship; (2) adoption of substantive or procedural limitations on claims; (3) creation of an industry-financed trust fund to support long-term stewardship activities and compensate parties for various types and forms of losses or damages that occur after site closure; and (4) transfer of liability to the Federal government after site closure (with certain contingencies). The Task Force recommended that open-ended Federal indemnification should not be used to address long-term liabilities associated with $CO_2$ storage.

[88] www.epa.gov/climatechange/policy/ccs_task_force.html.

# Vietnam

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## *Part 1: Progress to 2011 and developments in last six months*

The government is currently trying to understand other countries' regulatory frameworks for CCS, specifically countries with similar socio-economic conditions to Vietnam.

Currently, Vietnam participates in the Asian Development Bank's survey project to determine the potential for CCS implementation in Southeast Asia (focus on Vietnam, the Philippines, Thailand and Indonesia), in which both CCS potential and legislation related to CCS are subjects of study.

## *Developments expected in next six months*

The Asian Development Bank's survey outcomes in determining the potential and legislation for CCS implementation in Vietnam and other Southeast Asian countries.

# Regional jurisdiction contributions

## Alberta (Canadian province)

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### *Part 1: Developments in last six months*

Like many jurisdictions around the world, Alberta has been working to address policy and regulatory barriers facing the deployment of commercial-scale CCS. In mid-2009, the government of Alberta received a number of recommendations from the Alberta CCS Development Council, many of which related to existing policy and regulatory gaps.[89]

Building on advice from the Council, the government of Alberta passed the *Carbon Capture and Storage Statutes Amendment Act, 2010* in December 2010 to address uncertainty related to pore space ownership and the management of long-term liability.[90] This Act amended five existing pieces of provincial legislation that contribute to the regulation of Alberta's existing oil and gas sector with a view to addressing many of the regulatory barriers facing the first wave of projects being deployed in Alberta.

This Act:

- Declares that all pore space is owned by the province.
- Enables the Minister of Energy to enter into agreements to grant pore space rights.
- Allows the province to accept long-term liability for properly sequestered $CO_2$.
- Creates the Post-Closure Stewardship Fund to ensure that money is available when the province assumes liability for a site.

This legislation was essential to enable the Government of Alberta to proceed with four carbon capture and storage projects that will reduce greenhouse-gas emissions by five million tonnes annually beginning in 2015.

### *Developments expected in next six months*

Over the next six months, the province will undertake two key steps as it continues to develop a CCS regulatory framework:

- The passage of a new regulation that will grant tenure agreements for pore space access.
- The Regulatory Framework Assessment (RFA), a thorough review of Alberta's regulatory framework that relates to CCS, will commence in March 2011.

The new regulation will outline the administrative details necessary for the Minister to issue agreements for pore space access. Two agreement types are being established: one for short-term evaluation tenure and another for the long-term tenure needed for a commercial project.

[89] Alberta CCS Development Council Final Report: www.energy.alberta.ca/Org/pdfs/CCS_Implementation.pdf.

[90] Bill 24 – the Carbon Capture and Storage Statutes Amendment Act (2010): www.energy.alberta.ca/Initiatives/1902.asp.

Details around the term, maximum area, annual rentals, etc. are being established in the regulation. This regulation will also require the submission of measuring, monitoring, verification and closure plans that will be updated regularly as a commercial project proceeds.

In spring 2011, Alberta will commence its RFA, which will examine in detail the environmental, safety and assurance processes that exist and determine what, if any, new processes need to be put in place. This process will be guided by an expert panel that will consist of world-renowned scientists who are internationally recognised for their experience and expertise in CCS issues and in developing energy and environmental policy. This panel will act as a third-party advisor and will peer review work. A final report is expected to be delivered to the Alberta Government in the fall of 2012.



## *Part 2: Long-term liability for stored $CO_2$*

While the technical performance standards for closure remain to be worked out with industry during the RFA, the province is now able to accept long-term liability for stored $CO_2$ sites once they have been properly closed and the operators have demonstrated through long-term monitoring that the stored $CO_2$ is stable. This step has removed yet another barrier to the deployment of CCS in Alberta.

A commercial CCS operator will require a number of permissions prior to and during injection, including a commercial pore space lease that will grant sequestration rights. The issuing of this lease is the first signal to the province that at some point in the future an operator intends to obtain a closure certificate and transfer site responsibility to Alberta.

Over the operational phase of a project, all liability will reside with the lessee and operator of the project, which is consistent with Alberta's approach to most forms of liability. At the conclusion of operations, the lessee will be able to apply to Alberta for a closure certificate. A number of conditions will need to be met before a certificate can be issued, but perhaps the most important is that sequestered $CO_2$ is behaving in a stable and predictable manner. Once a closure certificate has been issued, Alberta becomes the owner of the sequestered $CO_2$ and assumes a number of obligations as set out under various pieces of provincial legislation.

Key to Alberta's acceptance of long-term liability is the establishment of the Post-closure Stewardship Fund which will ensure funds are available to the province for ongoing monitoring and any required remediation. Commercial projects will pay a set rate per tonne of $CO_2$ injected over the life of the project to the province. This money will be directed into the fund, accumulate over time, and be available when Alberta takes over responsibility for a storage site.

The methodology for setting the rates to be paid into the fund will be established in the 2011-12 fiscal year. The rates will be based on the costs associated with ongoing measuring, monitoring and verification and the costs of any remedial actions after a site is closed. It has yet to be determined if the rates will vary by facility and be directly linked to the unique challenges posed by each commercial operation, or if a general rate will be set for the entire industry. To help establish rates, Alberta is participating in a multi-stakeholder study, led by the Global CCS Institute, to produce a peer-reviewed model for determining liability rates and applying the model to real sites. Alberta will also be undertaking a study that will focus on gaining a better understanding of the future costs of monitoring and verification.

Alberta will also examine in detail some of the elements necessary for site closure as part of the RFA, including:

- The technical requirements and performance criteria that need to be met prior to a site closure.
- The regulatory process that needs to be followed to issue a closure certificate.
- The minimum timeframe that must lapse after a final injection before an application for a closure certificate can be submitted.



Alberta is committed to sharing its experience with others in the global CCS community. The province will provide periodic updates, as well as share reports, data and the lessons that are learned through the RFA and the four projects that are being funded through a $2 billion commercial demonstration program.

# European Union

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http://ec.europa.eu/clima/policies/lowcarbon/ccs_directive_en.htm
http://ec.europa.eu/clima/funding/ner300/index_en.htm

## *Part 1: Developments in last six months*

**EU CCS Directive**

Based on the outcome of consultations with stakeholders and member states (MS), the Commission services have finalised the four guidance documents on various elements of the EU CCS Directive, covering $CO_2$ storage life cycle risk management, characterisation of the storage complex, $CO_2$ stream composition, monitoring and corrective measures, transfer of responsibility, financial security and financial mechanisms. Following a consultation of other Commission services, the documents were published on 31 March 2011.[91] The purpose of the guidance documents is to support MS in the implementation of the EU CCS Directive and ensure a uniform implementation of the directive across Europe.

The Commission services have also prepared a questionnaire for MS reporting on the implementation of the EU CCS Directive. The questionnaire was adopted by the Commission on 10 February 2011 and published on 11 February 2011.[92] MS have six months to prepare and submit their reports to the Commission, the deadline for reporting being 11 August 2011.

The Commission services have also prepared for a number of upcoming tasks related to the implementation of the EU CCS Directive, including conformity checking of transposition legislation, which has to be notified to the Commission by 25 June 2011, and Commission review of draft storage permits.

A further meeting of the Information Exchange Group (IEG) with MS took place on 16 March 2011.

**NER 300 programme**

In the past couple of months, the architecture of the NER 300 programme, which was established to fund both CCS and innovative renewable energy source demonstration projects from the proceeds of 300 million allowances reserved in the new entrants reserve under the EU Emissions Trading Scheme (ETS), has been completed. Commission Decision 2010/670/EU setting out details of the selection process and of the monetisation of the allowances ("NER 300 Decision") was adopted on 3 November 2010.[93] In parallel, a Co-operation Agreement between the Commission and the European Investment Bank (EIB) (which is taking on important tasks in support of the Commission in the NER 300 process both regarding the selection of projects and

[91] http://ec.europa.eu/clima/policies/lowcarbon/ccs_implementation_en.htm.

[92] OJ L 37, 11.2.2011, p. 19, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011D0092:EN:NOT.

[93] Commission Decision of 3 November 2010 laying down criteria and measures for the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of $CO_2$ as well as demonstration projects of innovative renewable energy technologies under the scheme for greenhouse gas emission allowance trading within the Community established by Directive 2003/87/EC of the European Parliament and of the Council, OJ L 290, 6.11.2010, p. 39.

on the monetisation of allowances and management and disbursement of revenues) was concluded, signed and published.[94] As a third step, the First Call for Proposals under the NER 300 programme was launched on 9 November 2010.[95] Project Sponsors had until 9 February 2011 to submit their proposals to MS for further assessment. Pursuant to MS reports, submitted to the Commission before 9 March 2011, a total of 153 Project Proposals were received, including 22 CCS proposals. Summary information on the number of Project Proposals received per category and sub-category can be found on the NER 300 website.[96]



The Commission services have provided extensive assistance to Project Sponsors and MS since the launch of the Call, including through responding to around 250 questions on the NER 300 website to date.

## *Developments expected in next six months*

The EU CCS Directive has to be transposed by 25 June 2011. Timely and correct transposition of the directive is particularly important in view of the NER 300 programme, as funding of CCS demonstration projects under the programme will be conditional, amongst other things, upon all relevant national permits beings issued in line with relevant EU requirements, within 24 or 36 months (for saline aquifers) upon adoption of the award decision. The Commission will therefore closely monitor the timely communication of national transposition measures, and will assess the conformity of the communicated transposition measures with the requirements of the EU CCS Directive in due course. It is also expected that between one and two draft national storage permits will be submitted to the Commission for review in the coming six months. Finally, the Commission will have to evaluate the reports on the implementation of the EU CCS Directive, which MS have to submit by 11 August 2011, with a view to preparing a report on the implementation of the directive to be submitted to the European Parliament and the Council by May 2012.

On NER 300, MS now have until 9 May 2011 to assess the Project Proposals received for their eligibility under the NER 300 programme, and to submit those eligible Projects they wish to support to the EIB for the Due Diligence assessment. The Commission services have started to elaborate structures and procedures for knowledge sharing under the NER 300 programme.

## *Part 2: Long-term liability for stored $CO_2$*

The EU CCS Directive addresses long-term responsibility for $CO_2$ stored through transfer of responsibility under the conditions set out in Article 18 of the EU CCS Directive. Further information is provided in Guidance Document 3.[97]

[94] Cooperation Agreement on the implementation of Commission Decision C(2010) 7499 between the European Commission and the European Investment Bank, OJ C 358, 31.12.2010, p. 1.

[95] See NER 300 website: http://ec.europa.eu/clima/funding/ner300/index_en.htm.

[96] *Ibid*.

[97] *Supra* note 91.

# Queensland (Australian state)

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## *Part 1: Developments in last six months*

The main focus in the past six months has been on the need for a transparent, nationally consistent CCS legislation framework. This is intended to streamline the approvals process and provide a solid platform to build stakeholder and community confidence in the deployment of CCS. The framework underpins the desire for safe, secure storage of $CO_2$ without causing environmental harm.

The latest version of the *Greenhouse Gas Storage Regulation 2010* was published and in force from 1 January 2011. Copies of the regulation document can be sourced at www.legislation.qld.gov.au.

## *Developments expected in next six months*

An issues paper is to be drafted in the first quarter of 2011, to define further recommendations for cross jurisdictional studies. This will include an assessment of international approaches and case studies of cross-jurisdictional resource regulation. An options paper is to be driven from this initial document. Work is also planned to look at the interaction between greenhouse-gas legislation and other resource legislation to assess issues with potential resource conflicts and cross-legislative approvals.

## *Part 2: Long-term liability for stored $CO_2$*

Under Sections 181 and 269 of the *Greenhouse Gas Act 2009*, the state will take ownership of injected greenhouse-gas streams and injection wells. The minister may place a security requirement on the tenement owner, which may be held by the state for 1 year after injection authority has ceased. The surrender of an injection permit and/or the decommissioning of an injection well require satisfactory reporting under the relevant acts (this may include other legislation such as the Water Act in addition to the requirements of the Greenhouse Gas Act). The final report must include a detailed explanation of how any injected $CO_2$ has been monitored, the observed trajectory and spread of the plume and demonstration of long-term containment. If the minister does not deem that reporting is satisfactory the state is not obliged to release the tenement holder from their obligations. The issue of long-term liability remains complex.

# South Australia (Australian state)

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## *Part 1: Progress to 2011 and developments in last six months*

The injection and geological storage of $CO_2$ onshore in South Australia is regulated under the *Petroleum and Geothermal Energy Act 2000* and associated *Petroleum and Geothermal Energy Regulations 2000*. These documents are available at:

- www.pir.sa.gov.au/petroleum/legislation/relevant_acts_and_regulations.

The *Petroleum and Geothermal Energy Act* provides compatible gas storage tenements that explicitly authorise and provide for:

- In the case of a gas storage exploration licence: the exploration for natural reservoirs for the purpose of storing $CO_2$ or other regulated substances.
- In the case of a gas storage licence: operations for the use of a natural reservoir for the storage of $CO_2$or other regulated substances.
- In the case of a gas storage retention licence: protection of the interests of the licensee in the natural reservoir, to facilitate the testing of the natural reservoir for the storage of $CO_2$ or other regulated substance.

Gas storage within a gas storage licence is not subject to royalty payments.

All activities regulated under the *Petroleum and Geothermal Energy Act* must be undertaken in accordance with an approved Statement of Environmental Objectives, developed on the basis of an Environmental Impact Report. Activity approvals must also be granted by the Minister prior to the commencement of any regulated activity.

The *Petroleum and Geothermal Energy Act* also regulates the construction and operation of transmission pipelines for transporting $CO_2$ (and other regulated substances). Under the Act, the design, manufacture, construction, operation, maintenance, testing and abandonment of pipelines must be carried out in accordance with the relevant requirements of *Australian Standard (AS) 2885 Pipelines – Gas and Liquid Petroleum* unless otherwise approved by the Minister.

The status of gas storage licences in South Australia to end 2010 is as follows:

- Gas storage exploration licence applications in South Australia summed to a total area of 58,951 $km^2$.
- One gas storage retention licence was granted for a five-year period.

One of the key roles of Primary Industries and Resources for South Australia is to engage and promote innovative new technologies in relation to activities regulated under the *Petroleum and Geothermal Energy Act*. As part of this role, Primary Industries and Resources for South Australia provides support to the development and ongoing work of locally based CCS research centres, including support of the Adelaide University node of the CO2CRC.

## *Part 2: Long-term liability for stored $CO_2$*

The provisions of the *Petroleum and Geothermal Energy Act 2000* are designed to minimise risks associated with all regulated activities, and minimise liability that may accrue to the state. In this regard, the *Petroleum and Geothermal Energy Act* sets up a risk management framework so that all risks are reduced to "As Low As Reasonably Practicable" (ALARP), requiring Licensees/proponents to:

- Identify threats and assess risks for the life-cycle of the project (including decommissioning and abandonment) at the approvals phase, via the development of an Environmental Impact Report (EIR) and Statement of Environmental Objectives (SEO).
- Set clear objectives and measurement criteria, which are monitored over the life of the project through compliance with the SEO.

In addition to the risk management framework, licences granted under the *Petroleum and Geothermal Energy Act* incorporate a condition requiring the licensee to lodge security and hold insurance to cover potential liabilities associated with the storage activities.

The *Petroleum and Geothermal Energy Act* expressly vests ownership of the natural reservoir used for storage in the Crown. Gas stored in a natural reservoir is owned by the licensee who has injected it. On surrender or cancellation of the licence, it is considered that ownership of the stored gas reverts to the Crown.

Notwithstanding this, the *Petroleum and Geothermal Energy Act* specifies that a licensee or former licensee remains liable for the cost of environmental rehabilitation the state is reasonably required to carry out as a result of serious environmental damage arising from activities carried out under the licence.

A mechanism for the transfer of liability exists, whereby the Minister can limit or exclude a licensee's liability on the basis of an independent risk assessment. For a CCS project, this risk assessment will require demonstration that the geological formation remains suitable for storage, and that future monitoring and verification is either not required long-term, or is conditioned appropriately between the licensee and the state. This provision is only available to a licensee (not a former licensee) and therefore must be exercised prior to licence surrender. It is therefore in the licensee's interest to demonstrate acceptable risk prior to license surrender so that it is not subject to ongoing liability under these provisions.

# Victoria (Australian state)

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## *Part 1: Progress to 2011 and developments in last six months*

The State of Victoria has a comprehensive framework for the regulation of CCS (greenhouse-gas injection and storage) activities both onshore and offshore, in state waters. The Australian federal government regulates CCS (greenhouse-gas injection and storage) activities where they occur in Commonwealth waters.

The Victorian *Greenhouse Gas Geological Sequestration Act 2008*[98] received Royal Assent on 5 November 2008. The majority of this Act commenced operation on 1 January 2010. This Act regulates CCS (greenhouse-gas injection and storage) activities in onshore Victoria (the Onshore Act). Regulations made under the Onshore Act, the *Greenhouse Gas Geological Sequestration Regulations 2009*, came into operation on 1 December 2009.[99]

The *Offshore Petroleum and Greenhouse Gas Storage Act 2010*[100] (the Offshore Act) received Royal Assent in March 2010. This Act regulates CCS (greenhouse-gas injection and storage) activities and petroleum activities in offshore Victorian waters. In keeping with Victoria's signatory obligations (in accordance with the Offshore Commonwealth Settlement) the Offshore Act predominantly mirrors the Commonwealth offshore CCS and petroleum legislation, the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*. The Offshore Act will commence on 1 January 2012, unless proclaimed earlier. An extended commencement period was chosen to allow sufficient time for the requisite regulations, consistent with the Commonwealth, to be established.

## *Developments expected in next six months*

Regulations subsequent to the Offshore Act are currently under development. These are expected to be made before the end of 2011 and are anticipated to largely reflect a consolidated version of the Commonwealth regulations. However, as the CCS related regulations within the Commonwealth jurisdiction are also currently undergoing consolidation, details cannot yet be confirmed regarding the structure of the Victorian offshore regulations.

[98] www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/LTObject_Store/LTObjSt5.nsf/DDE300B846EED9C7CA257616000A3571/8CC99C46A9507BDCCA2577BC0015140F/$FILE/08-61a004.pdf.

[99] www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/LTObject_Store/LTObjSt4.nsf/DDE300B846EED9C7CA257616000A3571/3DE33065D181E058CA25776100364768/$FILE/09-149sr001.pdf.

[100] www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubStatbook.nsf/f932b66241ecf1b7ca256e92000e23be/6D3C2CCB18FB08C3CA2576EF001E64F4/$FILE/10-010a.pdf.

## *Part 2: Long-term liability for stored $CO_2$*

Long-term liability for stored $CO_2$ (greenhouse-gas) is allocated in the same way under both the Victorian Onshore and Offshore Acts. Under both acts, if an injection licence is surrendered or cancelled the state (the Crown) becomes the owner of any greenhouse-gas substance injected into an underground geological storage formation the subject of that licence, as the state is the owner of all underground geological storage formations.

However, liability transfer to the state does not extend to common law liability. Common law liability remains with the operator, which is not indemnified by the Onshore or Offshore Acts for any negligence during CCS injection and storage operations. This approach to liability transfer is consistent with the *Carbon Dioxide Capture and Geological Storage: Australian Regulatory Guiding Principles*[101] endorsed by the Ministerial Council on Mineral and Petroleum Resources in November 2005 which recommended:

- "Liability should be based on existing regulatory arrangements and common law. Thus the status quo should be adopted for all parts of a CCS project up until closure. Using this model, the practical consequence is that government may assume responsibility in the post-closure period."[102]

The Victorian Acts also require the proponent to, prior to surrender of their licence, undertake post injection monitoring and verification at their own cost, until the relevant state Minister is satisfied that the stored gas is behaving (and will continue to behave) in a predictable manner and that storage-related risks have been reduced to as low as reasonably practicable. Within the Onshore Act, the operator must also show that ongoing storage will not present a risk to public health or the environment, and that a long-term monitoring and verification plan and risk management plan is adequate. Only then can the licence be surrendered. Similarly, within the Offshore Act, prior to issuing a site closure certificate, the Minister retains the discretion to:

- Direct the operator to satisfy the Minister that conservation and protection of the natural resources in the licence area have been adequately provided for.
- Undertake certain activities to eliminate, mitigate, manage and remediate eliminating; or the risk that a greenhouse-gas substance injected into the identified greenhouse-gas storage formation will have a significant adverse impact on, for example, navigation, fishing, the environment and human health or safety.

As already noted, after licence surrender, ownership of any greenhouse-gas substance injected into an underground geological formation passes to the state, together with responsibility for long term monitoring of the stored substance. In order to ensure that the state can fund any potential liabilities arising from an adverse event to the environment or public health after licence surrender, the royalties power within each of the Acts enables the state to recover monies from proponents during the licence period. The relevant state Minister retains a discretion to require the operator to maintain insurance relating to "the clean-up or other remediation of the effects of the escape of a greenhouse-gas substance"[103] while holding an injection authority.

[101] www.ret.gov.au/resources/Documents/ccs/CCS_Aust_Regulatory_Guiding_Principles.pdf.

[102] *Ibid*, page 46.

[103] *Offshore Petroleum and Greenhouse Gas Storage Act 2010* section 620. A similar provision is contained in the *Greenhouse Gas Geological Sequestration Act 2008* section 218.

# Western Australia (Australian state)

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## *Part 1: Developments in last six months*

Approval has been granted for the drafting of a Bill amending the state's *Petroleum and Geothermal Energy Resources Act 1967* to provide a legislative framework for the onshore transport and geological storage of greenhouse-gases in Western Australia.

Potential Western Australian greenhouse-gas storage projects requiring a greenhouse-gas legislation framework include the Collie South West Hub and associated industrial projects.

For the drafting of the Bill, Western Australia has adopted the approach that the long-term liability for injected greenhouse-gases will be transferred to the state in the post-closure period, following the surrender of an injection licence. This approach follows the Commonwealth statutory model in the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

## *Developments expected in next six months*

Work on the Bill has commenced and it is anticipated that drafting will be completed ready for the Bill's introduction into Parliament in the second half of 2011.

## *Part 2: Long-term liability for stored $CO_2$*

The Western Australian legislative approach avoids any difference in the treatment of long-term liability between the state and the Commonwealth. Western Australia is also assisting in the development of a policy on cross-boundary migration.

# Organisation contributions

## CCSReg



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### *Part 1: Developments in last six months*

The objective of the CCSReg project is to develop recommendations that, if adopted, would create a US regulatory environment conducive to capture, transport, and deep geological sequestration (GS) of $CO_2$. Anchored in the Department of Engineering and Public Policy at Carnegie Mellon University, the project involves co-investigators at the Vermont Law School, the Washington, DC law firm of Van Ness Feldman, and at the University of Minnesota.

The first step in the development of recommendations was to identify the most significant obstacles to the deployment of CCS in the United States. Our findings were published in a report titled "Carbon Capture and Sequestration: Framing the Issues for Regulation"[104] in January of 2009. Between July, 2009 and January, 2010 we developed specific recommendations on how each of these obstacles could be overcome. Our recommendations have been released in a series of six short policy briefs; each brief deals with one of the barriers identified in the interim report.[105]

In May of 2010 we released the third and final major deliverable from the CCSReg project: model federal legislation that implements the recommendations made by the project.[106] There are five titles in this legislation dealing with: $CO_2$ pipeline siting; a framework for adaptive, performance-based regulation of GS; regulations for GS; long-term stewardship of closed sequestration sites; and accounting for sequestered $CO_2$. We solicited specific recommendations from stakeholders on how the model legislation could be improved during a two day workshop held in Washington, DC, October 25-26 2010. Participants in the workshop also highlighted other actions needed to enable large-scale geologic sequestration. We have produced a public summary of the comments and recommendations that we received.[107]

### *Developments expected in next six months*

In the coming six months the CCSReg project will be finalising its recommendations and the accompanying model legislation in a book from RFF Press. While we do not expect to update each of the policy briefs to reflect our revised recommendations, we will release updated model legislation on the project website. We will also continue to update our online database on U.S. state CCS policies.[108]

[104] The report is available online at www.ccsreg.org/pdf/CCSReg_3_9.pdf.

[105] All of the policy briefs are available online at www.ccsreg.org/policy_briefs.html.

[106] The CCSReg model legislation is available online at www.ccsreg.org/model_legislation.html.

[107] The workshop summary is available online at: www.ccsreg.org/pdf/workshop/Workshop_Summary_R1.pdf.

[108] www.ccsreg.org/bills.php.

## *Part 2: Long-term liability for stored $CO_2$*

In the United States, after injection of $CO_2$ has ceased and financial instruments required by the Underground Injection Control (UIC) programme have been released, those responsible for GS projects will face liability that can be divided into three broad classes: tort, climate, and regulatory liability.[109] We see uncertainty over the magnitude of long-term liability and means by these different types of liability will be managed to be one of the most pressing barriers facing development of CCS in the United States — the lack of emissions constraints notwithstanding. While some industries have successfully managed to raise capital despite facing liabilities of what appear to be a similar magnitude (in net-present value terms)— oil and gas production, for example — the current liability framework is inappropriate for CCS. Specifically, it is unlikely that federal and state tort regimes will allow for timely and equitable resolution of claims during long-term stewardship, nor will private mechanisms (*e.g.* insurance, bonding, etc.) be available for what will be essentially open-ended periods.[110] Moreover, these mechanisms may not encourage operators to select sites and operate projects in a manner that will minimise risk in the distant future (*i.e.* moral hazard).

In the United States, six states have begun to address these issues through new, GS-specific legislation. Legislators in Kansas, Louisiana, Montana, North Dakota, Texas and Wyoming have created long-term stewardship programs that relieve GS project operators of some liabilities, funding these programs through creation of state-level long-term stewardship funds. However, the majority of these statutes narrowly define the liabilities covered by the programs, often excluding tort and climate liabilities, which leaves it unclear which party would be responsible for unfunded liabilities in the distant future. While these state laws are an important step, a comprehensive federal programme to manage these long-term liabilities would be more efficient than multiple state-level programs because it would create a larger, more diverse risk-pool. Oversight of the programme could then be delegated to state agencies, if they so desire, as is the case with many other environmental programs in the United States (*e.g.* permitting under the UIC program).

To create a federal program, the CCSReg project recommends a statutory modification of tort law to limit liability for GS operators in long-term stewardship, while retaining tort law for the pre-operational, operational, and immediate post-operational phases of a GS project.[111] A Federal Geologic Sequestration Board (FGSB) would then be created to oversee the long-term stewardship of closed injection projects. Once the FGSB determines that a GS project is closed—that is, it presents no unreasonable risk to health, safety, or the environment—it would accept tort, climate, and regulatory liability and responsibility for compensation. The FGSB should administer, and be financed by, a revolving fund that is based upon risk-based assessments on GS projects during their operating life. Any necessary remediation or compensation payments during the stewardship phase should be the responsibility of the FGSB, and should be disbursed from the revolving fund. The FGSB could also make the fund available for emergency remediation of sites not yet covered by the long-term stewardship programme (with the requirement that the FGSB will recover costs of remediation from the project operator or other parties).

[109] We explicitly exclude trespass from this list, as we propose that this class of liability should be dealt with through other means. See the CCSReg Project policy brief "Governing access to and use of pore space for deep geologic sequestration" at www.ccsreg.org/pdf/PoreSpace_07132009.pdf.

[110] For further detail, see the CCSReg project interim report "Carbon Capture and Sequestration: Framing the Issues for Regulation" at www.ccsreg.org/pdf/CCSReg_3_9.pdf.

[111] By and large, the recommendations outlined here are expanded upon in the policy brief "Compensation, Liability and Long-Term Stewardship for CCS," available from www.ccsreg.org/pdf/LongTermLiability_07132009.pdf; however, we have made some changes to the recommendations that will be presented in the forthcoming book published by RFF Press.

We also expect that it will be necessary to establish a stop-gap federal indemnity programme for the long-term stewardship phase of "first-mover" projects. However, once the federal stewardship programme for commercial projects becomes operational, first-mover projects would be transitioned into, and covered by, this program.

# CCSA

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## *Part 1: Developments in last six months*

The past few months have seen significant strides forward with regards to CCS in the United Kingdom, Europe and internationally. The CCSA has been involved at a number of levels, facilitating and contributing to discussions and aligned understanding of CCS policy, regulatory issues and incentives between CCSA members, policy makers and regulators.

**UK and Europe**

The CCSA has submitted responses to a variety of UK consultations (available on request), but perhaps the most significant issues addressed have been with regards to the UK Electricity Market Reform, which considered packages of recommendations to encourage low carbon electricity generation. This proposal included a suite of options including feed-in-tariffs (FITs) to promote the transition to a low carbon economy. CCSA highlighted the fact that technology specific FITs would be the primary mechanism to drive low carbon deployment. Also considered was a carbon floor price in order to provide confidence in the price of carbon. Although this mechanism would allow efficient business planning, this will only indirectly stimulate low-carbon investment by inhibiting high-carbon investment. The CCSA believes that the carbon price along with a capacity payment (that rewards flexible low-carbon generation to provide backup up to intermittent, inflexible renewables) will be the primary mechanisms for reforming the electricity market, promoting CCS and ensuring security of supply. An emissions performance standard (EPS) has also been suggested, which prevents unabated coal plants from being built. However, it will be necessary for investors to be sufficiently rewarded by the primary mechanisms in order to ensure that the United Kingdom is not locked into non abated gas and partially abated coal plants.

Electricity market reform (EMR) is the largest shake-up of the industry since privatisation 20 years ago, and our response to the consultation was predicated by our wish to see an early framework for the deployment of CCS beyond the four projects part of the UK CCS Demonstration Programme[112] in time to meet the targets for CCS which are part of the United Kingdom and international targets on climate change. The main concern raised by the CCSA is that the EMR package is unsuited to deliver CCS first-of-a-kind costs, and mechanisms and policies need to ensure that early CCS projects are 'bankable' and enable sufficient penetration of CCS to meet the 2030 decarbonisation target.

Several submissions have also been made relating to the transposition of the EU CCS Directive[113] into UK law, which needs to be finalised by 25 June 2011, including a recent consultation on third party access to CCS infrastructure (pipelines and stores) and the termination of licenses.

Furthermore, the CCSA has submitted responses on the energy infrastructure package, which considers wider European energy policy, addressing the need to restructure ageing energy infrastructure to respond to the increased penetration of renewables resources, energy security and CCS. The CCSA believes it is vitally important that CCS infrastructure – both transportation

[112] www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/ccs/demo_prog/demo_prog.aspx.

[113] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF.

and storage – is expressly supported through the new legislative proposal. The development of CCS infrastructure in Europe will be required if CCS is to be deployed at the scale and pace necessary to achieve European climate change targets.

The CCSA has also been active in the discussions on the NER300 call for proposals[114] (involving the auction of 300 million EU ETS allowances to support the development of CCS demonstration projects and innovative renewables) launched at the end of 2010. In parallel, the CCSA continues to work to support members and the UK Government in progressing projects 2 - 4 of the UK CCS demonstration projects. The CCSA has been involved with ascertaining further clarity on the demonstration programme, highlighting the need for firm commitment to four demonstration, as well as fast, efficient and cost-effective roll-out of these demonstration projects in order to secure the creation of a positive landscape for the future development of commercial projects beyond the demonstration projects, particularly through the development of clusters, which will be key in firmly establishing the United Kingdom's lead in the global CCS industry.



**International**

The CCSA has 'observer organisation' status at the UNFCCC and attended the COP 16 Climate Change talks in Cancun. In addition to closely following the negotiations on CCS and its potential inclusion in the Clean Development Mechanism (CDM), the CCSA also held a successful side event on CCS, highlighting a number of recent developments in CCS, as well as hosting a CCS stand in order to distribute CCS related materials to delegates.

The recommendation to include CCS in the CDM, subject to the successful resolution of a number of issues, has been the most significant event for CCS in the international arena within the past few years, and is an important step forward in ensuring that CCS can contribute to global emission reductions efforts. In response to the outcomes from Cancun, the CCSA has submitted a number of responses to the UNFCCC on the inclusion of CCS in the CDM, particularly addressing how modalities and procedures can accommodate CCS in the CDM in order to encourage well-regulated, safe and efficient deployment of CCS in developing countries, as well as a submission on market and non-market mechanisms for the deployment of CCS in developing countries. The CCSA is looking forward to the next COP in South Africa, and sees the potential for further significant strides to be taken in the application of CCS in developing countries.

## *Developments expected in next six months*

The CCSA will continue to work with policy makers, regulators, members and other stakeholders to ensure the timely delivery of the four demonstration projects in the United Kingdom, working with the European Commission with regards to the NER300 process, and preparation for COP 17 in South Africa.

## *Part 2: Long-term liability for stored $CO_2$*

Long-term liability for stored $CO_2$ and financial security mechanisms have seen a particular focus in the past few months, especially in light of consultations in the United Kingdom on the termination of licenses (which considered financial contributions and conditions of termination) as well as the European Commission's Guidance Document 4 (GD4) on financial security and financial transfer, which provides guidance to member states on the options to address these obligations under the EU CCS Directive.

[114] http://ec.europa.eu/clima/funding/ner300/docs/call_en.pdf.

The termination of license regulations[115], which transpose articles of the EU CCS Directive into UK law to ensure safe and economic offshore storage of $CO_2$, will play a critical role in ensuring that CCS becomes a viable business activity that attracts business investments in all parts of the chain, as well as clarification of the scope and size of liabilities that a storage operator will be exposed to, the process of transfer of responsibilities to the competent authority and the scope of financial contribution. The CCSA believes that it is of fundamental importance for prospective storage operators to have clarity on their obligations to fulfil the requirements enabling them to transfer a storage site to the responsibility of a competent authority at the end of operations, which is critical to incentivise storage operation.

As mentioned previously, the European Commission is developing detailed guidelines on the implementation of the regulatory framework for CCS. Four Guidelines Documents (GDs)[116], which will provide a methodology to implement the EU CCS Directive, are currently being produced. The CCSA does have fundamental concerns with the first draft of GD4 on Financial Security and Financial Transfer, which could potentially be a significant impediment to the development of CCS. The draft guidance outlined measures which would place very large obligations on developers of CCS in the EU, that were disproportionate to the risks represented by CCS, and which could be a barrier to making CCS projects economically viable. Following extensive work on GD4, the CCSA has commissioned some work to provide options for improvements to GD4, which has been a significant concern particularly for industry. Entitled "Final Hurdles: Financial Security Obligations under the CCS Directive", this substantive piece of work has been welcomed by the United Kingdom and Commission and can be found on the CCSA website.[117]

Internationally, the CCSA is also involved in ongoing work on liabilities in the context of the inclusion of CCS in the CDM. This is one of the outstanding issues that needs to be resolved before CCS can be included in the CDM and the CCSA outlined how this issue should be addressed in its submission to the UNFCCC. The CCSA has noted that the liability of a CCS project takes two distinct forms. Firstly, there is the climate liability in the event that the stored $CO_2$ seeps and is released into the atmosphere. Secondly, there is the liability for any local impacts from the CCS project, for example damage to the local environment or communities as a result of $CO_2$ seepage. The inclusion of CCS in the CDM will require the host country to implement and demonstrate that provisions have been established to ensure that the climate liability is satisfactorily addressed.

In contrast, local liability issues - such as damage to the environment, property or public health - are a national issue and should be addressed on the basis of arrangements established by the host country. The national regulatory approach for managing liabilities in existing industrial sectors should be extended to CCS as appropriate. This is consistent with the approach taken to manage the liabilities from other CDM projects. There will be further discussions on the potential approaches to address liability under the CDM later this year. The CCSA intends to contribute to these discussions.

## *Annex 1: Progress to 2011*

The CCSA was launched in March 2006 to represent the interests of its members in promoting the business of CCS as a means of abating atmospheric emissions of $CO_2$. From its base in London, the CCSA brings together specialist companies in manufacturing and processing, power

[115] www.decc.gov.uk/en/content/cms/consultations/co2_storage/co2_storage.aspx.

[116] http://ec.europa.eu/clima/policies/lowcarbon/ccs_implementation_en.htm.

[117] www.ccsassociation.org.uk/docs/2011/ClientEarth%20report%20FS.pdf.

generation, engineering and contracting, oil, gas and minerals, as well as a wide range of support services to the energy sector such as law, banking, consultancy and project management. The CCSA is a model for sectoral co-operation in business development and its existence is welcomed by government.



As a non-technical trade association, the CCSA is unique in its focus on the business side of CCS and efforts to ensure commercial-scale CCS projects can play a part in moving towards a low-carbon global economy. To this end, the CCSA benefits from a close working relationship with the UK government and European Commission in developing an appropriate regulatory framework for CCS and influencing policy developments on an international level.

# Global CCS Institute

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## *Part 1: Developments in last six months*

The Global CCS Institute continues to undertake its work plan to address the specific legal and regulatory barriers to the global deployment of CCS. The Institute has recently focused on three particular agendas, including: CCS ready (CCSR); a CCS Regulatory Test Toolkit; and support for a number of key international initiatives.

### CCSR Activity

In late 2010, the Institute published a briefing paper on CCSR. This has formed a key part of the Institute's capacity building activities in this sphere.[118] The Institute had previously commissioned two reports on the topic, which considered the need for a definition and a comprehensive policy for CCSR, and hosted a CCSR event in Ottawa to work towards establishing consensus on a definition.

The briefing papers examined the issues surrounding global capture-ready policy and concluded that a careful balance must be struck; one which ensures that retrofit will occur and innovative carbon technological advances are not stifled. The Institute has planned further capacity development activity in this area, which it anticipates will benefit regulators and policymakers in their CCSR decision-making.

### CCS Regulatory Test Toolkit

In late 2010, the Institute collaborated with the Scottish Government to produce a "toolkit" which will assist in the development of best practice for the regulation and permitting of CCS projects in developed countries. The final report, published in February 2011, describes a process which is expected to enable governments to evaluate the adequacy of their pre-existing regulatory practices throughout the lifetime of a CCS project.

A regulatory simulation or "dry-run" is central to the toolkit's application to track the approvals processes for a simulated CCS project, from the initial planning stages, through the operational phase and into the decommissioning period. A workshop was undertaken by the Scottish Government between April and August 2010 and the experiences garnered from this dry-run form the centrepiece of this report.

This toolkit highly complements the IEA's *CCS Model Regulatory Framework* and may be applied in any circumstance where there is a regulatory regime.

### Cancun climate change negotiations

The Institute played an active role in raising the visibility of CCS as an important mitigation option at last year's climate change talks in Cancun, Mexico. The Institute hosted a number of side-

[118] Available at www.globalccsinstitute.com/resources/publications/ccs-ready-issues-brief.

events and was invited to speak at many external events, addressing the global significance of the technology and methodological issues associated with its inclusion within the international climate change architecture. The Institute also held events to consider and discuss CCS related bio-energy and the importance of CCS applications within industry.



In the lead up to the next climate change talks in Durban, South Africa, much work is still to be done by the CCS community (including the Institute) to ensure that the implementation of CCS under the CDM is both environmentally effective and commercially attractive. To operationalise CCS under the CDM, remedies still need to be proposed on a limited number of CCS issues (including legal and regulatory issues such transboundary projects and liability).

Further, for CCS projects to be included under CDM, a host country's domestic law must provide for: the approval of the implementation of CCS projects in accordance with the CDM rules, including any future modalities and procedures; and a regulatory environment consistent and/or compatible with delivering on the criteria and conditions established under the CDM rules. The Institute will continue to work with its Members to ensure that all CCS related decisions under international arrangements are fully informed with the most current evidence arising from the 80 or so large-scale, integrated demonstration projects. These projects cover all different technology phases including operations.

## *Developments expected in next six months*

The Institute's work programme in this area will capitalise upon existing activities under the auspices of its work with projects, member countries and strategic partnership organisations, with a view to: increasing certainty around investment decisions; minimising the technicalities associated with legislative design; and minimising the compliance costs for projects.

The Institute will continue to address the legal and regulatory challenges for CCS, focusing upon, but not limited to, those issues which will impact upon the deployment of CCS projects and the role of the technology within the international climate change regime. In addition to addressing individual legal and regulatory issues, the Institute will roll-out the regulatory test toolkit to test the sufficiency of domestic legal regimes across a number of jurisdictions. The Institute anticipates that this work will further drive debate in this area and provide useful analysis for policy-makers, industry and projects alike.

## *Part 2: Long-term liability for stored $CO_2$*

The Institute anticipates that the development of comprehensive and practical liability regimes will be essential for engendering broader confidence in the technology from project proponents, investors and the wider public alike. As a part of the Institute's ongoing work plan to address specific legal and regulatory challenges, work has already begun on pricing the risk of long-term liability, as well as analysing and responding to regulatory consultations.

As a technology, CCS involves the novel application of processes to ensure $CO_2$ is successfully stored for an indefinite period of time. Regulations to address liability will therefore need to reflect the properties and risks inherent in the CCS process. Essential elements in a regulatory regime should therefore include, amongst other things, high levels of protection for the environment and human health, the provision of regulatory certainty for operators and investors and the ability of the proposed model to address damages over an extended timeframe.

In many jurisdictions worldwide, the liability models developed to date have adopted a similar approach to managing the risks surrounding the CCS process. A number of the critical issues

raised above have been partially addressed in legislation, but various challenges endure and will require swift resolution if operators, investors and the public are to be convinced of the technology's efficacy.

Several enacted and proposed liability schemes require an operator of a storage site to be liable for the site's integrity and any necessary remediation activities stemming from its planning, operational and post-closure phases. Operators will therefore be faced with the management of an extensive number of risks and potential costs across the short, medium and long-term, including monitoring and verification requirements, possible remediation activities and the eventual sealing of the site and removal of the injection facilities. In an unlikely event of leakage from a storage site, the actions required of an operator to mitigate or remediate the situation are in some circumstances ill-defined or absent from legislation. In some circumstances, the vested authority is empowered to undertake counteractive action where an operator's response is deemed inadequate with the associated costs recoverable from the operator.



Provision has been made in some of the regulatory models for the transfer of liability from the operator of a storage site to the state, at the end of a post-closure period. Questions and uncertainties remain, however, as to the exact nature of this transfer and the extent to which an operator can be fully absolved of their responsibilities for the stored $CO_2$. Many of the transfer mechanisms enacted in legislation to date, conclude an operator's liability under the statute, but do not offer an indemnity from common law liabilities or obligations under other environmental liability regimes. In instances of severe environmental contamination or damage to property resulting from their operations, operators may remain obliged to pay substantial damages.

The requirement of operators to hold financial security products to demonstrate their capacity to meet operational risks and the requirements of long-term, pre-transfer site stewardship is a further issue common to many enacted framework regimes. Various references to operators' financial assurance are made in European, US and Australian legislation, necessitating an operator's provision of a bond, rehabilitation fund or other financial product. To date, little guidance as to the exact nature, scope, quantity and operation of these financial requirements has been provided by regulators, leaving operators uncertain of their potential financial exposure. A range of models for financial security have been proposed and this may lead to considerable variation between countries and disproportionate impacts upon operators, where the enacted regimes are informed by national finance and insurance markets.

# IEA Greenhouse Gas R&D Programme

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## *Part 1: Developments in last six months*

The IEA Greenhouse Gas R&D Programme (IEAGHG) is an international R&D programme established as an Implementing Agreement of the International Energy Agency in 1991, funded by 21 countries and 25 organisations. It aims to provide impartial and independent information on the role and issues around technologies to reduce greenhouse-gas emissions from fossil fuel use, focussing primarily on CCS. It undertakes a range of activities, including commissioning technical assessments and studies (and has published over 120 reports), facilitating or collaborating in demonstration projects, operating eight international research networks (Risk Assessment, Monitoring, Wellbores, Modelling, Post-combustion Capture, Oxy-firing, Chemical Looping, Social Research), running the International CCS Summer School and the GHGT-series of conferences.

One of IEAGHG's objectives is to assist legal and regulatory developments by providing information relevant to this process, so that they can be based on a sound evidence-base. IEAGHG is involved in many activities to undertake this. It is an actively contributing observer to the London Convention and UNFCCC meetings when CCS is under discussion or negotiation; it advises the European Commission and other governments developing CCS regulation, and has produced reports addressing specific regulatory issues such as capture ready power plant for the G8 (which formed the basis for the EU CCS Directive and UK regulation), Natural Analogues of Leakage, Remediation of Leakage, Methodology for CCS in the CDM and Market Impacts of CCS in the CDM. IEAGHG also collaborated with the IEA and UCL-CCLP in the establishment of the IEA International CCS Regulatory Network and regularly chairs or presents in the webinars. As well as the IEA, IEAGHG also collaborates with other bodies such as the Global CCS Institute, CCSA, the European Technology Platform for Zero Emission Fossil Fuel Power Plants, Carbon Sequestration Leadership Forum, UCL-CCLP, WRI, DNV, providing funding and/or expert input on legal and regulatory issues. IEAGHG has positions on many committees and groups directly working in and relevant to legal and regulation issues for CCS. For more information see the website www.ieaghg.org.

Reports issued over the last six months relevant to the IEA International CCS Regulatory Network include:

- IEAGHG (2010), Water Usage and Loss Analysis of Bituminous Coal Fired Power Plants with $CO_2$ Capture (5 volumes), Foster Wheeler, IEAGHG Report 2010/05 Feb 2011.
- IEAGHG (2010), 6th Meeting of the Monitoring Network (Natchez, USA), IEAGHG Report 2010/14.
- IEAGHG (2010), Pressurisation and Brine Displacement Issues for Deep Saline Formation $CO_2$ Storage, Permedia Research, IEAGHG Report 2010/15 Nov 2010.

## *Developments expected in next six months*

Studies which are underway most relevant to the IEA International CCS Regulatory Network include:

- Quantification techniques for $CO_2$ leakage.
- Potential Effects of $CO_2$ Waste Stream Impurities on Geological Storage.
- Global Storage Resource Gap Analysis for Policymakers.
- Barriers to Implementation of CCS – Capacity Constraints.
- Potential Impacts to Potable Groundwater from $CO_2$ Storage.
- Potential for Biomass CCS.
- Storage Cost Calculator.
- Incorporating Future Technological Change in Existing Capture Plants.
- Emissions of Substances other than $CO_2$ from Power Plants with CCS.
- Removal of Impurities from $CO_2$.
- Feasibility of Monitoring Substances Mobilised by $CO_2$ Storage.
- Evaluation of $CO_2$ Post-combustion Capture Chemical Emissions and Technologies for Chemicals Deep Removal.
- $CO_2$ Capture in Iron and Steel Industry.
- Ethical Attitudes and Underground $CO_2$ Storage.
- Operating Flexibility of CCS in Future Energy Systems.

**Research Networks**

The 2011 meetings of the IEAGHG networks on Modelling, Wellbore Integrity, Monitoring and Risk Assessment will represent the state-of-the-art of experience and knowledge around these issues and include sessions, talks and discussions on regulatory issues relating to these areas, including the issues raised by UNFCCC in Cancun to work on during 2011.

The Modelling and the Wellbore Integrity meetings will be 27-29 April in Perth, Australia. The 7$^{th}$ Monitoring meeting will be 7-9 June in Potsdam, Germany. The Risk Assessment meeting will be 21-23 June in Pau, France. For more information on these go to: www.ieaghg.org/index.php?/networks.html.

## *Part 2: Long-term liability for stored $CO_2$*

Long term liability will be addressed in a forthcoming IEAGHG study on Financial Mechanisms for Long Term Liability. Also, the various issues around $CO_2$ storage security into the long term are covered in the IEAGHG research networks, particularly the Modelling, Risk Assessment and Monitoring networks.

# NACCSA

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## *Part 1: Developments in last six months*

In November 2010, the United States Environmental Protection Agency (EPA) released its guidance document related to permitting greenhouse-gas emissions from certain stationary sources under the federal Clean Air Act (CAA). The guidance document is entitled "PSD and Title V Permitting Guidance for Greenhouse Gases."[119] "PSD" refers to "Prevention of Significant Deterioration," which is one of the CAA's primary permitting programs for stationary sources. The guidance document refers to CCS.

On November 22 2010, the EPA released its final greenhouse-gas reporting rule for geologic sequestration and injection of $CO_2$. The rule amends the previously issued Mandatory Reporting Rule. Under the new rule, facilities that conduct geologic sequestration report under subpart RR and all other facilities that inject $CO_2$ for enhanced oil and gas recovery report under subpart UU.

On December 10 2010, EPA released a final rule entitled "Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells."[120] The regulations establish a broad regulatory framework for conducting geologic sequestration.

In December 2010, EPA released a draft guidance document entitled "Underground Injection Control Class VI Program: Financial Responsibility Guidance."[121] The comment period on this document closed on February 8 2011.

On January 7 2011, EPA Region 6 submitted comments on the nation's first proposed greenhouse-gas PSD/Title V permit under the CAA. The subject facility was a steel mill. The comments refer to CCS.

The California Carbon Capture and Storage Review Panel released its findings and recommendations on January 20 2011.[122]

On January 31 2011, the Interstate Oil & Gas Compact Commission released its report on the need for a nationwide network of $CO_2$ pipelines. The report is entitled "A Policy, Legal and Regulatory Evaluation of the Feasibility of a National Pipeline Infrastructure for the Transport and Storage of Carbon Dioxide."[123]

On February 28, 2011, the FutureGen Alliance selected Morgan County, Illinois as the preferred location for the FutureGen 2.0 carbon dioxide storage site, visitor centre, research, and training facilities.

[119] www.epa.gov/nsr/ghgdocs/epa-hq-oar-2010-0841-0001.pdf.
[120] www.gpo.gov/fdsys/pkg/FR-2010-12-10/pdf/2010-29954.pdf.
[121] http://water.epa.gov/type/groundwater/uic/class6/upload/uicclass6financialresponsibilityguidancedec2010.pdf.
[122] www.climatechange.ca.gov/carbon_capture_review_panel/index.html.
[123] www.iogcc.state.ok.us/Websites/iogcc/Images/PTTF%20Final%20Report%202011.pdf.

## *Developments expected in next six months*

EPA is expected to issue further guidance documents for the Class VI Program.[124] In addition to financial responsible (discussed above), guidance documents are expected to be issued on the following topics: public participation, site characterisation, area of review and corrective action, well construction, testing and monitoring, addendum to UICPG #83 for Class V experimental, project plan development, injection depth waiver, and primary application and implementation.

As part of legislative debates over FY2011 and FY2012 funding bills, the US Congress is expected to consider legislation that would impede, block or defund EPA from taking certain actions related to climate change. The impact of these efforts on CCS is uncertain.

The US Senate Committee on Energy and Natural Resources is expected to consider clean energy standard (CES) legislation. That legislation, in turn, is expected to include provisions related to CCS.

The US Court of Appeals for the District of Columbia Circuit is expected to issue a briefing order in consolidated cases challenging EPA's authority to take specific actions with respect to climate change. The impact of these cases on CCS is unclear.

Various states are expected to seek primacy for enforcement of EPA's new Class VI regulations.

In July 2011, EPA is expected to propose New Source Performance Standards for electricity generating units. EPA is currently conducting public meetings in preparation for the issuance of these standards.

The NACCSA and the Pew Center on Global Climate Change are expected to release their final CCS methodology.

EPA is expected to propose a conditional exemption for CCS under the Resource Conservation & Recovery Act.

Legislation regarding CCS stewardship is expected to be reintroduced in the U.S. Senate.

President Obama's Interagency CCS Task Force is expected to continue to deliberate additional approaches for CCS stewardship.

Various States, including but not limited to Mississippi, are expected to debate laws that would implement CCS regulatory programs.

## *Part 2: Long-term liability for stored $CO_2$*

Legislation regarding CCS stewardship is expected to be reintroduced in the US Senate.

Some states have enacted stewardship laws that are roughly based on the trust fund approach of the Interstate Oil & Gas Compact Commission's model rules. Other states, such as Mississippi, are considering such legislation currently.

## *Annex 1: Progress to 2011*

EPA's issuance of its Class VI rules in December 2010 has gone a long way towards establishing a regulatory regime for CCS in the United States. In the meantime, the states continue to enact their own CCS regulatory programs to fill whatever regulatory gaps remain. All this said, CCS continues to face hurdles in the United States. Those hurdles include, but are not limited to, commercial considerations, cost considerations, and long-term stewardship.

[124] http://water.epa.gov/type/groundwater/uic/class6/gsguidedoc.cfm.

# UCL-CCLP

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## *Long-term liability for stored $CO_2$: an international law perspective*[125]

### Grounds for international regulation of long-term liability for CO2 storage

Among the legal issues associated with the deployment of CCS, primary attention has been given to the long-term liability for storage of $CO_2$. In this context, the focus has mainly been upon establishing a sound liability regime under national or regional law for potential leakage or other irregularities occurring within a state's territory. Examples of these dedicated CCS liability regimes are being developed, in particular, in the European Union, the United States, Australia and Canada.

However, due to the large scale of commercial CCS operations and the potential hazards posed by $CO_2$ storage, liability could also be triggered under international law in the case of transboundary damage across the territory of other states or in areas beyond national jurisdiction. This would entail the liability of both the operator and the state where the storage site is located. However, no dedicated international legislation exists to address the international liability for $CO_2$ storage activities. The adoption of a dedicated international regulation for long-term liability for $CO_2$ storage remains fundamental, as it would cover the areas where national law is not applicable or inadequate. Especially, it could:

- Provide a framework to redress leakage and other irregularities resulting in damage to areas beyond national jurisdiction, where resources are shared.
- Harmonise national CCS regimes within a supranational framework to avoid "regulatory competition" among jurisdictions, to attract business by means of more tolerant liability regimes. Such harmonisation would also ensure uniform liability standards for the CCS industry worldwide.

### The operator's liability

International lawmakers have prioritised removing explicit legal barriers within international marine legislation that would prohibit CCS activities offshore (*e.g.* by amending the OSPAR Convention[126] and the London Protocol[127]) rather than designing a long-term liability framework for storage. Despite the absence of specific civil liability rules for CCS under international law, the operator's individual liability could still be invoked by applying the polluter-pays principle, which is one of the fundamental principles of both international and national environmental law.

The enforcement of the polluter-pays principle is referred to both under the OSPAR Convention[128] and the London Protocol[129] as a key objective, but none of these conventions

[125] As this contribution focuses on long-term liability for $CO_2$ storage, issues of long-term liability under international law related to the transport of $CO_2$ under the 1989 Basel Convention and its 1999 Liability Protocol (not yet into force), although significant, will not be discussed.

[126] Annex I and III, 1992 Convention on the Protection of the Marine Environment of the North-East Atlantic, as amended in 2007. See: www.ucl.ac.uk/cclp/pdf/OSPAR_Convention_e_updated_text_2007.pdf.

[127] Annex 1 and Article 6, 1996 Protocol to the London Convention on the Prevention of Marine Pollution from Dumping at Sea (1972), as amended in 2006. See: www.ucl.ac.uk/cclp/pdf/PROTOCOLAmended2006.pdf.

[128] Article 2(2)(b), OSPAR Convention.

establish clear liability provisions to make this principle operational. Discussion of how to overcome this regulatory gap with respect to the regulation of CCS has yet to be included within the agenda of Contracting Parties.

**The state's liability**



In the absence of an international legal framework for an operator's liability for $CO_2$ storage, general principles of international law would apply. Transboundary harm caused by CCS activities (both onshore and offshore) could therefore not only trigger the individual liability of the operator, but also the liability of the state where $CO_2$ is injected. Under general international law, as well as many international environmental law treaties (including the London Protocol and the OSPAR Convention), the state must take all precautionary measures to ensure that activities undertaken within its territory and its jurisdiction do not cause adverse effects on human health and the environment in other states or areas beyond national jurisdiction, even when there is no conclusive evidence demonstrating the link between the activity and the effects ("precautionary principle"). The state is therefore required to exercise due diligence in monitoring, supervising and controlling such activities.

In the event of transboundary leakage or other irregularity from a $CO_2$ storage site, the international liability of the state where the storage site is located could therefore be invoked as a failure to apply the precautionary principle and exercise due diligence.

$CO_2$ leakage into the atmosphere from the storage site could also trigger the liability of the state with respect to its emission reduction commitments under the international climate change regime in force at the time when the leakage occurs or is detected. This aspect is particularly controversial in the context of the legal issues surrounding the inclusion of CCS as a clean development mechanism activity project. Short-, medium- and long-term liability of different entities involved in such a project, including the state, is one of the crucial issues to be resolved in order to consider CCS eligible under this mechanism.[130]

**Advantages of a dedicated international legal framework**

In light of the long-term dimension of $CO_2$ storage, establishing a clear liability scheme under international law could prove attractive, both from an operator and a state perspective. Such a scheme could:

- Encourage sound risk management for CCS and enforcement of environmental standards.
- Harmonise the threshold and magnitude of harm.
- Establish an ex-ante determination and allocation of responsibilities.
- Provide a remedy for claims of potential transboundary leakages, including health, environmental and economic damages.
- Establish a mechanism of prompt and adequate compensation for a definable harm.
- Enable the development of insurance coverage as a result of certainty on liability.
- Allow for a preventive response to potential damages caused by $CO_2$ storage.
- Possibly enhance public confidence in the technology.
- Protect the state from claims for failure to exercise due diligence

[129] Article 3(2), London Protocol.

[130] Decision adopted by the Contracting Parties to the United Nations Convention on Climate Change serving as meeting of the Contracting Parties to the Kyoto Protocol (COP16/CMP 6) in Cancun, 10 December 2010. See http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_cmp_ccs.pdf (provisional version).

# The World Bank

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## *Part 1: Developments in last six months*

The World Bank Carbon Capture and Storage Trust Fund (WB CCS TF) was established in December 2009 with financial support from the Norwegian government and the Global CCS Institute to promote capacity building in developing countries. The WB CCS TF is currently capitalised at US$11 million.

The work supported by the WB CCS TF includes nine programs in Botswana, China, Egypt, India, Indonesia, Jordan, Kosovo, South Africa, and the Maghreb region (Algeria, Morocco, and Tunisia), and a cross regional analytical study entitled “Carbon Capture and Storage: Regional Perspective in Developing Countries”.

**Country programs**

The types of capacity building activities included in the programs vary from country to country, but many of them include activities related to legal and regulatory issues. Four of the nine country programs have completed the approval stages of finalising the scope of the activities, three of which include regulatory components, as briefly described below.

- Botswana: training on CCS technology will be organised in order to raise awareness among decision makers on the legislative and regulatory requirements and characteristics of the technology. A Carbon Secretariat will be established as a small administrative unit under the Ministry of Mines, Energy, Water and Resources. The Carbon Secretariat will, among other activities, liaise with other relevant organisations, ministries and departments regarding CCS activities.
- Jordan: systematic assessments of the potential barriers which may affect the implementation of CCS projects will also be carried out, including legal and regulatory barriers. Capacity assessments of public and private institutions that may contribute toward CCS development in Jordan will be also developed. This will include a cataloguing exercise of expertise, or the gap of expertise, among the relevant institutions.
- Maghreb: identification of barriers which may inhibit the implementation of CCS activities, such as legal and regulatory issues, will be carried out, and recommendations of ways to overcome them will be suggested. More specifically, assessments of the potential for transporting captured $CO_2$ from power plants to the most suitable reservoirs will be undertaken, examining technical and economic issues, as well as regulatory issues.

**Cross regional analytical study**

The cross regional analytical work is mainly focussed in two regions, namely the Balkan and the Southern African regions. These regions were selected based on: 1) their level of reliance on fossil fuels for power generation; 2) regional energy and electricity network interdependency; and 3) potential to establish CCS regional networks linking $CO_2$ emitting sources and sequestration sites across different countries within the region.

The work contains four programme elements:

- Review of regulatory and institutional frameworks related to CCS in the case study regions.
- Techno-economic assessment of CCS deployment in power systems in the case study regions.
- Assessment of climate finance sources to accelerate CCS deployment in developing countries.
- Financing model for CCS projects.

The first component of this cross regional analytical study is a review of existing multilateral, regional, and national legal and regulatory frameworks that are directly or indirectly linked to potential CCS development. For the Southern African region, the review analysed the relevant laws in the Republic of Botswana, the Republic of Mozambique, and the Republic of South Africa, and within the regional electricity network, the Southern African Power Pool (SAPP). The analysis focused on the eight issues listed below.[131]

- Classification of $CO_2$ and its legal definition, including proprietary rights of stored $CO_2$.
- Jurisdiction over the control and management of domestic and cross-boundary pipelines and reservoirs (including monitoring, reporting and verification requirements).
- Proprietary rights to cross-boundary $CO_2$ capture and storage sites and facilities.
- Regulatory and/or licensing (permitting) scheme related to the operation and management of storage and transportation facilities.
- Long-term management and liability issues arising out of accidents or leaks in domestic and cross-boundary CCS projects.
- Third-party access rights to transportation networks, transit rights and land rights with regard to pipeline routes.
- Regulatory compliance and enforcement schemes.
- Environmental impact (including cumulative impact) assessment process, risk assessment and public consultation.

For all of the countries examined in the study, CCS is still at a nascent stage of development. Given that there are no CCS-specific laws at the national or regional levels in the Southern African region, and that the analysed countries differ in the extent to which they have incorporated CCS in their national frameworks, the report provides only a preliminary and high-level review of the relevant legislative, regulatory and institutional regimes applicable to country level and cross regional CCS activities. The analysis, however, revealed that the existing regulatory systems and institutional arrangements in Botswana, Mozambique and South Africa already contain certain elements that may be adapted to address the specific issues that may arise with CCS activities.

[131] The report addresses some of the issues included in the Decision of the Conference of the Parties serving as the meeting of the Parties (CMP 6) to the Kyoto Protocol. In Cancun in December 2010, the CMP adopted the Decision, "Carbon Dioxide Capture and Storage in Geological Formations as Clean Development Mechanism Project Activities," where the CMP decided that CCS in geological formations is eligible as project activities under the CDM, provided that the following issues, among others, are addressed and resolved in a satisfactory manner: environmental impacts; international law; liability; safety; and insurance coverage and compensation for damages caused due to seepage or leakage. See Decision CMP.6, available at: http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_cmp_ccs.pdf.

The report identified several gaps in the existing multilateral, bilateral and national regulatory and legal frameworks in the Southern African region that might prevent the development of cross-boundary and national CCS projects, and made a number of recommendations at the domestic, regional and international levels aimed to remove the regulatory and legal barriers to CCS deployment.



The report will become publicly available in the coming months.

## *Developments expected in next six months*

With regards to the cross regional analytical study, a similar regulatory and legal review will be carried out in the Balkan region, focusing in particular on Bosnia-Herzegovina, Kosovo, and Serbia. A consolidated report detailing the findings of all the parts of the analytical study is scheduled to be published in August 2011. Two workshops will be held (May 4 and 5 in Dubrovnik, Croatia, and tentatively June 1 and 2 in Johannesburg, South Africa) to present the findings of the study and to discuss the work programs of other multilateral development banks, international organisations and research institutes relevant to CCS in developing countries.

Further, the finalisation of the scope for the remaining country programs will be completed over the next few months.

In September 2011, a workshop will be held at the Washington DC World Bank office to discuss the progress of the activities of the programs and the cross regional analytical study carried out under the WB CCS TF.

# WRI

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## *Part 1: Developments in last six months*

**Guidelines for Community Engagement in CCS Projects, published November 2010**

The Guidelines were drafted by authors at WRI in close consultation with an international group of stakeholders with specific expertise and experience in engaging local communities regarding deployment of CCS technology. The Guidelines build on WRI's previous 2-year consensus-building stakeholder effort that resulted in the Guidelines for Carbon Dioxide Capture, Transport, and Storage[132], a set of technical guidelines for how to responsibly proceed with safe CCS projects. The Guidelines are intended to serve as international guidelines for regulators (including those in both regulatory policy design and implementation capacities); local decision makers (including community leaders, citizens, local advocacy groups, and landowners); and project developers to consider as they plan and seek to implement CCS projects. The full document is available for download at: www.wri.org/publication/ccs-and-community-engagement.

**Carbon Dioxide Capture and Storage and the UNFCCC: Recommendations for Addressing Technical Issues, published December 2010**

A number of countries - including the United States, China, and EU member states - are putting significant resources into the development of CCS technologies, and four commercial-scale projects are in operation in Norway, Canada, and Algeria. At the international level, the role of CCS in new technology mechanisms under discussion at the ongoing United Nations-led negotiations is not yet clear. In an effort to inform the negotiations, this policy brief provides context, concise analysis, and recommendations to Parties for addressing CCS issues raised to date in the twin track United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol (KP) processes. These issues include:

- Non-permanence, including long-term permanence.
- Measuring, reporting and verification (MRV).
- Environmental impacts.
- Project activity boundaries.
- International law.
- Liability.
- Safety.
- Insurance coverage and compensation for damages caused due to seepage or leakage.

In addition, the brief explores a broad range of current and future mechanisms and regulatory frameworks whereby the UNFCCC and national governments can consider CCS technologies. The report does not presuppose the successful implementation of CCS around the world. Nor does it make recommendations on whether CCS should be included in specific existing or future UNFCCC mechanisms (such as the Clean Development Mechanism [CDM] or technology mechanisms) or in

[132] www.wri.org/publication/ccs-guidelines.

countries' climate change mitigation commitments and actions (*e.g.* Nationally Appropriate Mitigation Actions [NAMAs], etc.). Instead, the report focuses on technical issues, with the aim of helping Parties evaluate a robust strategy for CCS as part of international negotiations and establish CCS best practice criteria for governments and the international process, thereby enhancing transparency and ensuring that CCS deployment is safe and effective. The full paper is available for download at: http://pdf.wri.org/carbon_dioxide_capture_and_storage_and_the_unfccc.pdf.



## *Developments expected in next six months*

**CCS Demonstration in Developing Countries: Priorities for a Financing Mechanism for Carbon Dioxide Capture and Storage, March 2011**

While CCS is potentially attractive to some developing countries, there has been limited development of demonstration projects in Africa, Asia, or Latin America due mainly to their high cost in the absence of expected profits or significant carbon financing. Existing financing for CCS is grossly insufficient to enable demonstration projects in developing countries. The few available funds are either spread over the full array of low-carbon technologies, or fall short of the magnitude or the mandate needed to propel commercial-scale CCS demonstrations forward. Current carbon offset mechanisms are not sufficient to spur CCS deployment in developing countries in today's context either. Overall, existing CCS financing mechanisms help grow capacity, but their support is insufficient to leverage enough funding from capital markets to implement projects in a non-OECD context.

This paper seeks to promote the effective deployment of CCS demonstration projects in developing countries. Aimed at international policymakers and agencies engaged in CCS funding and deployment negotiations and discussions, the paper explores some of the key issues emerging around this critically important topic, and it presents a series of options and recommendations to international policymakers. WRI's aim is to assist the initial design of an effective approach for financing CCS demonstration projects in developing countries over the next 10 years.

**China CCS Guidelines, September 2011**

The United States and China are in a unique position to act together as catalysts for advancing CCS deployment worldwide. CCS is a technology of great interest to China as a way to support the country's growing energy needs and reduce greenhouse-gas emissions from coal facilities.

Tsinghua University has partnered with WRI to begin addressing how to ensure that CCS deployment in China meets environmental standards by drafting Guidelines for Safe and Effective CCS in China. The Tsinghua-WRI team will build capacity that supports regulatory development by engaging technical experts and other stakeholders in building consensus surrounding guidelines and best practices.

The project is led by a bilateral steering committee that includes leading CCS experts from China and the United States. Each year the team spends a week in the other country, visiting leading CCS research facilities and relevant industrial facilities. At that time, the full bilateral steering committee meets to discuss the Guidelines. The steering committee includes a diverse set of stakeholders. From China, the leading enterprises involved in CCS are represented including the power sector, mining, oil and gas, and leading academics. From the United States the committee includes leading academic CCS experts as well as NGOs with legal expertise. The Guidelines are being drafted in Mandarin by Tsinghua University. This effort leverages the Guidelines for Carbon Dioxide Capture, Transport, and Storage but the China Guidelines are an original document, drafted from a China-specific policy and technology perspective.

## *Part 2: Long-term liability for stored $CO_2$*

The following text is excerpted from our most recent publication which covered liability:

Carbon Dioxide Capture and Storage and the UNFCCC: Recommendations for Addressing Technical Issues, http://pdf.wri.org/carbon_dioxide_capture_and_storage_and_the_unfccc.pdf

The lack of established procedures for addressing short and long-term liability for CCS has been raised as a concern. The term liability in a CCS context includes:

- Financial compensation for the affected individuals or entities in the event of unexpected leakage that harms people or the environment.
- Carbon liabilities associated with international trading schemes and other national market mechanisms.
- Post-closure stewardship (routine maintenance and monitoring) of CCS sites.

As with many aspects of CCS, potential impacts and liabilities are often site specific. While some broad categories of possible impacts exist (*e.g.* release of $CO_2$ to the atmosphere, $CO_2$ leaking from storage complex and into underground sources of drinking water, etc.) the actual probabilities of these events occurring, and their associated liabilities, are currently determined on a site-specific basis. Efforts are being made to provide broad estimates for risks and liabilities as the research is still evolving.

At the time that CCS discussions first began in the UNFCCC, there were no policies that provided national, state or provincial clarity on long-term stewardship and liability for CCS. A range of policy options and approaches are now being implemented, as summarised in the following table. Most of these policies require that the liability and stewardship responsibilities for a CCS effort rest with the project operator until injection ceases and a post-closure monitoring period has been completed to the satisfaction of a regulatory authority. After the post-closure period, some governments have elected to assume the liability for either specific CCS projects that they sponsor, or in some cases, for CCS projects more broadly. Such transfer of responsibility is usually contingent on issuance of a site-closure certificate which is granted when the operator has met the agreed upon financial and monitoring obligations and the site has been determined by a regulatory authority to no longer pose a significant threat of endangering people or ecosystems. The costs of stewardship are often linked with liability and are funded by a fee paid by the project operator in advance, typically during the injection phase.

Many NGOs assert that the operator should remain responsible for liability and post-closure stewardship indefinitely because such responsibility encourages due diligence in safe operations.[133] However, industry CCS experts argue that the uncertainty regarding such first-of-a-kind CCS efforts warrants government support, and in some cases indemnification.[134] Many other experts feel that industry should be responsible during the operational phases of a project and immediately after injection but concede that the government is the only entity that might exist long enough to provide the long-term oversight necessary for a storage site.

Additional research and discussion is needed in this area. As the first CCS projects are just being initiated, there is little available information on the actual costs of post-closure stewardship and liability coverage. In addition, the approaches taken for the first CCS projects might be revised as

[133] Interagency Task Force on Carbon Capture and Storage. "Report of the Interagency Task Force on Carbon Capture and Storage." August 2010. Available at: www.epa.gov/climatechange/policy/ccs_task_force.html.

[134] Clean Coal and CCS Technology Development Pathways Initiative. "Executive Summary: Clean Coal and CCS Technology Development Pathways Initiative. Participant Input." Office of Senator Byron L. Dorgan, Fall 2009. Available at: http://dorgan.senate.gov/issues/energy/cleancoal/executivesummary.pdf.

additional experience with the technology is gained. For example, a liability framework for the first projects might have the government assume liability after operations cease, but in the future mechanisms should be designed to internalise long-term costs for monitoring, stewardship, and liability into the planning and operation of a CCS project.



A key point in the discussions around liability is determining whether and when responsibility could be transferred to the government or another entity. WRI's Guidelines for Carbon Dioxide, Capture, Transport and Storage provide a set of criteria designed to ensure that a given CCS effort is not expected to pose a risk to human health or the environment in the future. Specifically, these criteria include a demonstration of all of the following:

- The estimated magnitude and extent of the project footprint, based on measurements and modelling.
- That $CO_2$ movement and pressure changes match model predictions.
- The estimated location of the detectable $CO_2$ plume based on measurement and modelling.
- Either (a) no evidence of significant leakage of injected or displaced fluids into formations outside the confining zone or (b) demonstrating the integrity of the confining zone.
- That, based on the most recent geologic understanding of the site, including monitoring data and modelling, the injected or displaced fluids are not expected to migrate in the future in a manner that encounters a potential leakage pathway.
- That wells at the site are not leaking and have maintained integrity.

**Approaches to CCS liability in place in key countries and regions**

| Jurisdiction | CCS Liability Framework | Application |
|---|---|---|
| **Australia** | The Australian Government accepted 80 percent, and the Western Australian Government 20 percent, of any post-closure liability for CCS in the long term | Gorgon LNG project |
| **Canada** | No unique liability for CCS, governed by same rules as oil and gas operations, although provincial rules are under consideration in Alberta and Saskatchewan | All CCS projects |
| **European Union** | Liability and responsibility for CCS is transferred to the member state's "competent authority", after operator proves that there is no risk of leakage and 20 years of post-closure monitoring are complete. | All CCS projects |
| **United States** | State-level policies are in place in seven states[135] which include a variety of policy approaches from operator retains liability to state accepts full liability/responsibility. No national framework for CCS liability exists. | All CCS projects in select states |
| **United Kingdom** | Adopted the EU CCS Directive, with the government acting as the "competent authority" | All CCS projects |

As national governments consider liability for CCS efforts, we recommend that procedures for transfer of responsibility be clearly articulated and based on the list of criteria provided in this section and expanded upon in WRI's CCS Guidelines. Where responsibility will not be transferred to the host government, the responsibilities of the project operator over the long-term should be clearly articulated to include both post-closure stewardship and liability.

[135] Illinois, Kansas, Louisiana, Montana, North Dakota, Texas and Wyoming and Washington.

# IEA

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## *Part 1: Developments in last six months*

In addition to the launch of the *CCS Review*, key IEA developments over the last six months include publication of the IEA *Carbon Capture and Storage Model Regulatory Framework* (*Model Framework*) and the third meeting of the IEA International CCS Regulatory Network (Network). The IEA has also engaged with several countries on CCS regulation and provided support to the April 2011 Clean Energy Ministerial through the Carbon Capture, Storage and Use (CCUS) Action Group.

***Model Framework***

The *Model Framework* (published November 2010) supports CCS framework development by providing a practical tool that governments can use to help develop national frameworks. The document synthesises regulation already in place in Europe, Australia, the United States and elsewhere to propose key principles for addressing 29 regulatory issues associated with CCS. The key issues addressed in the *Model Framework* cut across all stages of the CCS chain, including $CO_2$ capture, transportation and storage, but focus primarily on regulatory issues associated with $CO_2$ storage (generally, the more novel and complex issues). For each issue, the *Model Framework* sets out considerations to be taken into account when developing regulatory approaches. It also provides examples of how the issue has been addressed in existing CCS regulatory frameworks. A base or "starting point" regulatory framework that countries can build on with jurisdictionally appropriate additions and amendments – referred to in the *Model Framework* as "Model Text" – is also provided for $CO_2$ storage issues.

The *Model Framework* is directed toward countries that are currently developing or considering developing regulatory approaches to facilitate CCS demonstration efforts, or need comprehensive regulatory frameworks for the large-scale deployment of CCS. The publication is available at www.iea.org/ccs/legal/modelframework.asp.

**Third IEA International CCS Regulatory Network meeting**

The third meeting of the Network was held at the IEA in Paris on 1 and 2 March 2011. The meeting provided an update on work being done to develop legal and regulatory frameworks for CCS around the world, with a focus on how countries are addressing three of the most challenging aspects of CCS regulation: long-term liability, financial assurance for long-term stewardship, and public engagement. Updates were presented by representatives from countries that are well advanced in the development of CCS frameworks and countries that are less advanced, as well as the environmental NGO community and international CCS organisations. Twenty-one countries and regions gave presentations. There was also an update on international legal developments relevant to CCS. Further information on the meeting is available at www.iea.org/ccs/legal/network.asp.

In addition to the third face-to-face meeting of the Network, the IEA hosted a Network webinar on the *Model Framework* and CCS regulatory developments worldwide in November 2010.

**Outreach**

The IEA has engaged with several countries on CCS regulation over the last six months as part of the IEA CCS Unit's broader outreach programme, which aims to assist countries in identifying and addressing national CCS priorities.

The IEA co-hosted a CCS roundtable in Kuala Lumpur, Malaysia, in March 2011 with the Malaysian Ministry of Energy, Green Technology and Water. The aim of the roundtable was to explore the current status of CCS globally, including legal and regulatory developments; the status of the technology in Malaysia; and potential next steps for CCS development in Malaysia. The roundtable was attended by officials from several government ministries as well as key industry stakeholders, such as the national oil and gas company, Petronas, and the national utility company, Tenaga Nasional Berhad (TNB). The IEA also hosted a CCS legal and regulatory workshop in Johannesburg, South Africa, in April 2011, together with the South African Department of Energy and South African Centre for Carbon Capture and Storage. The workshop provided an update on the current status of CCS legal and regulatory developments in South Africa and globally, building on significant momentum in this area over the last six months, and identified potential next steps for South Africa. The workshop was attended by a broad range of South African CCS stakeholders from government, industry and NGOs and by international experts from several countries.

The IEA also engaged directly with key stakeholders in the United States, Australia, Malaysia, Indonesia, Vietnam, South Africa and several EU member states through a series of bilateral meetings over the last six months.

In addition, the IEA presented IEA CCS legal and regulatory work and global developments in CCS regulation at numerous conferences and events globally. The IEA also contributed to the Global CCS Institute's *The Global Status of CCS 2010* publication, writing Chapter 6 – Legal and regulatory developments (available at www.globalccsinstitute.com/global-status-ccs-2010?referrer=home-link).

**Clean Energy Ministerial**

The IEA provided input into the Clean Energy Ministerial (CEM) through the Carbon Capture, Storage and Use (CCUS) Action Group, including by leading the development of recommendations relevant to CCS regulation. The CEM brings together ministers responsible for clean energy technologies from the world's major economies; the CCUS Action Group was established at the 2010 CEM in Washington, DC, to provide recommendations to the CEM on concrete, near-term actions to accelerate global CCS deployment. Between September 2010 and April 2011, the CCUS Action Group, led by the Australian and UK governments, developed eight recommendations that could be undertaken by CEM ministers leading up to the 2012 CEM in the areas of CCS financing, regulation, knowledge-sharing and storage. At the second meeting of the CEM (Abu Dhabi, United Arab Emirates, 6 and 7 April 2011), these recommendations were endorsed by CEM ministers.

## *Developments expected in next six months*

The IEA will continue efforts to support national level CCS framework development, including engagement based on the *Model Framework*. Activities will include, but not be limited to, the following:

- After the CCS legal and regulatory workshop in Johannesburg in April 2011, the South African government is establishing structures to advance CCS framework development within the country. The IEA, along with other entities, is expected to provide a supporting role in this

process, drawing on the *Model Framework* and expert knowledge. Several activities are under discussion leading up to the South African CCS week planned for October 2011.

- The IEA will continue to participate in Alberta's Regulatory Framework Assessment process.
- The IEA is currently in discussions with several countries concerning proposed CCS legal and regulatory working meetings on select issues drawn from the *Model Framework* and more general CCS legal and regulatory workshops. It is anticipated that additional country-focused workshops will take place in the next six months.



Following on the launch of the *Model Framework*, the IEA will be releasing a series of issue-based papers that compile and analyse existing regulation on particular CCS regulatory issues, such as long-term liability. The IEA will be working over the coming months to further define the scope of this work.

The IEA will also hold further Network webinars, the first of which is schedule to take place in June 2011.

The IEA welcomes suggestions for additional work in the area of CCS legal and regulatory analysis.

# Previous editions of the *CCS Review*



## Edition 1: October 2010

### *Theme*

CCS legal and regulatory progress to 2010.

### *Jurisdictions*

| | | |
|---|---|---|
| Australia | Korea | Spain |
| Canada | Netherlands | Switzerland |
| European Commission | New Zealand | United Kingdom |
| France | Norway | United States - Environmental Protection Agency |
| Germany | Slovak Republic | United States - Department of Energy |
| Japan | South Africa | |

### *Organisations*

CCSReg
Global CCS Institute
IEA Greenhouse Gas R&D Programme
UCL-CCLP
WRI
IEA

### *Key discussion points*

Who regulates CCS?
Starting from existing laws
Heading offshore
Providing incentives for CCS
Building "CCS-ready" plants
Gaining public acceptance

International Energy Agency

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