



# Strategic Analysis of the Global Status of Carbon Capture and Storage

Report 3: Country Studies  
The United States of America

Final Report



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United States of America

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## 1. Executive summary

There has been an increasingly rapid concentration of policymaking, funding and research around the development and deployment of CCS technology in the United States as a means of mitigating GHG emissions. While the US has yet to set a cap on economy-wide GHG emissions, or to impose substantial costs on sources of these emissions, the development of CCS technology is seen as critical to the ultimate success of any future emissions control regime in the country. The new US Government has moved quickly in the areas of energy, environmental protection and land management to initiate policies that will help facilitate development of CCS technologies. Large amounts of funding under the country's recent stimulus package have been allocated to CCS initiatives. At the same time, recent developments in Congress suggest that legislation imposing costs on the emission of CO<sub>2</sub> in the US may be in place as early as later this year.

Nonetheless, significant technological, financial and regulatory hurdles remain for large-scale commercial deployment of CCS technology in the US. Questions related to the application of existing US law and policy are implicated at almost every stage of the CCS process, while in some areas new policy models are already being developed. In particular, with respect to capture, the non-CO<sub>2</sub>-related environmental impacts of the technology need to be considered under existing law in the US. With respect to transport of sequestered CO<sub>2</sub>, a more coherent regulatory framework for multi-jurisdictional infrastructure development appears necessary for large-scale CCS deployment. Finally, with respect to underground storage of captured CO<sub>2</sub>, policymakers in the US have proposed technical standards and regulation for the injection of CO<sub>2</sub> and have begun to address questions of property rights to underground storage space and long-term liability for sequestered CO<sub>2</sub>. More clarity on each of these issues will be necessary as several large-scale CCS projects get underway in the US within the next five years.

## 2. Glossary

ACES	American Clean Energy and Security Act
ARRA	American Recovery and Reinvestment Act
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BACT	best available control technology
BAU	business as usual
BLM	Bureau of Land Management
CAA	Clean Air Act
CCP	Clean Coal Portfolio Standard
CCPI	Clean Coal Power Initiative
CWA	Clean Water Act
CCX	Chicago Climate Exchange
DCEO	Illinois Department of Commerce and Economic Opportunity
EA	Environmental Assessment
EIS	Environmental Impact Statement
EGUs	electricity generating units
EOR	Enhanced Oil Recovery
EPA Rule 2008	Proposed Rule, Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells, 73 Fed. Reg. 43, 492 (2008).
EPA Rule 2009	Proposed Rule, Mandatory Reporting of Greenhouse Gases, 74 Fed. Reg. 68, 16448, 16584 (2009).
EPAct05	Energy Policy Act of 2005
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act
FERC	Federal Energy Regulatory Commission
GS	geological sequestration
IGCC	Integrated Gasification Combined Cycle
IECC	International Energy Conservation Code
LAER	lowest achievable emission reduction

MLA	Mineral Leasing Act
MMS	Minerals Management Service
MRCSP	Midwest Regional Carbon Sequestration Partnership
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
NSR	New Source Review
OPS	Office of Pipeline Safety
PPA	Purchase Power Agreement
PSDF	Power Systems Development Facility
RCRA	Resource Conservation and Recovery Act
RCSP	Regional Carbon Sequestration Partnership
RGGI	The Regional Greenhouse Gas Initiative
SDWA	Safe Drinking Water Act
STB	Surface Transit Board
USDOE	US Department of Energy
USDOI	US Department of the Interior
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
WCI	Western Climate Initiative
WESTCARB	West Coast Regional Carbon Sequestration Partnership

## **3. CO<sub>2</sub> pricing**

### **3.1 Introduction**

While there are several proposed legal frameworks around the United States to impose costs on GHG emissions, only one such framework is currently operational: the Regional Greenhouse Gas Initiative (RGGI), a mandatory regional cap-and-trade program in the north-eastern United States.

There is no Federal-level mechanism currently in place in the United States to impose a cost on GHG emissions.

On 26 June 2009, the US House of Representatives (House) passed HR 2454, the American Clean Energy and Security Act of 2009 (ACES), which would create a mandatory, Federal cap-and-trade program for GHG emissions. The Senate Environment and Public Works Committee is likely to develop a piece of climate legislation of its own based largely on ACES, as well as on the Lieberman-Warner Bill, S.3036, that passed out of committee in the Senate in June of 2008, but stalled in debate on the Senate floor.

If climate bills pass the Senate, a Conference Committee made up of members of both houses would be formed to reconcile the bills. The changes made in conference would then have to be approved by both houses before the final legislation could be forwarded on to the President for approval.

Democratic leadership hopes the legislative process to impose a cost on GHG emissions in the US will culminate prior to the UNFCCC Conference of the Parties meeting in Copenhagen in December 2009.

The details of RGGI and ACES are discussed below, along with other schemes that impose direct and/or indirect costs on GHG emissions in the US

### **3.2 Mandatory cap and trade schemes**

RGGI commenced in the north-eastern United States on 1 January 2009. It is the first compliance cap-and-trade program in the US for CO<sub>2</sub> emissions. Various other states and regions in the US are considering the development of mandatory cap-and trade schemes, including California, Oregon and a group of 11 US States and Canadian provinces known as the Western Climate Initiative (WCI).

While there is no Federal cap-and-trade scheme currently in place, a description of the mandatory cap-and-trade program created by ACES is provided because this scheme represents the most advanced legislative proposal in the US Congress to create a Federal cap-and-trade program for GHG emissions. The ACES Act further provides a comprehensive approach for commercial development of CCS technology in conjunction with the cap-and-trade system.

#### **3.2.1 RGGI**

In general, covered entities under RGGI, which include all fossil-fuel fired electricity generating units (EGUs) greater than 25 MW located in the RGGI member States, are free to pass the costs of the auction-based emission trading system on to energy consumers. There are two caveats to this general principle. First, while covered entities may pass costs on to consumers, the RGGI Model Rule requires member States to divert a portion of auction proceeds back to energy consumers to offset some of the costs passed through by power companies under the program (Model Rule § XX-5.3(a)). Second, some covered entities under RGGI are prevented from passing on CO<sub>2</sub> costs by contract.

Long-term, fixed-price power purchase agreements (PPAs) have prevented some generators in the region from passing the cost of RGGI compliance on to power purchaser/providers. This issue is one of several in dispute in a recently filed lawsuit by a electric generation company against the State of New York challenging its implementation of RGGI (*Indeck Corinth, L.P., v David A. Patterson, et.al, Supreme Court of N.Y., County of Saratoga, 2009/0369*).

Under the ACES Act, covered entities, which include, among other sources, electric power generators, oil and gas producers, geologic sequestration sites and heavy industry, may pass the cost of compliance with the system on to consumers. Like RGGI, the ACES Act provides a mechanism for consumer protection from these costs. Over forty percent of emission allowances issued under the program for years 2012 and 2013 will be allocated rather than auctioned to the electricity sector with the stipulation that these allowances be used to protect consumers from energy price increases. The ACES Act also attempts to address the long-term PPA contract issue described above by distributing free allowances to generators locked into such contracts.

### **3.2.2 Application of emission reduction obligations**

RGGI only addresses direct emissions from power plants. The Federal cap-and-trade program proposed under the ACES Act is more comprehensive, creating compliance obligations for sources in several sectors of the economy.

## **FOSSIL FUEL EXTRACTION FACILITIES**

Under the ACES Act, any producer or importer of petroleum- or coal-based liquid fuel, petroleum coke, or natural gas liquid, the combustion of which would result in 25,000 tons of GHG emissions per year would be required to hold emission allowances equivalent to those emissions (ACES § 700(13)(B)).

## **CO<sub>2</sub> CAPTURE AND TRANSMISSION INFRASTRUCTURE**

Carbon capture and transmission infrastructure regulation is not covered under either RGGI or the ACES Act.

## **CO<sub>2</sub> STORAGE FACILITIES**

Under the ACES Act any geologic sequestration site would be required to hold allowances equivalent to its GHG emissions, i.e. CO<sub>2</sub> released from the storage site (ACES § 700(13)(E)).

### **3.2.3 CCS-specific incentive provisions**

## **STAGED TECHNICAL GOALS**

The ACES Act would also require new coal-fired power plants to meet certain performance standards. Under the Act, plants initially permitted from 2009-2020 would be required to achieve a 65 percent reduction in emissions of CO<sub>2</sub> four years after the demonstration of 4 GW of CCS technology in the US, but not later than 2025. New coal-fired power plants permitted in 2020 or thereafter must achieve a 65 percent reduction in emissions of CO<sub>2</sub> (ACES § 812(b)).

These performance standards are considered very stringent and are expected to discourage the development of new coal-fired power plants until commercial deployment of advanced CCS technology is possible.

## BONUS PERMIT ALLOCATION

ACES includes a bonus permit allocation scheme to support commercial deployment of CCS technologies for certain coal-fired EGUs and industrial sources that achieve at least a 50 percent reduction in CO<sub>2</sub> emissions using CCS technology. Bonus allowances would be issued directly to the owner or operator of a CCS project (ACES § 786(b)). Projects would be eligible for this dispensation only during the first 10 years of operation (ACES § 786(g)).

The amount of allowances available for this purpose would be equal to 1.75 percent of the total annual allowances issued under the cap-and-trade system from 2014 to 2017 and 5 percent of the allowances issued in 2018 and subsequent years (ACES § 782(f)).

## EGUS

For projects at eligible EGUs,<sup>1</sup> bonus allowances would be distributed in two phases, with a separate allocation method for both phases.

In Phase I, which would only encompass the first 6 gigawatts of CCS projects at EGUs, measured in cumulative generating capacity of such units, bonus allowances would be distributed according to the following formula:

$$\frac{\text{mt CO}_2 \text{ avoided through use of CCS technology} \times \text{bonus allowance value}}{\text{average fair market value of 1 emission allowance during the preceding year}}$$

The “bonus allowance value” would be roughly equivalent to the percent of a facility’s business as usual (BAU) CO<sub>2</sub> emissions captured by the project in a given year, for example, 50 percent capture would have a US\$50 per ton bonus allowance value. For EGUs capturing 85 percent or more of the CO<sub>2</sub> that would otherwise be emitted from their facility, the bonus allowance value would be US\$90.

As an illustration of the above, if, in a given year, Facility A avoided 15,000 mt of CO<sub>2</sub> emissions using CCS technology, capturing 50 percent of the facility’s BAU CO<sub>2</sub> emissions, and the average fair market value of an emission allowance during the preceding year was US\$15,<sup>2</sup> then Facility A would receive a bonus permit allocation of 50,000 (worth approximately US\$50 per ton of CO<sub>2</sub> captured and stored that year).

In Phase II, which would encompass CCS projects beyond the 6 gigawatt threshold identified for Phase I, bonus allowances would be distributed using a “reverse auction” system, essentially a competitive bidding process for ACES allowance funding.

In a reverse auction, the US Environmental Protection Agency (USEPA) would solicit bids from eligible CCS projects that would include the project’s desired level of incentive per ton of CO<sub>2</sub> avoided and the estimated quantity of CO<sub>2</sub> that the project would permanently sequester over 10 years (ACES § 786(d)(3)(B)). Allowances would be distributed to selected bidders pursuant to a formula similar to the one described above, except that the incentive level that is bid by the project sponsor would be substituted for the bonus allowance value (ACES § 786(d)(3)(C)). The reverse auction system is

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<sup>1</sup> An eligible EGU must have a nameplate capacity of 200 MW or more and derive at least half of its annual fuel input from coal or petroleum coke, ACES § 786(b)(1)(A).

<sup>2</sup> The USEPA, Preliminary Analysis of the Draft American Clean Energy and Security Act of 2009 estimated that that allowance prices would be between US\$13 to US\$17 in 2015. However, see USEPA, “Ways in Which Revisions to the American Clean Energy and Security Act Change the Projected Economic Impacts of the Bill,” finding that compared to the earlier draft bill, HR 2454 would likely result in lower allowance prices.

intended to ensure that subsidy amounts for CCS projects are fixed at a level that is neither too high, nor too low.

If the USEPA determines that the reserve auction system is not effective, it may instead provide for the distribution of bonus allowances to CCS projects in a series of tranches, each tranche supporting projects of different size capacities and available on a first-come, first-served basis.

Importantly, the Act also applies a discount rate to the number of bonus allowances that may be allocated to new EGUs based on the number of years they are in operation before achieving the requisite level of CO<sub>2</sub> capture. This discount is intended to discourage the development of new coal-fired power plants before those plants are willing or able to effectively employ CCS technology.

For any EGU initially permitted between 2009 and 2015, a 20 percent discount will be applied for each year after an EGU has been in operation for five years that it does not achieve a 50 percent reduction, or each year after 2020 that an EGU operates without achieving a 50 percent reduction, whichever event occurs first (ACES § 786(e)(2)).

EGUs permitted between 2015 and 2025 would be ineligible for bonus allowances if they do not achieve a 50 percent reduction “upon commencement or thereafter” (ACES § 786(e)(3)). Any ambiguity in the meaning of the term “thereafter” would be subject to interpretation by the USEPA.<sup>3</sup>

## INDUSTRIAL SOURCES

USEPA may distribute no more than 15 percent of the allowances allocated for commercial-scale deployment of CCS to owners or operators of eligible industrial sources (ACES § 786(b)(1)(B)).<sup>4</sup> These allowances would be distributed on the basis of tons of CO<sub>2</sub> captured and permanently sequestered using either the reverse auction or the tranche method described above.

### 3.3 Non-mandatory emission reduction schemes

The Chicago Climate Exchange (CCX) is a private, voluntary emission reduction scheme in the United States, which imposes a cost on CO<sub>2</sub> emissions for CCX members. CCX members make a voluntary, but legally binding emission reduction commitment and participate in the CCX cap-and-trade system.

#### 3.3.1 Acceptance into mandatory cap and trade schemes

There is no indication at this point that the CCX cap-and-trade system would be recognized under a mandatory Federal program

### 3.4 CO<sub>2</sub> taxation schemes

Several bills that include a tax on CO<sub>2</sub> have been introduced in the US Congress to date. Discussion of these bills has remained marginal, without any one proposal emerging as a leading alternative to the omnibus cap-and-trade bills proposed thus far. The proposed tax schemes include HR 3416, “America’s Energy Security Trust Fund Act of 2007,” which would impose a tax of US\$15 per ton of CO<sub>2</sub> emitted starting in 2008, increasing 10 percent annually thereafter; and HR 2069, “Save Our Climate Act of 2007,” which would tax CO<sub>2</sub> emissions in the US at the rate of US\$2.72 per ton in 2008,

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<sup>3</sup> See for example *Chevron USA, Inc. v. Natural Resources Defense Council, Inc.*, 467 US 837 (1984).

<sup>4</sup> An eligible industrial source is a source that, absent carbon capture and sequestration, would emit greater than 50,000 tons per year of CO<sub>2</sub> and that does not produce liquid transportation from a solid fossil-fuel based feedstock, e.g. oil shale,

increasing by US \$2.72 each year until emissions reach 20 percent of 1990 levels. Both bills would provide a credit or refund for sequestered CO<sub>2</sub> (Pew Center, 2008).

### **3.5 Indirect cost imposition: renewable energy schemes**

#### **3.5.1 Portfolio energy standards**

The state of Illinois recently adopted the country's first "Clean Coal Portfolio Standard" (CPS). The law requires utilities in the state to obtain 5 percent of their electricity from coal plants that capture and sequester CO<sub>2</sub> emissions. The law would require utilities to negotiate a PPA with the only operational CCS project in the state, a 525 MW IGCC power plant in Taylorville, Illinois. The Taylorville project is only expected to meet half of the demand created by the CPS. Estimates suggest that in order to meet CPS demand, an additional 800 MW of CCS capacity will be needed in the state (EER, 2009).

To date, 44 US states have adopted renewable energy portfolio standards (DSIRE, 2009). California, Texas and Connecticut were among the first states to do so.

In California, each retail seller of electricity is required to increase its total procurement of eligible renewable energy resources by at least an additional 1 percent of retail sales per year so that 20 percent of its retail sales are procured from eligible renewable energy resources no later than 31 December 2010.

Under the Texas Renewable Energy Program, the cumulative installed renewable capacity for public utilities in the state must total 5,880 MW by 1 January 2015, with a target of at least 500 MW of the total installed renewable capacity after 1 September 2005, coming from a renewable energy source other than wind.

In Connecticut, electric suppliers and distribution companies must meet targets for generation from renewable energy sources starting at 7 percent in 2010 and increasing to 20 percent by 2020.

The US may introduce similar standards at a Federal level. The ACES Act includes a provision requiring that a specified portion of US electricity sales, reaching 20 percent in 2020, be provided by renewable energy sources and energy efficiency measures, excluding traditional hydroelectric generation.

#### **3.5.2 Feed-in tariffs**

The US has no feed-in tariffs in place at the Federal level. While several states plan to create feed-in-tariffs, California remains the only state with an established feed-in tariff system. Under California's system, any electricity customer with that owns an eligible renewable generating facility with a nameplate capacity of not more than 1.5 MW can sell electricity to electric utilities in the state. An electric utility will agree to purchase every kWh of renewable electricity generated by the customer up to the state-wide cap of 470 MW. California's tariff rates are based on time-of-delivery. Price varies depending on whether the electricity is generated during peak or off-peak hours.

### **3.6 Greenhouse gas emission and energy use reporting schemes**

#### **PROPOSED FEDERAL RULE**

On 10 April 2009, the USEPA published its proposed, economy-wide GHG reporting rule in the Federal Register (EPA Rule 2009). The rule does not propose to require emissions reporting from

geologic sequestration sites. However, the USEPA is in the process of evaluating existing and proposed methodologies for monitoring and reporting fugitive emissions from CO<sub>2</sub> capture, transport, injection and storage.

In general, the reporting rule would require reporting from sources emitting 25,000 metric tons of CO<sub>2</sub> equivalent or more per year. Suppliers of fossil fuels and industrial GHGs, fuel suppliers and manufacturers of vehicles and engines are also required to report GHGs under the draft rule. The rule is anticipated to cover 85-90 percent of total US GHG emissions. The first reporting year is proposed to be 2010, except for vehicle and engine manufacturers, which would begin reporting in the year 2011. The reported emissions data would be verified by the USEPA.

## STATE RULES

Numerous US States have implemented their own mandatory GHG reporting rules. Many States are requiring GHG reporting from all facilities that hold permits for air emissions under Title V of the Clean Air Act. These States include Connecticut, Iowa, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, and Oregon. Other States include all sources that emit CO<sub>2</sub> above a certain threshold, e.g. Massachusetts (5,000 tons CO<sub>2</sub>e), and Virginia (10,000 tons CO<sub>2</sub>e, proposed) (ERG, 2009).

The California Air Resources Board has also implemented a mandatory greenhouse reporting rule for the state that requires GHG emission reporting from cement plants, power generation and retail, cogeneration plants, oil refineries, hydrogen plants, and large combustion sources emitting over 25,000 metric tons per year of CO<sub>2</sub>. The reporting rule is intended to provide the Air Resources Board with the information necessary to meet its statutory obligations under California's Global Warming Solutions Act (AB 32) to develop a cap-and-trade program for that state.

More than 20 states have also implemented mandatory fuel mix disclosure requirements that require disclosure of energy fuel mixes and emissions by all retail suppliers of electricity (DSIRE, 2009).

## WESTERN CLIMATE INITIATIVE

The WCI has issued the final draft of its Essential Requirements of Mandatory Reporting that would create requirements for reporting GHG emissions from certain sources in WCI-participating states. Once these requirements are finalized, WCI jurisdictions, including the state of California will adopt the requirements or incorporate them into existing state reporting requirements.

## CLIMATE REGISTRY

The Climate Registry, a non-profit partnership, has also successfully developed standards for the measurement, verification, and public reporting of greenhouse emissions throughout North America in a single unified registry. The development of the Climate Registry was based on the work of the California Climate Action Registry, established in 2001 by the state of California. The goal of the Climate Registry is to support current and future mandatory reporting programs and to help link up these programs in a unified registry.<sup>5</sup>

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<sup>5</sup> For an overview of The Climate Registry, see [www.theclimateregistry.org/about.html](http://www.theclimateregistry.org/about.html).

## **4. Existing CCS initiatives**

### **4.1 Introduction**

The US Department of Energy (USDOE) has created a network of Regional Carbon Sequestration Partnerships (RCSPs) around the US to help develop and implement CCS technology. The RCSP represents the USDOE's front-line effort to demonstrate and deploy CCS technology. Now in Phase III, the regional partners, working with funding from the USDOE, are implementing seven large-scale sequestration projects around the country to demonstrate the potential for long-term storage of CO<sub>2</sub>.

The US Secretary of Energy also recently announced that US\$2.4 billion of the American Recovery and Reinvestment Act (ARRA) stimulus funding will be used to develop and implement CCS technology through a combination of public and private investment. Several CCS incentive programs were also created under the Energy Policy Act of 2005 (EPAct05).

Finally, in addition to the bonus allowance program described in section 3.2 above, ACES also creates a comprehensive incentive structure to support early CCS technology

### **4.2 Government or government-business research facilities**

The USDOE recently commissioned a new National Carbon Capture Centre to research and develop CCS technologies. The Centre, to be established in Wilsonville, Alabama, will be managed and operated by Southern Company Services Inc. The Centre will be set up at an existing test site known as the Power Systems Development Facility (PSDF). With an existing coal gasifier and combustor already in place at the PSDF, the USDOE expects that the Centre will conduct large-scale testing and simulate real CCS operating conditions. The Centre will work on technology development for both pre- and post-combustion CO<sub>2</sub> capture.

### **4.3 Government funding**

#### **4.3.1 Mapping and data collection and sharing**

In Phases I and II of the RCSP Program, the USDOE worked with regional partners to characterize geologic potential for CCS in local land formations and to implement small-scale pilot projects to validate these characterizations.

In 2008, the USDOE published the second edition of its *Carbon Sequestration Atlas of the United States and Canada*, which provides a coordinated update of CCS potential across the majority of the US and portions of Canada (USDOE, 2008).

The USDOE also recently announced that US\$50 million in stimulus funding will be used to fund a competitive solicitation to characterise a minimum of ten geologic formations around the United States. Projects will be based on, and build from, the existing characterisation information generated by the USDOE's RCSPs. The goal of this effort is to accelerate the determination of potential geologic storage sites.

### 4.3.2 Research, development and commercialisation

#### RESEARCH: ARRA, EFACT05

US\$20 million from the ARRA will also be used to educate and train the geologists, scientists, and engineers needed to support a comprehensive national CCS program. In particular, the USDOE is hoping to facilitate education and training in CCS project development, resources assessment, site characterization, permitting, well drilling and completion, only as it differs from that used in oil and gas extraction, reservoir engineering, CO<sub>2</sub> injection, CO<sub>2</sub> monitoring activities, geochemical and mechanical impacts, and project assessment (USDOE, 2009).

Additional funding for CCS research is provided by the USDOE's Clean Coal Power Initiative (CCPI). Initially authorised and funded under the EFACT05, and recently expanded under ARRA, the CCPI funds clean coal research in coal-based gasification and combustion technologies (USEPA, 2006).

#### DEVELOPMENT AND COMMERCIALISATION: RCSP

The USDOE's RCSP program is now in its third phase. In this phase regional partners, working with funding from the USDOE, are implementing seven large-scale sequestration projects around the country to demonstrate the potential for safe, long-term storage of CO<sub>2</sub>. Regional partners are responsible for development of the infrastructure, operations, closure, and monitoring of the injected CO<sub>2</sub>. Examples of these projects include: the West Coast Regional Carbon Sequestration Partnership (WESTCARB) Project in the San Joaquin Basin in Central California, which will inject one million tons of CO<sub>2</sub> over four years into deep (7,000+ feet) geologic formations below a 50-megawatt, zero-emission power plant; and the Midwest Regional Carbon Sequestration Partnership (MRCSP) Project, which will inject approximately one million tons of CO<sub>2</sub> from an ethanol production facility into Mount Simon Sandstone, a geologic formation that stretches from Kentucky through Ohio and has the potential to store more than 100 years of CO<sub>2</sub> emissions from major point sources in the region. Both of these projects are projected to be operational prior to 2020.

#### DEVELOPMENT AND COMMERCIALISATION: ACES

The ACES Act would also provide incentives for near-term deployment of commercial CCS. The Act would authorise distribution utilities delivering fossil fuel-based electricity to conduct a referendum on the creation of a Carbon Storage Research Corporation (Corporation). If the referendum results in approval by representatives of 2/3 of the fossil fuel-based electricity delivered to retail consumers in the US and by State regulatory authorities, the Corporation would be established (ACES § 114).

The Corporation would be operated as a division or affiliate of the Electric Power Research Institute (EPRI) and would be managed by a Board of not more than 12 members. The Board would be appointed by EPRI and include representatives from various types of utilities.

The Corporation would assess fees on distribution utilities for all fossil fuel-based electricity delivered to retail consumers. The assessment would be applied to electricity generated from coal, natural gas and oil and would reflect the relative CO<sub>2</sub> emission rates of each fuel. The total assessment would be approximately US\$1 billion annually. The legislation specifies that distribution utilities will be allowed to recover the costs of the fee from retail consumers. The fee translates into a roughly US\$10-12 total annual increase in residential electricity rates.

The Corporation would distribute the funds through grants and contracts to private, academic and governmental entities with the purpose of accelerating the commercial availability of CCS

technologies. Supported projects would encompass a range of different fuel varieties, be geographically diverse, involve diverse storage media and employ technologies suitable for either new or retrofit applications.

### 4.3.3 Technology demonstration and early deployment incentives

#### CCS EQUIPMENT INSTALLATION

EPAct05 provides loan guarantees for IGCC projects and financial assistance for a demonstration project to produce energy from coal mined in the western US, as well as US\$2 billion to expand the Clean Air Coal funding program for coal-based generation projects (USEPA, 2006).

## 4.4 Government-business joint ventures

### Case study: FutureGen

In 2003, the USDOE announced a US\$1 billion investment in a project known as FutureGen, a government-business joint venture to develop a 275 MW clean coal power plant that would produce electricity and hydrogen using CCS technology (FG1). However, the USDOE decided to restructure the program in late 2007 after the FutureGen Alliance (a consortium of private companies that form half of the government-business joint venture) chose a site in Illinois over a site in Texas to locate the project. The stated reason for changing the nature of the project and denying FG1 the funding previously promised by the USDOE was increased costs, although a Congressional Budget Office study has called into question the underlying rationale for the USDOE determination. Rather than developing a complete near-zero emission plant, the restructured FutureGen Project (FG2) would fund implementation of CCS components at several IGCC plants planned to be operational by 2015.

In 2006, the USDOE determined that providing financial assistance for the construction and operation of FG1 would constitute a major Federal action that could significantly affect the quality of the natural and human environment and accordingly prepared an EIS for the project in compliance with NEPA (FG1 EIS, 2007).

After a rigorous nation-wide selection process, the final four sites under consideration to host FG1 were located in Illinois and Texas. Both states passed legislation in anticipation of FG1 development, which provided that the state would take title to and assume liability for captured CO<sub>2</sub> at different points in the CCS cycle of the potential project. In Texas, legislation provided that the Texas Railroad Commission would take title to CO<sub>2</sub> as soon as it is captured (H.B. 149 (2006)), but the indemnity for liability was less certain. In Illinois, legislation provided that the state would take title to the successfully sequestered CO<sub>2</sub>, and assume all liability for such post-injection (S.B. No.1704 (2007)), but only for the CO<sub>2</sub> injected during the period when the project was to be operated as a research and development pilot project. Upon conversion to commercial operations, the state would no longer provide liability protection to the future commercial operator.

## 4.5 Taxation incentives

### 4.5.1 Project development

In Texas, the proposed H.B. 469 would provide tax incentives for CO<sub>2</sub> sequestration and enhanced oil recovery projects in the state.

EPAAct05 creates an Advanced Gasification Program Tax Credit. US\$350 million is authorised for the development of certain specific gasification project attributes such as CCS, renewable fuels, as well as experienced and successful gasification teams (USEPA, 2006).

### 4.5.2 CCS-specific taxation incentives

Section 1307 of EPAAct05, "Credit for Investment in Clean Coal Facilities," authorises US\$1.3 billion for a Qualifying Advanced Coal Project Tax Credit.

US\$800 million of this total amount would be used for IGCC projects. In a given year, this credit would be worth an amount equal to 20 percent of a taxpayer's investment for that taxable year in a qualifying IGCC project (USEPA, 2006).

In order to be eligible for this credit, within 2 years of certification an applicant must:

- demonstrate site ownership (in the US);
- obtain all Federal and State environmental reviews to commence construction;
- enter a binding contract (except for re-powering) to purchase main steam turbines; and
- place project in service within 5 years of certification.

Projects eligible for the credit can be new construction or retrofit. Fuel input at the host plant must be at least 75 percent coal and generate at least 400 MW of power. Furthermore, investors must demonstrate that the plant's output can be utilised or acquired. Priority is assigned to projects with CO<sub>2</sub> capture ability (USEPA, 2006).

In addition, Title 26 of the Internal Revenue Code, Sections 48A, 48B, and 48C, provide investment tax credits for qualifying electric generating unit and industrial gasification projects that employ CCS, as well as a US\$20 per ton tax credit for up to 75 million tons of geologically stored CO<sub>2</sub> (US\$10 per ton for projects using enhanced oil recovery). In addition, the USDOE has solicited CCS project proposals for US\$8 billion in Federal loan guarantees, which result in low interest loans. On 13 July 2009, Tenaska Corporation announced that it had been selected by the USDOE for a US\$2.6 billion loan guarantee for the company's proposed US\$3.5 billion facility which will gasify coal to produce substitute natural gas and electricity, and which will capture and store at least 50 percent of its generated CO<sub>2</sub> (Tenaska, 2009).

## 4.6 Liability for failure to capture

Under the RCSP Program, regional partners are responsible for development of the infrastructure, operations, closure, and monitoring of the injected CO<sub>2</sub>.

## **4.7 Evaluation**

The 2009 stimulus bill has given a significant boost to CCS incentive policies. In addition to allowing for a restructuring of the FutureGen program, it has also mobilized billions of dollars towards CCS research and development. The incentive program contemplated under ACES would add another layer to the financing available for current development of CCS technologies. This level of funding in the near-term is seen as essential to ensuring that CCS will be available for large-scale commercial deployment within the next 20 years.

## **5. Capture of CO<sub>2</sub>**

### **5.1 Introduction**

ACES directs the USEPA, in consultation with the USDOE and other relevant Federal agencies to develop a “unified and comprehensive strategy to address key legal, regulatory and other barriers to the commercial-scale deployment of CO<sub>2</sub> capture and sequestration” (ACES § 111). To the extent that such a national regulatory has not yet been established, existing US environmental laws are evaluated for their application to CO<sub>2</sub> capture.

### **5.2 General policy and legislation with applicability to CO<sub>2</sub> capture**

#### **5.2.1 Planning requirements**

Where Federal agencies, such as the USDOE, are significantly involved with a CCS project or where such a project is subject to regulation and/or permitting by Federal agencies, the requirements of the National Environmental Policy Act (NEPA) could apply. NEPA requires agencies to prepare Environmental Impact Statements for “major Federal actions significantly affecting the human environment” (40 C.F.R. 1508). “Major Federal actions” has been interpreted to encompass “actions with effects that may be major and which are potentially subject to Federal control and responsibility” (40 C.F.R. 1508.18). Thus, to the extent a CCS project triggers permit obligations under other environmental laws as described below, the permitting agency could be required to prepare an Environmental Impact Statement (EIS) for the project.

For a comprehensive example of an EIS prepared for a CCS project, see the EIS prepared by the USDOE for its initial FutureGen project proposal (FG1 EIS, 2007).

#### **5.2.2 Retrofitting**

#### **REQUIREMENTS UNDER THE CLEAN AIR ACT**

Retrofitting an existing power plant with CCS technology could trigger New Source Review (NSR) requirements under the Clean Air Act (CAA). NSR is a preconstruction permitting program that governs new sources and major modifications to existing sources. NSR requirements are triggered for modifications where there is a physical change or change in method of operation that results in a significant net emissions increase (40 C.F.R. § 51.166). While retrofitting an existing power plant with CCS technology clearly constitutes a physical change for purposes of NSR requirements, it is not clear whether the change would always result in a net emissions increase from the plant. Increased fuel use and reductions in plant efficiency incident to the use CCS systems have been shown to raise a plant’s overall air emissions, even while decreasing the amount of CO<sub>2</sub> emitted (IPCC 2005). Thus, NSR requirements might trigger for plants where the overall increase in emissions resulting from a CCS modification is significant.

NSR requirements would vary depending on whether or not the area in which plant requesting the modification is located is in “attainment” with national ambient air quality standards (NAAQS) under the

CAA. In attainment areas, sources seeking modification to retrofit with CCS technology would be required to install best available control technology (BACT) (40 C.F.R. § 51.165(a)(1)(xl)).<sup>6</sup> In “nonattainment” areas, a plant would be required to install lowest achievable emission reduction (LAER) air pollution control technology (40 C.F.R. § 51.165(a)(1)(xiii)).<sup>7</sup> In either case, NSR requirements could impose additional costs on CCS projects to the extent those projects are required to incorporate advanced pollution control technology for air emissions other than CO<sub>2</sub>.

Also relevant to retrofit modifications are the New Source Performance Standards (NSPS) established pursuant to Section 110 of the CAA. Section 110 requires the EPA to establish Federal emission standards for source categories that cause or contribute significantly to air pollution. BACT and LAER emission levels must be at least as stringent as the NSPS set for a given source category (33 USC § 1342). Thus, any modification that triggered NSR requirements would also be subject to NSPS for stationary sources.

## REQUIREMENTS UNDER THE CLEAN WATER ACT

Under the Clean Water Act (CWA), an applicant for a Federal licence or permit to conduct any activity that may result in a discharge to navigable waters must provide the Federal agency with a Section 401 certification. The certification, made by the State in which the discharge originates, declares that the discharge will comply with applicable provisions of the CWA, including water quality standards (FG1 EIS, 2007).

The National Pollutant Discharge Elimination System (NPDES) permit program authorised under the CWA controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES program establishes permit requirements for certain discharges from industrial sources, including stormwater runoff from an industrial facility or construction site and wastewater discharges to a municipal sewer systems. NPDES permits covering existing facilities would likely have to be amended to account for the impact of a CCS retrofit on a facility’s effluent discharges (USDOE, 2007).

### 5.2.3 Relevant pollution laws and policies

## RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA governs the disposal of solid and hazardous waste in the US. “Hazardous waste” is defined under the Act as a solid waste that poses a “substantial present or potential hazard to human health when improperly treated, stored, transported or, disposed of, or otherwise managed” (42 USC 6903(5)).

As CCS operations will require increased fuel consumption at the host facility, there will be a corresponding increase in solid waste by-product from that increased consumption (WRI, 2008). Section 3001 of RCRA creates an exemption under the Act for waste generated through the combustion of coal and other fossil fuels (42 USC 6921). It is unclear whether this exemption might be

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<sup>6</sup> BACT means a pollutant emissions limit “based on the maximum degree of reduction” achievable for the modification “taking into account energy, environmental, and economic impacts and other costs.” *Id.* Essentially an applicant is required to implement the most effective, technically feasible pollution control option available to them, taking into consideration economic impacts and other costs.

<sup>7</sup> LAER is simply the lowest achievable emissions rate for the new or modified emissions units without taking into account economic impacts and other costs.

extended to include excess waste generated by CO<sub>2</sub> capture operations at a coal combustion facility (USDOE, 2007).

If CCS projects were required to hold permits under RCRA for excess waste generated from capture it would impose significant additional costs on CCS projects. This seems unlikely, however, given that excess waste from CO<sub>2</sub> capture is not expected to be substantially more hazardous than the coal combustion waste already generated by power plants (IPCC, 2005).

### **5.3 Liability for failure to capture**

If CO<sub>2</sub> capture equipment failed at a covered facility under either RGGI or the cap-and-trade program proposed under ACES, the facility would be required to hold permits equal to the amount of emissions not captured or face fines for non-compliance that would vary depending on the amount of overage. For example, a facility that failed to meet its compliance obligation under ACES would be fined an amount equal to the amount of overage multiplied by twice the market price for an emission allowance at that time (ACES § 723). This issue might be addressed contractually between a facility owner and a CCS project operator where the parties are distinct.

### **5.4 Evaluation**

In general, while the proposed requirement under ACES to create a national regulatory strategy for CCS is much needed in some areas, existing permitting requirements under the CAA, CWA and RCRA would cover many of the operational changes that result from installation of CO<sub>2</sub> capture equipment at regulated facilities, for example, increased emissions and waste and changes in effluent discharges.

## **6. Transport of CO<sub>2</sub>**

### **6.1 Introduction**

Construction of a pipeline network to transport CO<sub>2</sub> in the US began over 25 years ago and that network now spans more than 3,900 miles (Kelliher, 2008). Thus far, CO<sub>2</sub> pipelines have been used mainly in the Enhanced Oil Recovery (EOR) industry. Texas and New Mexico have been the center of CO<sub>2</sub> pipeline development for EOR activities (WRI, 2008).

At present, there is no comprehensive regulatory scheme for transport of CO<sub>2</sub> in the US. The resulting system is one in which CO<sub>2</sub> pipelines are affected by a range of State laws, as well as certain Federal laws related to pipeline safety and the collateral effects of pipeline development.

### **6.2 General policy and legislation specific to transport of CO<sub>2</sub>**

#### **6.2.1 Licencing of transportation activities**

##### **PIPELINES**

##### **NEW PIPELINES**

Siting and licencing of new CO<sub>2</sub> pipelines in the US is governed by State law. There is currently no comprehensive national regulatory scheme for transport of CO<sub>2</sub> but the USDOE has published a "best practice" manual for CO<sub>2</sub> transportation and storage which is discussed below (NETL, 2009). Many state administrative codes require a pipeline to be licenced or permitted prior to operation. For example, in Texas such permits are issued by the State Railroad Commission for proposed pipelines (16 Tex. Code § 3.70). In New Mexico, the State Public Regulation Commission requires pipeline operators to apply for a licence and pay a fee for each new fiscal year (NM Code § 70-3-2). An interstate CO<sub>2</sub> pipeline in the US therefore could be required to hold permits in each state that it transects. While a state-by state approval process could be costly and time-consuming for CO<sub>2</sub> pipeline authorities, as recently as January 2008, the Chairman of the Federal Energy Regulatory Commission (FERC) testified to Congress that state-by state-licencing for CO<sub>2</sub> pipelines was working well and should not be pre-empted by Federal law (Kelliher, 2008).

Siting and rate-setting for new pipelines other than CO<sub>2</sub> pipelines in the US is generally regulated by the FERC and the Surface Transportation Board (STB). However, both FERC and the Interstate Commerce Commission, the predecessor to the STB, have specifically disclaimed jurisdiction over CO<sub>2</sub> pipelines under the Natural Gas Act of 1938 and the Interstate Commerce Act respectively (WRI, 2008). Because these agencies have disclaimed jurisdiction, Federal approval is not required to construct new CO<sub>2</sub> pipelines in the US. At the same time, this means that the Federal government will not use its eminent domain authority for CO<sub>2</sub> pipeline construction (CRS, 2008).

An exception to this rule is found where CO<sub>2</sub> pipelines are sited on Federal lands. The Federal Bureau of Land Management (BLM) has the authority to grant rights of way to CO<sub>2</sub> pipelines on Federal lands under the Federal Land Policy and Management Act (FLPMA) or the Mineral Leasing Act (MLA) (CRS, 2008).

## EXISTING PIPELINES

Existing pipelines must remain in compliance with any permit or licence conditions established at the state level, as well as pipeline safety regulations established by the US Department of Transportation's (USDOT) Office of Pipeline Safety (OPS). OPS regulates CO<sub>2</sub> pipelines under the rules it has established for hazardous liquid pipelines (49 C.F.R. 195.1). OPS has exclusive jurisdiction to enforce these regulations for all interstate pipelines, while it delegates enforcement authority to state agencies in certain states solely with respect to intrastate pipelines.

With respect to rate-setting for existing pipelines, even if the STB found that it was not bound by its predecessor's determination as to the agency's jurisdiction over CO<sub>2</sub> pipelines, STB jurisdiction would still be somewhat limited. The STB may set maximum tariff rates for pipelines only in response to complaints by shippers or other affected parties (Nordhaus, 2009). Therefore, in order for the STB to set rates for a CO<sub>2</sub> pipeline, an affected party would have to file a complaint with the STB.

## ROAD AND RAIL TRANSPORT

Observers have noted that while it is possible to transport sequestered CO<sub>2</sub> by rail cars and trucks, it may be logistically impractical to do so for large scale CCS operations (IPCC, 2005). To the extent CO<sub>2</sub> is transported via either road or rail in the United States, the USDOT's regulations related to transportation of hazardous materials would apply. Carbon dioxide is considered a Class 2.2 (non-flammable gas) hazardous material under the USDOT regulations (49 C.F.R. § 172.101). Pursuant to these regulations special handling requirements are provided for transport of CO<sub>2</sub> by rail (49 C.F.R. § 174) and on the highway (49 C.F.R. § 172.101).

## TRANSPORTATION BY SHIP

The USDOT also imposes certain requirements on transportation of hazardous materials by vessel (49 C.F.R. § 172.176).

### 6.2.2 Planning

## ZONING FOR TRANSPORT FACILITIES

Municipal and county zoning codes would apply to linear development of CO<sub>2</sub> pipelines. While public utilities are often exempted from such codes as service providers, the same exemption has not always been granted to pipeline operators.<sup>8</sup> Arguably, however, where a CO<sub>2</sub> pipeline is operated by a public utility, a zoning exemption should apply.

## CONSTRUCTION AND BUILDING CODES

OPS regulates the design and construction of CO<sub>2</sub> pipelines. OPS regulations contain certain pressure and temperature thresholds for CO<sub>2</sub> pipelines, as well as requirements for pipes, valves and fittings (49 C.F.R. 195.100). OPS also provides mandatory standards and specifications applicable to CO<sub>2</sub> pipeline construction (49 C.F.R. 195.200).

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<sup>8</sup> See for example *St. Clair v. Colonial Pipeline Co.*, 235 Md. 578 (1964).

## **PIPELINE LICENCING REGIMES – NEW PIPELINES**

### **ONSHORE PIPELINES**

As described above, CO<sub>2</sub> pipelines in the US are currently sited under State law. Whether or not this system will remain in place will depend in large part of the nature and extent of CCS development in the US. Three regime models are generally referred to as potential options for the future of CO<sub>2</sub> pipeline licencing (Kelliher, 2008). The first is the existing model in which pipelines are sited under state law and subject to OPS safety regulations. Second, there is the licencing regime in place for oil pipelines in which pipelines are sited by state authorities, but rates are set by the FERC. Third, there is the licencing regime in place for natural gas pipelines under which the FERC controls both siting and rate-setting.

### **OFFSHORE PIPELINES**

Offshore pipelines are regulated by both OPS and the Minerals Management Service (MMS), an agency of the United States Department of Interior (USDOl).

## **PIPELINE LICENCING REGIMES – EXISTING PIPELINES**

### **ONSHORE PIPELINES**

As described above, pipelines must remain in compliance with any permit or licence conditions including annual fees established at the state level, as well as pipeline safety regulations.

### **OFFSHORE PIPELINES**

In addition to being required to comply with OPS pipeline safety regulations, offshore pipeline operators are required to continuously inspect their facility and report any exposed portion or element of the facility that is a hazard to navigation (49 USC 60108(c)).

## **ENVIRONMENTAL IMPACT ASSESSMENT**

Where Federal agencies, such as the USDOT or FERC, are significantly involved with a CO<sub>2</sub> pipeline project, an EIS might be required for the project under NEPA. Because all interstate pipelines in the US are subject to regulation and/or permitting by the Federal government, Federal agencies would likely be required to conduct an Environmental Assessment (EA) under NEPA to determine whether or not the project would have a significant effect on the environment. If so, a full EIS would be required.

## **STAKEHOLDER ENGAGEMENT**

### **PUBLIC CONSULTATION**

Where a state is considering allowing the siting of a large-scale transportation project, public proceedings are likely to be held to obtain public consultation. A recent example of such a process is the ongoing siting process for the Trans-Allegheny Interstate Line, a 500-kilovolt power transmission line stretching from south-western Pennsylvania to northern Virginia. Virginia, West Virginia, and Pennsylvania have held hearings to obtain public input on whether or not the Line would constitute useful development for state citizens (CCS Alliance, 2008).

## LEGAL CHALLENGE

Administrative procedure codes for most US states and certainly for the Federal government contain mechanisms by which stakeholders can mount a legal challenge to state action with respect to the licencing or permitting of major projects. Under the Federal Administrative Procedure Act (APA) a person “suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute” is entitled to judicial review (APA § 702).

### 6.2.3 Access / tenure

## NATURE OF PROPERTY INTERESTS CONFERRED

Land for pipeline construction in the US is often leased from private landowners, or acquired through eminent domain where landowners and pipeline sponsors are unable to reach agreement.

## ESTABLISHING PRIORITY BETWEEN TRANSPORT AND EXISTING USES AND RIGHTS (INCLUDING PETROLEUM EXTRACTION)

In its 2006 report, the National Commission on Energy Policy observed that in the US, “most new energy projects are still regulated primarily at the state level and public opposition remains inextricably intertwined with local concerns, including environmental and ecosystem impacts as well as, in some cases, complex issues of property rights and competing land uses” (NCEP, 2006).

## PETROLEUM AND RESOURCE EXTRACTION

Early CCS projects in the US are expected to depend on use and/or expansion of existing CO<sub>2</sub> pipeline infrastructure for EOR. However, some observers anticipate that a CCS CO<sub>2</sub> pipeline network is likely to begin with short pipelines from sources to storage sites (MIT 2007). In this case, competition for pipeline access between the EOR and CCS industries would likely be minimized.

## FAUNA AND FLORA, INCLUDING ENDANGERED SPECIES

The Endangered Species Act (ESA) enjoins the Federal government from taking any action that could jeopardize a listed endangered or threatened species in the US, or destroy or adversely modify critical habitat for such species (16 USC 1531). In order to trigger the requirements of the ESA, a CO<sub>2</sub> pipeline would first have to impact a protected species or habitat. Second, there would have to be enough Federal involvement with the project, either through permitting or funding, to identify the project as a Federal action. If the ESA did apply, the permitting or funding agency would be required to consult with the US Fish and Wildlife Service (USFWS) or the National Marine Fisheries, part of the National Oceanic and Atmospheric Administration (NOAA). On the basis of this consultation, the consulting agencies would prepare a biological opinion to determine whether the project would jeopardize protected species or habitat. If so, the action could be prohibited under the ESA.

## NAVIGATION

Offshore pipeline operators are required to continuously inspect their facility and report any exposed portion or element of the facility that is a hazard to navigation (49 USC 60108(c)).

## MINING

Not applicable.

## SUBSEQUENT USES

With respect to land reclamation after a pipeline is taken out of operation, BLM requires all pipeline projects on Federal lands to maintain a Surface Use Plan of Operations. Part of the plan must deal with reclamation of pipeline corridors including surface restoration and erosion prevention.

## RIGHTS OF INDIGENOUS PEOPLES AND OTHER CUSTOMARY RIGHTS

EPAAct05 creates a mechanism by which Indian tribes may issue rights-of-way for pipelines (not to exceed thirty years) on tribal lands without specific approval by the Secretary of the Interior (25 USC 3501(a)(1)-(2)).

## COMPULSORY ACQUISITION AND COMPENSATION REGIMES

Because licencing of CO<sub>2</sub> pipelines is done on a state-by-state basis, whether or not licencing will entail eminent domain or compulsory acquisition authority for the construction of a CO<sub>2</sub> pipeline is also a question of State law.

In contrast, oil and gas pipelines that obtain a “certificate of public convenience and necessity” under Federal law automatically receive eminent domain authority. The NGA provides that where a pipeline sponsor and a property owner cannot agree to the terms of a right-of-way for the construction of a natural gas pipeline, the pipeline sponsor “may acquire the same by the exercise of the right of eminent domain in state or Federal court” (15 USC 717f(h)).

While US states retain the power to condemn property for public benefit, not all states will delegate this power to pipeline developers. In particular, states generally will use this power for the benefit of “common carriers”. In Texas, CO<sub>2</sub> pipeline operators have an option as to whether or not they accept common carrier status (Tex. Nat. Res. Code 111.002), which grants the pipeline eminent domain authority, but also triggers additional regulatory requirements. Montana has also recently passed legislation automatically granting CO<sub>2</sub> pipelines common carrier status (H.B. 338 2009).

In other states, the question may depend on the type of company seeking to build a CO<sub>2</sub> pipeline. Several states, including Arkansas, Kansas and Washington, hinge common carrier status on whether or not a company generates power for the use of others and maintains a service area (CCS Alliance, 2008). In such cases, a power company seeking eminent domain authority for a CCS pipeline would likely be eligible.

### 6.2.4 Environmental and other risks

#### LEAKAGE OF TRANSPORTED CO<sub>2</sub>

Surface risks of CO<sub>2</sub> leakage are regulated by the Occupational Safety and Health Administration (OSHA) under the US Department of Labour. While OSHA safety guidelines are promulgated at the Federal level, they are generally enforced by state-level authorities. OSHA has set the permissible exposure and air contamination limit for CO<sub>2</sub> at 5,000 ppm (OSHA 2007).

## **POLLUTION – NOISE, AIR AND WATER**

Section 4 of the Noise Control Act of 1972, as amended (42 USC 4901) directs Federal agencies to carry out programs in their jurisdictions “to the fullest extent within their authority” and in a manner that furthers a national policy of promoting an environment free from noise that jeopardize health and welfare.”

## **WASTE**

Questions remain in the US as to whether pipeline CO<sub>2</sub> will be classified as commodity or a pollutant. Because CO<sub>2</sub> can be sold as a commodity for EOR operations, some argue that pipeline CO<sub>2</sub> should be classified as a commodity (CRS, 2008). However, the USEPA has recently proposed to characterize CO<sub>2</sub> and other GHGs as pollutants under the CAA (EPA Rule 2009). In order to resolve the ambiguity as to whether pipeline CO<sub>2</sub> constitutes a pollutant and/or waste or a commodity, a new regulatory scheme of the order contemplated by ACES will likely be necessary.

## **MIGRATORY SPECIES**

Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds,” requires Federal agencies to avoid or minimize the negative impacts of their action on migratory birds, and to take active steps to protect birds and their habitats.

### **6.3 Evaluation**

The development of CO<sub>2</sub> pipeline infrastructure necessary to support large-scale deployment of CCS will likely require more involvement from the Federal Government than the current model provides (Nordhaus, 2009). Greater Federal involvement would likely reduce transaction costs by providing uniform licencing rules, while also giving CO<sub>2</sub> pipelines eminent domain authority anywhere in the country.

## **7. Exploration of potential CO<sub>2</sub> storage sites**

### **7.1 Introduction**

The Energy Independence and Security Act of 2007 contained a requirement for the Secretary of the Interior to submit a report to Congress on a recommended framework for managing geologic CO<sub>2</sub> sequestration activities on public lands. The Interior Secretary submitted the USDOI's report to Congress on 3 June 2009. This report provides a general outlook for use of different types of geologic formations around the country, especially those with proximity to other uses by the petroleum and mining sectors. While the USDOI sees a number of key policy questions that still need to be resolved, it also sees great potential for CCS on Federal lands with limited immediate need for new regulation or legislation in the area (USDOI, 2009).

The USDOE has also made a huge effort to characterize geologic formations around the US and Canada and to assess those formations for their potential CO<sub>2</sub> storage capacity (USDOE, 2008). The USDOE has drawn from the findings of its RCSP program, as well as the work of other agencies and experts in the field to generate the best available estimates of potential CO<sub>2</sub> storage resources in North America. The USDOE has focused on the storage potential of three key formation types: mature oil and gas reservoirs, un-minable coal seams, and saline formations (USDOE, 2008).

Each of these formation types presents different challenges and opportunities with respect to storage site characterisation. Oil and gas reservoirs, as well as existing coal seams, have largely been identified by long-standing industry exploration efforts to access and produce those resources. On the other hand, much less is known about saline formations because they lack the characterization experience that industry has acquired through resource recovery with respect to the other formations (USDOE, 2008).

In general, any potential CCS site characterization would involve additional subsurface investigation and eventual drilling and storage well construction (WRI 2008).

Where exploration and subsequent sequestration activities take place on Federal land, those activities must be licenced by BLM. The estimated CO<sub>2</sub> storage potential for geologic formation beneath leasable Federal lands is between 127 and 374 billion metric tons, about 5.5 percent of the total onshore storage resource identified by the USDOE for North America (USDOE, 2008).

Exploration and subsequent sequestration on private land would require a lease or ownership of the relevant estate in land as discussed further below in section 9.2.

### **7.2 General policy and legislation with application to exploration of potential CO<sub>2</sub> sequestration sites**

#### **7.2.1 Exploration licencing**

While there are no current regulations governing exploration for CCS sites, USDOI has noted that BLM's authority under FLPMA would enable them to issue leases, permits, and easements to accommodate a wide range of CCS development activity, including surface and subsurface rights-of-way and leases for subsurface storage (USDOE, 2009). The regulations implementing this authority are at 43 C.F.R. 2920.

It is important to note that this authorisation would only be required on Federal lands. CCS development rights on privately-owned land would be acquired by contract or deed.

## **APPLICATION CRITERIA**

Applications for land use authorisations under 43 C.F.R. 2920 would require a description of the proposed CCS activity including:

- a description of all facilities for which authorisation is sought, access needs and special types of easements that may be needed;
- a map of sufficient scale to allow all of the required information to be legible and a legal description of primary and alternative project locations; and
- a schedule for construction of any facilities.

Land use authorisations under 2920 may be offered on a competitive basis.

## **RIGHTS CONFERRED BY EXPLORATION LICENCE**

2920 authorisations represent transferrable land-use interests, which grant the holder a right to use Federal lands for a specified purpose in exchange for rent payments to the Federal government .

## **LICENCE TERM**

The term of use under a 2920 authorisation would be determined during the application process. The government would also have the right to terminate the authorisation if a holder failed to use the land in accordance with the established terms or purpose of the authorisation, or if the holder failed to pay rent or to comply with applicable laws.

### **7.2.2 Access / tenure**

## **NATURE OF PROPERTY INTERESTS CONFERRED**

Exploration rights to CCS formations could be obtained either through the BLM land use authorisation process described above or through exploration leases for private lands. In either case, the right conferred would be a right to access and a right to explore geologic formations.

## **ESTABLISHING PRIORITY BETWEEN EXPLORATION AND EXISTING USES AND RIGHTS**

### **PETROLEUM AND RESOURCE EXPLORATION AND EXTRACTION**

Depleted oil and gas fields in the US represent primary targets for CCS exploration activities. To the extent mineral resources in these fields have already been exploited, conflict with CCS exploration activities would be limited.

### **FISHING**

Offshore exploration can only be undertaken to the extent that the activity is not “unduly harmful to aquatic life in the area” (43 USC 1340).

## **FAUNA AND FLORA, INCLUDING ENDANGERED SPECIES**

Exploration activities must not jeopardize any threatened or endangered species or harm any critical habitat as designated by FWS or NOAA.

## **NAVIGATION**

Statutory authority for offshore exploration permitting does not contain additional requirements in relation to impacts on navigation (43 USC 1340).

## **MINING**

The effect of exploration activities on mining would depend on whether or not a site that had extractable resources was ultimately selected for injection. The more likely scenario is that a geologic site suitable for CCS would underlie a mineral strata and potential interference with and/or contamination of such usable strata would be the concern. This conflict has not been resolved by law or regulation in the US

## **SUBSEQUENT USES**

To the extent that exploration activities do not lead to actual injection of CO<sub>2</sub>, the impact of exploration on subsequent uses of the property would be limited.

## **RIGHTS OF INDIGENOUS PEOPLES AND OTHER CUSTOMARY RIGHTS**

Exploration on tribal lands would be subject to approval both by tribal leaders, as well as BLM.

## **COMPULSORY ACQUISITION AND COMPENSATION REGIMES**

Up to this point, Federal efforts to encourage CCS have not included use of Federal eminent domain authority to condemn private lands for CCS exploration. State level eminent domain authority with respect to CCS operations in general is discussed below in section 9.2.3.6.

### **7.2.3 Planning and construction regulation applicable to CO<sub>2</sub> sequestration facilities**

## **ZONING**

CCS operations on private lands would be required to adhere to local zoning codes and would likely be limited to areas zoned for industrial development. In many cases, the rural nature of suitable CCS sites may require promulgation of new zoning classifications as many local jurisdictions may not have a relevant zoning classification. This has been the case for wind farms located in rural areas, for example.

## **ENVIRONMENTAL IMPACT ASSESSMENT**

An EA and a potential EIS would likely be required under NEPA for construction of CCS facilities on Federal lands or on private land where the facility required a permit from the Federal government.

## **PIPELINE LICENCING REGIMES**

An analysis of regulatory requirements for CCS exploration should also include an analysis of the pipeline licencing regime for the relevant jurisdiction. With respect to Federal lands, BLM would both licence exploration and site pipelines in connection with the eventual sequestration site.

## **CONSTRUCTION AND BUILDING CODES**

Construction of CCS facilities would be required to comply with jurisdictional building codes. Currently around 40 states use a version of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) or International Energy Conservation Code (IECC) model energy code for commercial buildings. These standards are developed in conjunction with the USDOE. More than half of the states are using the most recent code that the USDOE has approved.<sup>9</sup>

As described above in section 7.3.2, OPS regulates the design and construction of CO<sub>2</sub> pipelines. OPS regulations contain certain pressure and temperature thresholds for CO<sub>2</sub> pipelines, as well as requirements for pipes, valves and fittings (49 C.F.R. 195.100). OPS also provides mandatory standards and specifications applicable to CO<sub>2</sub> pipeline construction (49 C.F.R. 195.200).

## **STAKEHOLDER ENGAGEMENT**

### **PUBLIC CONSULTATION**

As described above, wherever a permit from a State or Federal agency is required for CCS operations, public consultation mechanisms are likely to be built into the permitting process.

### **LEGAL CHALLENGE**

With respect to Federal permitting decisions for CCS operations, any person “suffering legal wrong” because of the agency action, or “adversely affected or aggrieved by agency action within the meaning of a relevant statute” would be entitled to judicial review (APA § 702). It is likely that if Congress enacts new comprehensive legislation to address CCS, there will still be an ability for “aggrieved persons” to challenge any action.

## **7.3 Evaluation**

The policy problems raised in relation to multi-state pipeline siting procedures would also apply to CCS exploration. To the extent that a level of certainty about transportation to any potential CCS site is primary in the CCS exploration process, applicable pipeline licencing regimes would have to be identified and analysed in conjunction with an analysis of local property laws and geologic potential in the targeted exploration area.

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<sup>9</sup> For the status of state building codes for both residential and commercial sectors see, [bcap-energy.org](http://bcap-energy.org).

## **8. Injection and pre-closure of CO<sub>2</sub> storage formations**

### **8.1 Introduction**

There is nothing in the US experience with subsurface injection of CO<sub>2</sub> to date to indicate that the process is unsafe or impractical (WRI, 2008). However, the scale of CO<sub>2</sub> injection contemplated if CCS is to be widely deployed and the importance of ensuring that all injected CO<sub>2</sub> remains underground and immobile has focused the attention of regulators on the issue.

In the US, the USEPA has regulatory authority over the injection of wastes and other substances into below-surface wells through its Underground Injection Control Program (UIC). Authority for the UIC Program is found under the Safe Drinking Water Act (SDWA) (42 USC 300). The SDWA gives USEPA the authority to regulate public drinking water supplies by establishing drinking water standards, delegating authority for enforcement of drinking water standards to the states, and protecting aquifers from hazards such as injection of wastes and other materials into wells.

At present there are five classes of injection wells established by the EPA in the UIC program (40 C.F.R. 144-18): Class I (hazardous waste); Class II (fluid associated with oil and gas production); Class III (mining injections); Class IV (hazardous or radioactive waste); and Class V (all other injection wells).

In July 2008, the USEPA released a Draft Rule proposing to establish a new Class VI for CO<sub>2</sub> injection. The Draft Rule provides CO<sub>2</sub>-specific requirements for well construction, measurement, monitoring and verification, and closure. These requirements are discussed below.

In addition to the Draft Rule at the Federal level, West Virginia and Montana have passed legislation establishing a permitting framework for CO<sub>2</sub> injection and storage projects. West Virginia issued the State's first permit for underground injection of CO<sub>2</sub> to American Electric Power in May 2009.

### **8.2 Integrated policy and legislation**

#### **8.2.1 Injection licencing**

##### **APPLICATION CRITERIA**

Under the Draft Rule, the USEPA would require CCS operators to submit maps and cross sections of the underground sources of drinking water (USDWs) near the proposed injection well, as well as data to demonstrate that the injection zone is sufficiently porous to receive the CO<sub>2</sub> without fracturing and extensive enough to receive the anticipated total volumes of injected CO<sub>2</sub> (EPA Rule 2008).

CCS operators are also required to prepare data on the geologic structure and seismic history of the area around the proposed injection site.

Current UIC regulations require that well owners or operators delineate an Area of Review (AoR), within which the owner or operator must identify all penetrations (regardless of property ownership) in the injection zone and determine whether they have been properly completed or plugged. Under the Draft Rule, CCS operators would be required to use models reflecting the specific site conditions and injection regime to delineate the AoR (EPA Rule 2008). The Draft Rule would require that the owner or operator periodically re-evaluate the AoR during the injection operation. Re-evaluations would

occur at a minimum fixed frequency, not to exceed 10 years. CCS operators would perform corrective action to an injection well as necessary, on an iterative, phased basis over the operational life of a CCS project.

In addition, the Draft Rule prescribes certain requirements for CO<sub>2</sub> injection wells related to building materials and method of construction. It also provides operating rules related to injection pressure and depth, as well as monitoring.

## **RIGHTS CONFERRED BY INJECTION LICENCE**

A CCS operator permitted under the UIC program would have the right to inject CO<sub>2</sub> into the well area delineated in their permit application

## **LICENCE TERM**

The USEPA proposes that Class VI injection well permits would be issued for the operating life of the CCS project including the post-injection site care period.

## **CHALLENGING LICENCES**

Under the Draft Rule, the permitting authority would be required to provide public notice and opportunity for public input.

### **8.2.2 Approval processes for sequestration facility closure**

#### **APPLICATION CRITERIA**

The Draft Rule would require that permit applicants submit a demonstration of financial responsibility to plug a CO<sub>2</sub> injection well and to provide for post-injection site care and closure.

Permit applicants would also be required to submit a post-injection site care and site closure plan.

Note that this financial assurance and planning requirement is imposed pre-injection, as a prerequisite for sequestration.

#### **CLOSURE APPROVAL PROCESS**

In order to plug a CO<sub>2</sub> injection well, a CCS operator would be required to provide notice of their intent to plug a well at least 60 days in advance. The CCS operator would then be required to submit an amended post-injection site care and site closure plan, or demonstrate to the permitting authority through monitoring and modelling results that no amendment to the plan is needed.

When these conditions are satisfied, the Director would authorise site closure.

### **8.2.3 Access / tenure**

#### **LEGAL ACCESS TO AND USE OF DEEP GEOLOGICAL FORMATIONS FOR SEQUESTRATION**

American law has long recognized the right of property owners to split surface land and minerals into different estates. Where estates in land are severed, the mineral estate owner generally retains certain appurtenant rights to use the surface for access to and enjoyment of the severed estate. At

the same time, under existing precedent in many states, the surface estate owner is generally viewed not only as the owner of the surface land, but also the land and strata overlying the severed mineral estate (*Marquette Cement Min. Co. v. Oglesby Coal Co.*, 253 F. 107 (1918)).<sup>10</sup> Most importantly in the context of GS, the majority view in the US provides that the subsurface pore space- where CO<sub>2</sub> would likely be stored- belongs to the surface owner (USDOE, 2009).<sup>11</sup> The State of Wyoming recently passed legislation explicitly establishing the majority view as a rule of law in the state (H.B. 89 2008) and other states are considering similar legislation. Thus, in many cases legal access to deep geological formations in the US would require either ownership of the surface estate overlying the targeted formation or lease rights from such owner.

## NATURE OF PROPERTY INTERESTS CONFERRED

As described above, the rights of the surface estate owner are generally subject to the rights of a mineral estate owner to access and enjoy their estate (*Miller v. Ridgley*, 2 Ill. 2d 223, 231 (1954)).<sup>12</sup> Therefore, to the extent that CCS activities prevented a mineral owner from accessing their estate, the CCS operator could be liable for property damages. Given that mineral estates can often be extremely valuable, this reinforces the importance of conducting title searches and determining rights prior to injection.

## ESTABLISHING PRIORITY BETWEEN EXPLORATION AND EXISTING USES AND RIGHTS

### PETROLEUM AND RESOURCE EXPLORATION AND EXTRACTION

According to the USDOE, depleted oil and gas fields in the US are potentially suitable for GS. Furthermore, EOR processes offer some potential to store CO<sub>2</sub> even while recovering petroleum to the extent the CO<sub>2</sub> is stranded in the geologic formation. For these reasons, conflicts between petroleum extraction and CCS in the US could be minimized.

### FISHING

There is no clear applicable authority on establishing priority with fishing rights.

### FAUNA AND FLORA, INCLUDING ENDANGERED SPECIES

CCS activities must not jeopardize any threatened or endangered species or harm any critical habitat as designated by the USFWS or NOAA.

### NAVIGATION

While not subject to the UIC Program, injection wells up to three miles offshore could become subject to regulation under the Marine Protection, Research, and Sanctuaries Act (MPRSA). The USEPA recently submitted to Congress proposed changes to MPRSA to implement the 1996 Protocol to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (London

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<sup>10</sup> In the case it was held that the "word 'surface' in mining controversies means that part of the earth or geologic section lying over the minerals in question .... It is not merely the top of the glacial drift, soil, or the agricultural surface."

<sup>11</sup> Note that there is some indirect support for ownership of pore space by the mineral owner in case law in the following states: Alabama, California, Illinois, Indiana, Kentucky, Louisiana, New York, Ohio, Oklahoma (Camco, 2008).

<sup>12</sup> In the case it was held that the "reservation of the mineral carries with it, as a necessary appurtenance thereto, the right to use so much of the surface of the land as may be necessary to enforce and enjoy the estate reserved."

Protocol). Among the proposed changes is a provision to allow for and regulate CO<sub>2</sub> sequestration in sub-seabed geological formations under the MPRSA.

## MINING

Sequestration would limit all possibility of extracting minerals from the same formation (USDOE, 2009). Therefore in exploring potential sequestration sites, title searches and investigation as to ownership of mineral estates in the exploration area would be necessary to limit liability to potential mineral estate owners.

CCS exploration might also focus on un-minable coal seams and/or saline (non-potable) water aquifers. However, it is not clear that a coal seam or saline aquifer that is determined to be un-minable or unusable now, would remain so for the duration of sequestration.

## SUBSEQUENT USES

The duration of sequestration and the impact of sequestration on subsequent land uses for thousands of years to come must be taken into account. In particular, on Federal lands, where agencies have certain policy agendas, such as BLM's "multiple-use mission" for long-term management of public lands, the required duration for sequestration activities could be a limiting factor (USDOE, 2009).

## RIGHTS OF INDIGENOUS PEOPLES AND OTHER CUSTOMARY RIGHTS

CCS operators would need to obtain approval from tribal leaders in addition to the USEPA prior to injecting CO<sub>2</sub> on tribal lands.

## COMPULSORY ACQUISITION AND COMPENSATION REGIMES

States could potentially invoke eminent domain authority on behalf of CCS operations in the state. In Illinois, for example, the DCEO spent considerable time negotiating with individual landowners that would be affected by FutureGen project development, but the agency's eminent domain authority remained on the table to the extent any landowner refused to consent to the project. The DCEO has statutory authority in Illinois to condemn private land for purposes of siting or providing rights of way to coal utilization and/or coal conversion projects (20 ILCS 1110/3).

### 8.3 Evaluation

The Draft Rule provides a comprehensive framework for CCS regulation with respect to the technical requirements for underground storage wells. The period for public comment on the Draft Rule closed on 24 December 2008. A final rule is expected sometime in 2010 or 2011.

CCS also raises a multi-jurisdictional question with respect to ownership of subsurface pore space. While the majority rule provides some uniformity for CCS operators, states hoping to encourage CCS development should follow Wyoming's lead in legislating this issue, rather than leaving the issue open to litigation between CCS operators and mineral or surface estate owners in different states.

## **9. Post-closure and long-term storage of CO<sub>2</sub>**

### **9.1 Introduction**

In general, long-term liability for CCS projects remains a key issue both at the state and Federal level. The extremely long time frame for CCS post-closure responsibility makes it commercially and legally impracticable to merely impose liability onto a CCS operator that may only exist for a limited period of time. For this reason, many emerging policy models in the US focus on pooled funds and/or state liability in order to address liability for future harm from CCS operations.

In the US, injection of CO<sub>2</sub> by temporary pilot-scale storage projects is conducted under a regulatory policy designed specifically for such projects, within EPA's authority for the Underground Injection Control program. These special "Class V well" rules were published in March 2007. For commercial storage projects. Regulations that reflect the special attributes of large-scale CO<sub>2</sub> injection were proposed by the USEPA in July 2008. The USEPA's Draft Rule would create a series of requirements for post-closure CCS operations, but would not provide a framework for liability beyond financial responsibility for maintenance of the CCS facility for a specified period of time.

In addition, the Interstate Oil and Gas Compact Commission (IOGCC), an association of State Governments in the US (and Canadian provinces), has published model legislation and regulations for states to consider in establishing state oversight of CO<sub>2</sub> storage. The IOGCC framework includes approaches to eminent domain, unitization of reservoirs owned by multiple parties, resolution of subsurface property rights, and assumption of long-term liability by state governments. Sixteen states and four Canadian provinces are currently developing, or have adopted CO<sub>2</sub> legislation and regulations (IOGCC, 2008).

### **9.2 Integrated policy and legislation**

#### **9.2.1 Obligations of approval authorities**

Under the Draft Rule, permitting authorities would be responsible for approving site closure, but would not accrue any liability or financial responsibility for the site.

#### **9.2.2 Monitoring and reporting obligations**

The USEPA is proposing a default post-injection site care period of 50 years. During this 50-year period, the owner or operator would be required to submit periodic reports providing monitoring results and updated modelling results as appropriate until a demonstration of non-endangerment to USDWs can be made (EPA Rule 2008).

#### **9.2.3 Leakage liability**

### **FRAMEWORK FOR POST-CLOSURE LIABILITY**

The Draft Rule would require CCS operators to demonstrate financial responsibility for remedial action at a CCS facility, including injection well plugging, post-injection site care and site closure, and emergency and remedial response. Financial mechanisms that might be used for this purpose include

trust funds, letters of credit, surety bonds or self-insurance, such as a corporate guarantee. This obligation would terminate after the post-injection site care period has ended.

While the USEPA has authority under the SDWA to require financial responsibility for well plugging and post-injection site care, the SDWA does not provide authority for coverage of potential risks to air, ecosystems, or public health (EPA Rule 2008). Thus, general liability for a CCS site would not terminate at the end of the site care period.

Conscious of the importance of providing a framework for long-term liability in this area, USEPA and other governmental and non-governmental stakeholders in the US are considering policy options that could be used to fill this gap. Examples of these policy options include:

#### PRICE-ANDERSON NUCLEAR INDUSTRIES INDEMNITY ACT, USC § 2014(HH)

The Price Anderson Act created a tiered system of limited liability for nuclear accidents, which essentially divided liability for such accidents between facility owners, the industry as a whole, and the Federal government. The three-tiered coverage system requires licenced nuclear facilities to maintain their own liability insurance, as well as contribute to an industry pool for liability insurance. The Federal government would provide the licensee with indemnity in case liability exceeded the amount available from these sources (EPA Rule 2008).

#### ILLINOIS AND TEXAS FUTUREGEN STATUTES

As described above, under these statutes, the states would assume full responsibility for CO<sub>2</sub> at a given point in the CCS cycle. While these models are helpful to spur short-term investment, a more strategic government approach to liability assumption based on risk profiles or site performance may be necessary in the future.

#### USDOE CARBON CAPTURE AND SEQUESTRATION PROGRAM AMENDMENTS ACT OF 2009

This bill would enable the USDOE to enter into cooperative agreements to provide financial and technical assistance to up to ten CCS demonstration projects. The Secretary of Energy would also have authority under the bill to indemnify and hold harmless the recipient of a cooperative agreement from any liability arising out of their CCS demonstration project. This model provides the government more ability to determine which projects should be insured, rather than more general assumptions of liability for the entire industry, but is limited in scope. The value of this indemnification is tempered by a requirement that the government collect a fee from the project owner equal to the net present value of payments made by the government to cover the liability under the indemnification agreement. In addition, the legislation would prohibit site closure until ten years after the CO<sub>2</sub> plume is stabilised.

#### INTERSTATE OIL & GAS COMPACT COMMISSION (IOGCC) MODEL

Under the IOGCC Model, state authorities would assume long-term responsibilities for monitoring and remediation activities at CCS sites. This effort would be financed through an industry-funded, state-administered trust fund. While the IOGCC Model insulates a CCS operator from regulatory liability it would not insulate them from long-term general liability.

## **LIABILITY CAPS**

See the Price Anderson Act above.

## **VICARIOUS LIABILITY**

There is no clear authority on vicarious liability in the CCS context.

## **CONTRACTUAL ASSIGNMENT OF RESPONSIBILITY**

See state assumption of liability models above.

## **LONG-TERM CORPORATE LIABILITY IN THE EVENT OF CORPORATE RESTRUCTURING**

There is no clear authority on long-term corporate liability in the event of corporate restructuring, in the CCS context.

## **STANDING TO ENFORCE STORAGE OBLIGATIONS**

Under the Draft Rule, prior to the end of the post-injection site care period, the USEPA or an enforcing state authority would have clear standing to enforce permit obligations.

### **9.3 Evaluation**

The examples discussed above demonstrate the important role played by state and/or multi-party risk allocations where new and important, but potentially high-risk technologies are being developed. The US has particular experience with this issue in the nuclear industry, where a multi-tiered liability approach has been successful under the Price Anderson Act. This experience, as well CCS-specific policies like the IOGCC Model, should inform near-term efforts to craft a national CO<sub>2</sub> liability framework. Until there is a clear policy in place in this area, the issue of long term liability will continue to deter investment in CCS technology.

## 10. Summary

In summary, while existing US law and policy may prove adequate in addressing certain aspects of the CCS process, a more comprehensive national regulatory policy will be necessary in order to drive investment towards CCS technology. Under ACES, regulators are specifically tasked with developing this type of national strategy for regulation of CCS deployment. The success of ACES, or of legislation similar to ACES, will also be critical to spurring investment in CCS. By imposing a cost on CO<sub>2</sub> emissions and providing comprehensive incentives for CCS deployment, ACES sends a clear message that CCS technology is essential to the country's transition to a carbon-constrained economy.

Multi-jurisdictional infrastructure development issues will also have to be addressed. In particular, greater Federal involvement in the siting and regulation of CO<sub>2</sub> pipelines would likely reduce transaction costs for pipeline operators, while also providing the pipelines eminent domain authority anywhere in the country.

Finally, the USEPA's Draft Rule provides a comprehensive framework for the technical aspects of underground CO<sub>2</sub> injection. However, key policy questions remain with respect to both ownership of underground storage space and long-term liability for sequestered CO<sub>2</sub>. Property rights questions should be resolved at the state level. State legislatures should pass legislation clearly allocating rights to subsurface pore space in order to obviate the need for courts to resolve the issue. Finally, a framework for long-term liability for sequestered CO<sub>2</sub> should be developed at the Federal level that effectively allocates risk between different CCS shareholders. Ultimately, where the deployment of CCS technology is essential to mitigating the risks posed by global climate change, the risk of investment in the technology should be shared.

### 10.1 CCS policy and legislation 'best practice'

Lessons may be learned from the following legislation:

- ACES;
- EPA Rule 2008;
- Hazardous Liquids by Pipeline, 49 C.F.R. 195;
- WRI 2008; and
- Wyoming H.B. 89 (2008).

### 10.2 Gaps in CCS policy and legislation

Gaps are present in the legal treatment of captured CO<sub>2</sub>, the long-term liability for sequestered CO<sub>2</sub> and subsurface pore space ownership.

### 10.3 Priority areas for future policy and legislative development

Priority areas for future policy and legislative development include:

- legal treatment of captured CO<sub>2</sub>;
- licencing regimes for multi-jurisdictional infrastructure development;

- long-term liability for sequestered CO<sub>2</sub>; and
- subsurface pore space ownership.

#### **10.4 Other lessons learned**

There is strong industry support for CCS technology in the US. Cooperation and information sharing between the private sector and the government on this issue could help ensure that appropriate policies and incentives are developed to encourage growth in the CCS sector.

## 11. References

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*United Nations Framework Convention on Climate Change*, opened for signature 9 May 1992, 1771 UNTS 107 (entered into force 21 March 1994).

### 11.2 Federal law and proposed legislation

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American Recovery and Reinvestment Act of 2009, Public Law 11-5, 123 Stat. 115.

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Public Lands Regulation 43 USC 1340.

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#### **CONNECTICUT**

Connecticut General Statutes §§ 16-245a, 16-243q.

#### **ILLINOIS**

Clean Coal Portfolio Standard Law, Public Act 095-1027 (2009).

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#### **MONTANA**

Senate Bill 498 (2009).

H.B. 338 (2009).

#### **TEXAS**

H.B. 149 (2005)

#### **REGIONAL GREENHOUSE GAS INITIATIVE**

Regional Greenhouse Gas Initiative Model Rule (2007), as implemented in participating states.

#### **TEXAS**

Texas Nat. Res. Code Ann. § 111.002 (2008).

Texas UTILITY CODE § 39.904(a).

16 TEX. CODE § 3.70.

H.B. 469 (2009).

H.B. No. 1796 (2009).

## **WEST VIRGINIA**

- H.B. 2860 (2009).

## **WYOMING**

H.B. 89 (2008).

### **11.4 Case law**

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