2012

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Sustainable Development Law & Policy

Volume 12
Issue 2 *Winter 2012: Climate Law Reporter*

Article 14

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*by Paul Bailey, Elizabeth McCullough, and Sonya Suter**

Introduction

It is well-accepted within the scientific community that global climate change is a real and urgent challenge facing the planet.[1] One technological method that has gained significant support from government and industry for reducing global emissions of carbon dioxide ("CO_2"), the most prevalent anthropogenic greenhouse gas,[2] is carbon capture and sequestration ("CCS").[3] CCS is a process by which CO_2 is isolated from an emissions stream, compressed, and transported to a CO_2 storage facility deep underground where it is stored permanently.[4] However, two regulatory barriers to widespread CCS deployment include (1) the lack of comprehensive climate change legislation including a price on carbon and (2) the lack of regulatory certainty surrounding long-term CCS liabilities.[5] This article focuses on the second of these two barriers.

This article analyzes possible regulatory frameworks to address long-term CCS liabilities from the perspective of the Polluter Pays Principle ("PPP"). The analysis begins with a brief description of CCS's role in reducing global CO_2 emissions and the regulatory barriers to CCS implementation. Next, the article introduces the PPP, explaining its origins and influence on environmental policy. The article then presents four possible regulatory frameworks for long-term CCS liabilities within the PPP context, providing examples of countries and programs where these frameworks are either in place or proposed. The frameworks analyzed are: (1) transfer of liability, (2) government indemnification, (3) owner/operator retention of long-term liabilities without financial responsibility requirements, and (4) an industry-funded pooled trust fund. Finally, this article concludes that an industry-funded pooled trust fund is the framework most in line with the PPP in the CCS context because it is the scenario in which the polluter is most likely to pay for, and the public is most likely to avoid, the greatest portion of long-term CCS liability costs.

Background

Climate Change and Carbon Capture and Sequestration

Climate change is a term that refers to major alterations in the climate (i.e. temperature, extreme weather events, droughts, and higher sea levels) that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable periods of time.[6] Although the Earth's climate has changed many times throughout its history, the rapid warming seen today exceeds any changes over the past 650,000 years and cannot rationally be explained by natural processes.[7] Many greenhouse gases, like water vapor and CO_2, which trap heat in the atmosphere, occur naturally.[8] However, human activities, including fuel burning, are adding large amounts of CO_2 to the natural mix of atmospheric gases at a rapid rate that is projected to increase in the coming years.[9] The Intergovernmental Panel on Climate Change in its 2007 Fourth Assessment Report determined that "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations," with the term "very likely" corresponding to at least ninety percent certainty.[10] According to the United States Environmental Protection Agency ("EPA"):

> Climate change is a real and urgent challenge that is already affecting people and the environment worldwide. Significant changes are occurring on the Earth, including increasing air and ocean temperatures, widespread melting of snow and ice, and rising sea levels. . . . For this reason, human-caused climate change represents a serious challenge – one that could require new approaches and ways of thinking to ensure the continued health, welfare, and productivity of society and the natural environment.[11]

CCS has emerged as viable a method to reduce these detrimental GHG emissions.[12] During the CCS process, CO_2 is isolated from an emissions stream, compressed, transported, and permanently stored underground in a CO_2 storage facility.[13] While reducing emissions will require multiple strategies, according to the International Energy Agency's ("IEA") World Energy Outlook for 2011, "[i]f CCS is not widely deployed in the 2020s, an extraordinary burden would rest on other low-carbon technologies to deliver lower emissions in line with global climate objectives."[14] The IEA estimates that CCS could account for approximately ten percent of needed reductions in emissions by 2050.[15]

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Currently, there are fifteen CCS projects around the world that are under construction or in operation, with an additional fifty-nine in the planning phases.[16] These fifteen projects have the capacity to sequester 35.4 million tons per year of CO2—approximately the equivalent of Norway's annual emissions.[17] There is, however, public concern about the safety and viability of CCS projects. For example, the proposed Vattenfall Jänschwalde plant in the Brandenburg region of Germany was recently canceled due, in part, to opposition from nearby residents, and, in part, to a lack of a legal framework for CCS.[18] Though the European Commission required countries to establish national CCS legal frameworks, Germany's 2011 parliament repeatedly failed to pass such a law despite a proposal.[19]

Major Barriers to Widespread Deployment of Industrial-scale CCS

In August 2010, the U.S. Interagency Task Force on Carbon Capture and Storage ("Task Force") identified several barriers to the widespread deployment of CCS.[20] Two regulatory barriers that the Task Force identified include: (1) the lack of comprehensive climate change legislation that establishes a price on carbon and (2) the lack of regulatory certainty surrounding long-term CCS liabilities.[21] With respect to the first, the Task Force stated:

> Establishing a clear price signal on GHG emissions . . . will also put established low-carbon technologies on a level playing field with conventional carbon-emitting technologies, yield near-term opportunities for emerging technologies, and create greater market certainty for long-term investments in new or improved low-carbon energy technology development.[22]

Although the Task Force identified a price on carbon as a "threshold barrier for further CCS technological development,"[23] this article focuses on the second barrier and assumes that comprehensive climate change legislation will be developed in those jurisdictions where it is currently absent.

The second barrier, the lack of regulatory certainty surrounding long-term CCS liabilities, is of particular concern because financial resources sufficient to cover long-term liabilities must be available over an indefinite time-frame in order to (1) fulfill CCS's purpose—permanent storage of CO_2—which may require indefinite stewardship of CCS sites and (2) ensure that human health and the environment are not negatively impacted. Following from these two long-term needs, relevant long-term liabilities can be divided into two major categories: long-term stewardship and long-term compensatory liability. Long-term stewardship includes obligations to perform maintenance responsibilities (e.g., long-term water quality monitoring or land use controls). Long-term compensatory liability includes obligations to reimburse parties for various types and forms of legally-compensable losses or damage due to CO_2 storage.

The Polluter Pays Principal

The Polluter Pays Principle ("PPP") is an environmental policy principle reflecting the idea that the costs of pollution should be borne by those who cause it.[24] The PPP has been said to provide several benefits including promotion of economic efficiency, legal justice, harmonization of international policies, and definition of cost allocation within an economy.[25]

The first mention of the PPP at the international level occurred in the 1972 Recommendation by the Organization for Economic Co-operation and Development ("OECD") Council on Guiding Principles concerning International Economic Aspects of Environmental Policies.[26] There the OECD announced: "The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called Polluter-Pays Principle."[27] The 1972 Recommendation continued, stating that the polluter should be responsible for costs associated with pollution prevention and control.[28] It also emphasized "the necessity for removal of subsidies that would prevent polluters from bearing the full cost of pollution which they caused." [29]

Since the 1972 Recommendation, the PPP has been reaffirmed by other international declarations. Its adoption by the 1992 Rio Declaration is one such example. Principle 16 of the Declaration states: "National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment."[30] As another example, the Treaty Establishing the European Community provides that "[c]ommunity policy on the environment [. . .] shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay."[31] The incorporation of the PPP in multiple international declarations and treaties demonstrates its widespread acceptance as a legitimate legal principle.

Applying PPP to the CCS Context

In the CCS context, CO_2 is the pollution that the polluter ought to pay for under PPP. The polluter in the CCS context would likely, but not exclusively, be the owner/operator of a coal or natural gas-fired power plant, which emits CO_2 as a byproduct of producing electricity.[32] The operation and maintenance of the CO_2 storage facility, including the cost of all liabilities associated with the capture, transport, and sequestration of CO_2, is the pollution prevention and control method.[33] Despite international acceptance of the PPP, many governments across the globe have adopted regulatory frameworks that subsidize the long-term liability costs associated with CCS.[34] Government subsidization of long-term CCS liabilities transfers a portion of the responsibility to pay for CO_2 pollution away from the CO_2 storage facility owner/operator and onto the public.[35]

Internationally, regulatory frameworks to deal with long-term CCS liabilities or long-term liabilities for industries analogous to CCS come in many different forms, including: (1) transfer of liability, (2) government indemnification, (3) owner/operator retention of long-term liability, without financial

responsibility requirements, and (4) industry funded pooled trust funds.

Liability Transfer

One option for handling long-term CCS liability is to transfer long-term CCS liabilities from the CO2 storage facility owner/operator to the government. Under this arrangement, the government agrees to accept liability after the CO2 storage facility stops injecting CO2.[36] Although the scope of transferred liabilities varies, a transfer of liability in the CCS context would typically include stewardship obligations, requiring indefinite care of the CO2 storage facility.[37] Under these frameworks, certain liabilities typically remain with the site owner/operator such as tort liability for releases caused by gross negligence.[38]

In practice, liability transfer has been enacted by the CCS regulatory frameworks in the United Kingdom ("UK"), Spain, and France.[39] The United States also takes a similar approach to regulating long-term liabilities for radioactive waste.[40]

UK regulations enacted in 2011 allow a CO2 storage facility operator to transfer responsibility for long-term compensatory liability and stewardship of its CCS site to the government after a twenty-year period of monitoring and performing corrective action as necessary.[41] Under this framework, long-term compensatory liability includes "any liabilities, whether future or present, actual or contingent, arising from leakage from the storage complex . . . and includes liabilities for personal injury, damage to property and economic loss."[42] The operator retains liability for leakages that occur prior to the transfer and leakages that occur after the transfer but are due to negligence, deceit, or a failure to exercise due diligence;[43] in the case of a leak where the operator is at fault, the government may recover its costs.[44] The UK requires operators to pay a financial contribution prior to the site transfer in order to cover the government's expected post-transfer costs.[45] However, the European Commission guidance on post-transfer cost estimates, referenced in the UK regulations, seems to account for monitoring costs only, and not compensatory liability costs.[46] While the guidance explicitly requires that costs of monitoring be covered for a thirty-year period, it does not mention any costs related to potential compensatory liability.[47]

Spain and France employ similar liability transfer approaches in order to comply with the European Commission's 2009 Directive on the Geological Storage of CO2.[48] Both countries require a minimum period of thirty years of post-closure site care and require that an owner or operator meet certain criteria prior to site liability transfer.[49] Spain's framework also explicitly includes monitoring, maintenance, corrective action, storage sealing, removal of the CO2 storage facilities, and compliance with preventative measures and repairs.[50] However, the Spanish government does not assume liability for monitoring and maintenance costs in cases of operator misconduct. [51]

France transfers similar liabilities, including long-term compensatory liability (for surrendering allowances to offset leaks), monitoring and verification of the safety of the CO2 storage facility, response costs of a post-closure accident, and clean up after injections cease.[52] France also requires the owner/operator to pay a stewardship contribution to cover a minimum of thirty years of monitoring.[53]

These CCS requirements mirror the U.S. approach to handling long-term liability in its regulation of the disposal of uranium or thorium byproduct materials, which also requires indefinite stewardship.[54] Disposal sites for these radioactive materials are covered by the Uranium Mill Tailings Radiation Control Act of 1978 ("UMTRCA"),[55] which allows Department of Energy ("DOE"), another agency, or a state to manage custody and long-term care of the sites.[56] In order for site liability to be transferred, the operator must have closed the disposal facility to reduce radioactivity at the site, and prepared a Long-Term Surveillance Plan.[57] Additionally, uranium mill operators must pay "a minimum of $250,000 (1978 dollars) to cover the costs of long-term surveillance," although the Nuclear Regulatory Commission ("NRC") may adjust this amount.[58] Titles to both the sites and the uranium byproduct material are transferred to the government permanently[59]—six sites are currently managed by DOE, which expects to manage up to twenty-seven[60]—but site transfer does not relieve the prior license holder from liability for fraud or negligence prior to transfer.[61] Specifically, the requirements for transfer hold that sites transferred to the government should "be such that ongoing active maintenance is not necessary to preserve isolation."[62]

All of these programs in some way incorporate the PPP by requiring the owner/operator to cover the government's stewardship responsibilities and leaving some liability with the owner/operator in the event of misconduct. However, the degree to which the cost of pollution will be borne by the owner/operator relies heavily on both the government's assessments of future costs prior to transfer and on the government's willingness to require payment of the assessed amount. Additionally, in the event of owner/operator misconduct, the framework relies on the courts to enforce payment. Given that CCS is a novel technology with uncertain costs, assessments of future costs are unlikely to be consistently accurate and proving misconduct or negligence will be far from straightforward in the courts. This leaves the strong possibility that the government and taxpayers would support the long-term liability of the CCS industry.

Indemnification

The second option is government indemnification of the owner/operator's long-term CCS liabilities. Under this arrangement, the government agrees to reimburse the owner/operator for actual liabilities sustained.[63] Here, the indemnifying government could limit an indemnity in cases of gross negligence or misconduct.[64] Governmental indemnification could be provided for a pre-determined number of demonstration projects, which would be phased out as CCS commercializes, the cost of CCS lowers, and liabilities become more predictable.[65]

Government indemnification is currently used to regulate long-term CCS liabilities in Australia.[66] Additionally, federal indemnification of long-term CCS liabilities was proposed by U.S. Senator Jeff Bingaman (D-NM) in the 112th Congress on March 31, 2011, which, after having been approved by the

Senate Committee on Energy and Natural Resources, is awaiting full Senate consideration.[67]

The Australian *Offshore Petroleum and Greenhouse Gas Storage Act 2006* ("OPGGS Act") provides mandatory indemnification by the Australian Government for specified long-term CCS liabilities.[68] Liability under this law rests with the holder of the CO2 injection license during the course of the licensed injection and storage activities.[69] Following the cessation of injection and storage activities, the licensee must apply for a site closure certificate.[70]

Assuming the Australian Government is prepared to issue a site closure certificate, the licensee will receive a pre-certificate notice.[71] This notice sets out the financial contribution that must be paid by the owner/operator, which is equivalent to the estimated costs to be incurred by the Australian Government in carrying out long-term stewardship of the storage formation.[72]

Following a site closure, the licensee will continue to remain at risk for liabilities arising from its operations.[73] At least fifteen years after issuing a site closure certificate, the Australian government may declare that the closure assurance period has been reached.[74] Based on the fifteen year period of monitoring, the Australian government must be satisfied that:

1 The injected CO_2 is behaving as predicted in the approved site plan;
2 there is "no significant risk" that the substance will have a "significant adverse impact" (SRSAI) on the geotechnical integrity of whole or part of the storage formation, the environment, or on human health and safety; and
3 no injection operations have taken place since the recorded cessation date.[75]

Once there is a valid site closure certificate and a declared closure assurance period, the Australian government then indemnifies the injection licensee against specified liabilities.[76] The scope of the Australian government's indemnification is limited by the following four conditions:

1 the liability is a liability for damages;
2 the liability is attributable to an act done or omitted to be done in the carrying out of operations authorized by the license;
3 the liability is incurred or accrued after the end of the closure assurance period; and
4 such other conditions (if any) as are specified in the regulations.[77]

The licensee will continue to be at risk of incurring the full costs of liabilities that fall outside of the scope of these indemnification conditions.[78] For example, the licensee will continue to be fully responsible for acts or omissions in carrying out activities that were not authorized under the OPGGS Act.[79]

In the U.S., the Anti-Deficiency Act prevents the U.S. government from agreeing to open-ended indemnification arrangements absent specific Congressional authorization, which has rarely been granted.[80] However, The Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2011 (S. 699) provides an opportunity for indemnification in the domestic CCS regime.[81] This bill directed the Secretary of Energy (DOE) to conduct a program to demonstrate the commercial application of CCS and authorized the Secretary of Energy to enter into cooperative agreements with up to ten demonstration projects for indemnification of liabilities up to $10 billion collectively.[82] Essentially, the bill proposes a waiver of the Anti-Deficiency Act that would allow the DOE to sign indemnification agreements and would provide a permanent, indefinite appropriation for any costs incurred by DOE to indemnify sponsors of demonstration projects and remediate sites.[83] Exceptions to federal indemnities include any liabilities that result from gross negligence or intentional misconduct by the site operator.[84] To be eligible, each large-scale demonstration project must inject over one million tons of carbon dioxide each year from "industrial sources" (not naturally occurring CO_2) for a period of ten years.

The bill also authorizes the collection of indemnification fees.[85] With this authority the DOE will be able to collect fees in amounts to be determined by the Secretary of Energy from operators receiving indemnification based on the likelihood of incidents resulting from specific risk-based hazards during post-closure stewardship.[86] The fees will be collected in an amount equal to the estimated amount of payments expected to be made by the United States to cover liability under the indemnification agreements.[87] This bill was introduced on March 31, 2011 and received approval from the Senate Committee on Energy and Natural Resources on May 26, 2011.[88] However, as of March 26, 2012, the Senate has not considered or voted on the bill and immediate consideration is unlikely given an upcoming election and the current congressional climate.[89]

Similar to the transfer of liability framework, both of these indemnification frameworks serve as a subsidy that could prevent polluters from bearing the full costs of the pollution they have caused.[90] When compared to transfer of liability, indemnification provides a lower level of subsidy because the owner/operator is responsible to initially bear the cost of liability and then seek reimbursement.[91] However, indemnification, as seen in Senator Bingaman's bill, could provide an appropriate legal framework if CCS can garner sufficient governmental support.

Owner/Operator Retention of Long-term Liabilities without Financial Responsibility Requirement

Another option for handling long-term CCS liability is for the owner/operator to retain liability indefinitely without requiring a demonstration of financial responsibility. Under this arrangement, the owner/operator is responsible for long-term compensatory liability for the CO_2 storage facility, but does not have explicit long-term stewardship obligations and is not required to act until damages occur.[92]

The United States currently employs a CCS regulatory framework that requires owner/operator retention of long-term CCS liabilities without a financial responsibility requirement.[93] The Safe Drinking Water Act ("SDWA"), the U.S. federal law regulating CCS, does not provide authority to any government agency to transfer liability for a CO_2 storage facility from

one entity (i.e., owner/operator) to another (i.e., a government agency).[94] Under the SDWA, owners/operators of CO_2 storage facilities must ensure protection of underground sources of drinking water from endangerment and are subject to liability for enforcement under the Act.[95] Once an owner or operator has met all regulatory requirements and received approval for site closure, the owner/operator will generally be free from liability under the SDWA.[96] However, even after site closure, the owner/operator will always be required to comply with governmental orders to protect human health if, for example, there is fluid migration at a CO_2 storage facility that causes or threatens imminent and substantial endangerment to an underground source of drinking water.[97] Furthermore, after site closure, an owner/operator remains liable under tort and other remedies, or under other statutes such as the Clean Air Act.[98]

Owner/operator retention of long-term CCS liability is a regulatory framework closely in-line with the PPP because each owner/operator, theoretically, is independently responsible for the total costs of long-term CCS stewardship and liability. However, in the CCS context, which occurs over an indefinite timeframe, it is likely that the CO_2 storage facility owner/operator will go out of business, experience severe financial problems, or otherwise desert their responsibilities prior to the end of the relevant long-term liability period.[99] For example, gas companies could declare bankruptcy without leaving sufficient funds to cover the long term cost of their actions.[100] Under scenarios such as this, long-term liabilities which arise when the owner/operator is no longer a viable entity become the responsibility of the public. Therefore, over the indefinite time-frame associated with CCS activities, owner/operator retention of long-term liabilities without financial responsibility requirements, in practice, is not as closely in-line with the PPP as one may initially believe.

Industry-Funded Pooled Trust Fund

A final option for addressing long-term CCS liability is to use an industry-pooled trust fund to generate resources to cover long-term liabilities associated with a group of CCS facilities. Under this approach, CCS storage facility owner/operators would be required to pay into a fund that the government would hold in trust for use in paying for long-term CCS liabilities.

The Carbon Capture and Sequestration Deployment Act of 2010 (S.3589) [101] was introduced by Senator John Rockefeller (D-WV) and proposed a pooled trust fund for post-closure stewardship funded by per-ton fees on injected CO_2.[102] Although not reintroduced in the 112th U.S. Congress, an examination of the bill provides one possible direction for a U.S. approach to long-term CCS liability.[103] As proposed, the fee would be based on a risk assessment of the type of CO_2 injection site (e.g., type of rock where the CO_2 is being injected).[104] As with other approaches described here, the Rockefeller proposal would have allowed for a transfer of site stewardship and liability to the government, with exceptions for breach of contract, willful violations of rules, and reckless or intentional misconduct on the part of the operator.[105] Currently, under federal regulations, a certificate of closure is issued at a minimum of fifty years after operations cease, during which the operator is responsible for monitoring the site.[106]

Under the Rockefeller proposal, damages arising from the site could be paid for from three sources: (1) the Stewardship Trust Fund; (2) the stewardship agency itself; or (3) the site operator.[107] Money in the stewardship fund would be used to pay for administrative, monitoring, and remediation costs that arise after the site was transferred to the government.[108] The stewardship agency (a state government or the DOE) would be liable for performance of its stewardship duties.[109] The operator would be liable only for claims, compensation, or reimbursement due to gross negligence, intentional misconduct, and if the Stewardship Trust Fund did not have sufficient funds to pay for damages.[110] Decisions on who would be liable in a particular circumstance would be made by a public claims office within the DOE.[111]

As with the liability transfer frameworks discussed above, this approach has the potential to require the polluter to pay for all damages or site care because the owner/operator would pay for all government responsibilities upfront. The requirement that the owner/operators pay for damages in the event that the fund did not have enough money further aligns with the polluter pays principle.[112] A fifty year post-closure period increases the likelihood of the owner/operator paying for problems associated with its CO_2 storage facility prior to transfer, assuming that problems would emerge in the years immediately after injection operations cease. However, a pooled trust fund is effective only if the risk-based fees collected from the owner/operators fully account for the cost of CCS facilities' long-term liabilities. Similarly, the requirement that the owner/operators pay in the event of fund insolvency is effective only where owner/operators still exist and are solvent when the funds are required.[113]

The idea of an industry-funded pooled trust fund is not new, with several used currently by the U.S. government to deal with such issues as abandoned coal mines and nuclear waste.[114] One such existing fund is the Oil Spill Liability Trust Fund, which is financed by an eight cents per barrel tax on petroleum.[115] The fund, created in 1990, has increased the tax once, from five to eight cents, with an additional increase planned for 2017.[116] The trust fund is used to pay for oil spill cleanup costs and related purposes.[117] While this fund is currently solvent, recent events such as the Deepwater Horizon oil spill in 2010 illustrate that the fund alone is insufficient to finance all oil spill liability; the Oil Spill fund may not spend more than one billion dollars per incident, and the fund set up to handle Deepwater Horizon claims is due to be funded to $20 billion by 2014.[118]

Given the indefinite nature of long-term CCS liabilities, a trust fund provides a way to ensure that the polluter pays for at least a portion of the costs of future care of the CO_2 storage facility and any associated liabilities, even if the polluter becomes insolvent or is no longer in business. Although there is no guarantee that the trust fund will be viable for an indefinite amount of time, it is more likely that a portion of long-term CCS liabilities will be borne by the polluters than under the other three frameworks discussed. Therefore, in the long-term CCS context, an industry-funded trust fund is the regulatory framework

most in-line with the PPP; it establishes a scenario in which the polluter is most likely to take responsibility for long-term liabilities and the public is the least likely to be stuck with the cost.

Conclusion

In its simplest terms, the PPP reflects the idea that the costs of pollution should be borne by those who cause it. Of the four frameworks discussed, an industry-funded pooled trust fund is the framework most in-line with the PPP in the CCS context because it is the scenario in which the polluter is most likely to pay for and the public is most likely to avoid the costs of the greatest portion of long-term CCS liabilities. However, currently, the majority of governments who have chosen to establish a legal framework regulating CCS have chosen to subsidize long-term CCS liabilities, to some degree, through a regulatory framework that includes transfer of long-term liabilities, while still requiring some industry contribution or maintaining some industry liability.[119] This partial acceptance of the PPP can be justified in two ways: (1) the indefinite timeframe associated with CCS liabilities, which may not practically be paid for by an owner/operator with a limited life-cycle, presents an unusual regulatory scenario that many governments have limited experience addressing, and (2) the national and global interest many governments recognize in combating global climate change presents an immediate concern that may outweigh the benefits associated with strict adherence to the PPP. However, as governments begin to gain more information about the long-term liabilities associated with CCS, the severity of potential impacts of global climate change, and other technological options for mitigation, a regulatory system that accounts for the PPP will perhaps be adopted in a greater number of jurisdictions.

Endnotes: Can Governments Ensure Adherence to the Polluter Pays Principle in the Long-term CCS Liability Context?

1 *See generally* Press Release, U.N. Env't Programme Fin. Initiative, 2011 Global Investor Statement on Climate Change (2011), http://www.unepfi.org/fileadmin/documents/2011InvestorStatementClimateChange.pdf (explaining the economic and environmental concerns related to climate change).

2 Intergovernmental Panel on Climate Change, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2 (S. Solomon et al. eds., 2007) [hereinafter IPCC 2007].

3 Carbon Capture and Sequestration, Env't Def. Fund, http://www.edf.org/energy/carbon-storage (last visited February 22, 2012).

4 *Id.*

5 *See* Int'l Energy Agency, 3rd IEA Int'l CCS Regulatory Network Meeting, Executive Summary, Mar. 1-2, 2011 (Mar. 2011), http://www.iea.org/work/2011/ccs/Executive_Summary.pdf.

6 United Nations Framework Convention on Climate Change, art. 1, May 5, 1992, 1771 U.N.T.S. 107, U.N. Doc. A/AC.237/18, http://unfccc.int/resource/docs/convkp/conveng.pdf [hereinafter UNFCCC].

7 *See* IPCC 2007, *supra* note 2.

8 *See Greenhouse Gases, Climate Change, and Energy*, U.S. Energy Info. Admin., http://www.eia.gov/oiaf/1605/ggccebro/chapter1.html (last visited Feb. 22, 2012).

9 *See CO2 Emissions from Fuel Combustion: Highlights,* Int'l Energy Agency (2011), http://www.iea.org/co2highlights/CO2highlights.pdf.

10 IPCC 2007, *supra* note 2.

11 U.S. Env't Prot. Agency [U.S. EPA], Climate Change Science Facts (2010), http://www.epa.gov/climatechange/downloads/Climate_Change_Science_Facts.pdf.

12 *See generally* U.S. Dep't of Energy, Overview of Carbon Storage Research, http://fossil.energy.gov/programs/sequestration/overview.html (last visited Feb. 22, 2012) (explaining the regional, national, and international efforts to promote CCS).

13 *See* Env't Def. Fund, *supra* note 3.

14 Int'l Energy Agency, World Energy Outlook 2011 Executive Summary (2011), http://www.iea.org/weo/docs/weo2011/executive_summary.pdf.

15 Int'l Energy Agency, Cost and Performance of Carbon Dioxide Capture from Power Generation 7 (2011), www.iea.org/articles/2011/costperf_ccs_powergen.pdf.

16 Global CCS Inst., Global Status of Large Scale Integrated CCS Projects: December 2011 Update 2 (2011), http://cdn.globalccsinstitute.com/sites/default/files/publications/27936/quarterly-update-december-2011-final-v4.pdf (requiring projects to sequester 800,000 tons of CO2 or more per year for a coal fired power plant, or 400,000 tons of CO2 per year for other types of operations in order to be included in this summary).

17 *Id.* at 5.

18 *Id.* at 2.

19 *See generally Id.* (explaining that Germany's Vattenfall Jänschwalde project to regulate CCS failed because of an inability to resolve regulatory hurdles related to the program).

20 *See* U.S. EPA, Report of the Interagency Task Force on Carbon Capture and Storage 53 (2010) http://www.epa.gov/climatechange/downloads/CCS-Task-Force-Report-2010.pdf.

21 *Id.* at 10.

22 *Id.* at 54.

23 *Id.*

24 Vito De Lucia, *Polluter Pays Principle,* Encyclopedia of the Earth (Richard Reibstein et al. eds., last revised 2010), http://www.eoearth.org/article/Polluter_pays_principle (last visited Jan. 10, 2012) (citing H.C. Bugge, *The Principles of Polluter Pays in Economics and Law, in* Law and Economics of the Environment (E. Eide and R. van der Bergh eds., 1996)).

25 *Id.*

26 *Id.*

27 *Id.* (quoting Org. for Econ. Cooperation and Dev., Recommendation of the Council on Guiding Principles of Concerning International Economic Aspects of Environmental Policies, OECD Doc.No. C(72) 128 (May 26, 1972)).

28 *Id.*

29 *Id.*

30 *Id.*

31 *Id.* (quoting Consolidated Version of the Treaty Establishing the European Union art. 174(2), Dec. 24, 2002, 2002 O.J. (C 325) 107-08).

32 *See* U.S. Energy Info. Admin., *supra* note 8.

33 *See Carbon Capture and Sequestration*, Env't Def. Fund, http://www.edf.org/energy/carbon-storage (last visited Feb. 22, 2012).

34 *See generally* Allan Ingelson, Anne Kleffner & Norma Nielson, *Long-Term Liability For Carbon Capture And Storage In Depleted North American Oil And Gas Reservoirs - A Comparative Analysis*, 31 Energy L.J. 431, 465-66 (2010) (analyzing the different approaches taken by governments to shift liability for CCS).

35 *Id.*

36 *Id.* at 446.

37 *Id.* at 445–46 (noting that the state of Montana allows for permanent liability transfer from the private company to the state).

38 *Id.* at 440.

39 *See, e.g.*, Environmental Protection: Storage of CO2 (Termination of Licenses), 2011, S.I. 2221/8, 7(2) (U.K.); Law 40/2010 of 29 December on the geological storage of carbon dioxide, B.O.E. 2010, 317, Art. 23(5) [hereinafter B.O.E. 2010, 317]; C. Env. Art. L 519-1.

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Endnotes: An Alternative Approach for Addressing CO_2-driven Ocean Acidification

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[1] *See* Scott C. Doney et al., *Ocean Acidification: The Other CO2 Problem*, 1 Annu. Rev. Marine Sci. 170, 172 (2009).

[2] *See* U.N. Entl. Programme [UNEP], *Emerging Issues: Environmental Consequences of Ocean Acidification: A Threat to Food Security*, 2 (2010), http://www.unep.org/dewa/pdf/Environmental_Consequences_of_Ocean_Acidification.pdf (last visited Mar. 26, 2012).

[3] Victoria J. Fabry, *Impacts of Ocean Acidification on Marine Fauna and Ecosystem Processes*, 65 ICES J. Marine Sci. 414 (2008).

[4] *Id.* at 415.

[5] *See generally* K. R. N. Anthony *et al*., *Ocean Acidification Causes Bleaching and Productivity Loss in Coral Reef Builders*, 105 PNAS 17442–17446 (2008), http://www.pnas.org/content/105/45/17442.full.pdf+html (detailing the impacts of ocean acidification in coral reefs); Coral bleaching refers to "the loss of color from reef-building corals because of a breakdown of the symbiosis with the dinoflagellate *Symbiodinium*." Simon D. Donner et al., *Model-based Assessment of the Role of Human-induced Climate Change in the 2005 Caribbean Coral Bleaching Event*, 104 PNAS 5483 (2007), http://www.pnas.org/content/104/13/5483.full.pdf+html.

[6] *See* Philip L. Munday *et al*., *Replenishment of Fish Populations is Threatened by Ocean Acidification*, 107 PNAS 12930 (2010), http://www.pnas.org/content/early/2010/06/24/1004519107.abstract.

[7] *See id*. *See also* Philip L. Munday, *Ocean Acidification Impairs Olfactory Discrimination and Homing Ability of a Marine Fish*, 106 PNAS 6, 1848–1852 (2009) (detailing low pH impact on clownfish ability to find suitable habitat).

[8] Doney, *supra* note 1, at 185; See also UNEP, *supra* note 2, at 6.

[9] United Nations Framework Convention on Climate Change, May 5, 1992, 1771 U.N.T.S. 107, U.N. Doc. A/AC.237/18, http://unfccc.int/resource/docs/convkp/conveng.pdf [hereinafter UNFCCC].

[10] U.N. Convention on the Law of the Seas, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

[11] *See e.g.* John M. Broder, *At Meeting on Climate Change, Urgent Issues but Low Expectations,* The New York Times (Nov. 27, 2011), http://www.nytimes.com/2011/11/28/science/earth/nations-meet-to-address-problems-of-climate-change.html (Last visited Mar. 26, 2012).

[12] UNCLOS, *supra* note 10, arts. 2-16.

[13] *See id*, arts. 192-237; *see, e.g.*, Heidi R. Lamirande, *From Sea to Carbon Cesspool: Preventing the World's Marine Ecosystems from Falling Victim to Ocean Acidification*, 34 Suffolk Transnat'l L. Rev. 183, 192 (2011) (discussing protection of the marine environment under UNCLOS); Rachel Baird, et al., *Ocean Acidification: A Litmus Test for International Law*, Carbon & Climate L. Rev., 459, 464-65 (2009) (discussing international instruments that relate to ocean acidification, including UNCLOS).

[14] UNCLOS, *supra* note 10, art. 192; Although UNCLOS does not define the term 'marine environment', it is generally understood to mean "the ocean space taken as a whole (*i.e*., the surface of the sea, the water column, the subsoil, the seabed and the atmosphere above them) and everything comprised in that space, both physical and chemical components, including marine life." Veronica Frank, The European Community and Marine Environmental Protection in the International Law of the Sea: Implementing Global Obligations at the Regional Level 10 (2008).

[15] For the purposes of UNCLOS, pollution of the marine environment refers to the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities. *See* UNCLOS, *supra* note 10, art. 1(4).

[16] UNCLOS*, id.*, art. 194(1).

[17] *See id*., art. 212(1).

[18] *See id.*, art. 207(1).

[19] *See* William C.G. Burns*, Potential Causes Of Action For Climate Change Impacts Under The United Nations Fish Stocks Agreement,* 7 Sust. Dev. L. & Pol'y No. 3, 36 (Winter 2007) (arguing that CO2 is pollutant under the meaning of UNCLOS).

[20] UNCLOS has been ratified or acceded to by 162 countries. It should be noted that of the largest emitters of CO2, to date only the United States of America has not ratified UNCLOS. *See* United Nations Division for Ocean Affairs and the Law of the Sea, *Status of the United Nations Convention on the Law of the Sea, of the Agreement relating to the implementation of Part XI of the Convention and of the Agreement for the implementation of the provisions of the Convention relating to the conservation and management of straddling fish stocks and highly migratory fish stocks*, (as of September 2011), http://www.un.org/depts/los/reference_files/status2010.pdf (Last visited Mar. 26, 2012).

[21] *See generally* Barry Buzan, *Negotiating by Consensus: Developments in Technique at the United Nations Conference on the Law of The Sea,* 75 A.J.I.L. 324 (1981).

[22] *See* UNCLOS, *supra* note 10, arts. 279-299.

[23] *See* Jonathan L. Hafetz, *Fostering Protection of the Marine Environmental and Economic Development: Article 131(3) of the Third Law of the Sea Convention*, 15 Am. U. Int'l L. Rev. 583, 596 (2000).

[24] *See* Frank, *supra* note 14, at 10.

[25] UNCLOS*, supra* note 10, art. 207 ("internationally agreed rules, standards and recommended practices and procedures").

[26] Lakshman Guruswamy, *The Promise of the United Nations Convention on the Law of the Seas (UNCLOS): Justice in Trade and Environment Disputes*, 25 Ecology L.Q. 189, 208 (1998).

[27] Robin Warner, Protecting the Oceans Beyond National Jurisdiction: Strengthening the International Law Framework 49 (2009).

[28] *See* UNCLOS, *supra* note 10, art. 212.

[29] *See* Frank, *supra* note 14, at 10.

[30] *See* Burns, *supra* note 19.

Endnotes: Can Governments Ensure Adherence to the Polluter Pays Principle in the Long-term CCS Liability Context?

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[40] *See* 10 C.F.R. § 40.28.

[41] Environmental Protection: Storage of CO2 (Termination of Licenses), 2011, S.I. 2221/8, § 7(2) (U.K.); Environmental Protection: Storage of CO2 (Termination of Licenses), 2011, S.I. 2221/8 Schedule I, 4(1) (U.K.).

[42] *Id.* § 15(3)(b).

[43] *Id.* § 14–15.

[44] *See, e.g.*, Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of CO2 and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, art. 20, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:01:EN:HTML; B.O.E. 2010, 317, Art. 23(5); C. Env. Art. L 519-1 (Fr.).

[45] Environmental Protection: Storage of CO2 (Termination of Licenses), 2011, S.I. 2221/8, § 10(1) (U.K.); Environmental Protection: Storage of CO2 (Termination of Licenses), 2011, S.I. 2221/8 Schedule I, 4(1) (U.K.).

[46] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of CO2 and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, art. 20, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:01:EN:HTML.

[47] *Id.*

[48] B.O.E. 2010, 317, art. 23(5); C. Env. Art.L 519-1 (Fr.).

[49] *Id.*

[50] B.O.E. 2010, 317, art. 23(5).

[51] B.O.E. 2010, 317, art. 24(6).

[52] C. Env. Art.L 519-1 (Fr.).

[53] C. Env. Art.L. 229-47-II (Fr.).

[54] 10 C.F.R. § 40.28.

[55] *See* Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. § 7901 (West 2012).

[56] *See* General license for custody and long-term care of uranium or thorium byproduct materials disposal sites, 10 C.F.R. § 40.28(a) (1990).
[57] *Id.* § 40.28(b).
[58] *See* Financial Criteria, 10 C.F.R. § 40 Appendix A, Criterion 10 (2011).
[59] *Id.* § 40 Appendix A, Criterion 11.
[60] *See Regulatory Framework*, Dep't of Energy, Office of Legacy Mgmt., http://www.lm.doe.gov/pro_doc/references/framework.htm#umtrca (last visited Feb. 22, 2012) (Colorado, New Mexico, South Dakota, Washington, and Wyoming).
[61] Ownership And Custody Of Certain Byproduct Material And Disposable Sites, 42 U.S.C. § 2113(b)(6).
[62] 10 C.F.R. § 40 Appendix A, Criterion 12.
[63] *See generally* Jacobs et al., *Proposed Roadmap for Overcoming Legal and Financial Obstacles to Carbon Capture and Sequestration*, Discussion Article 2009-04, Belfer Center for Science and International Affairs, Harvard Kennedy School (2009), http://belfercenter.ksg.harvard.edu/files/2009-04_ETIP_Jacobs_et_al.pdf.
[64] *Id.* at 19.
[65] *Id.* at 14.
[66] Discussion Article, Dep't of Primary Industries- Victoria, A Regulatory Framework for the Long-Term Underground Geological Storage of Carbon Dioxide in Victoria (Jan. 2008), http://www.dpi.vic.gov.au/energy/about/legislation-and-regulation/ccs-regulations/a-regulatory-framework-for-the-long-term-underground-geological-storage-of-carbon-dioxide.
[67] The Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2011, S. 699, 112th Cong. (2011).
[68] UCL Carbon Capture Legal Programme, Liability: Australia, http://www.ucl.ac.uk/cclp/ccsliable-AUS.php (last visited Feb. 22, 2012) (summarizing the Austl. Cap. Terr. Laws Act No. 14 (2006)).
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] *Id.*
[75] *Id.*
[76] *Id.*
[77] *Id.*
[78] *Id.*
[79] *Id.* ("The OPGGS Act also provides for a transfer of long-term liability if the licensee ceases to exist (whether or not the license is in force). Provided the above conditions are otherwise met, liability will be considered to be a liability of the [Australian Government].").
[80] *See* 31 U.S.C.A. § 1341 (West 2012).
[81] The Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2011, *supra* note 67.
[82] *Id.*
[83] *Id.*
[84] *Id.* § 963A(g).
[85] *Id.* § 963A(g).
[86] *Id.* § 963A(g)(4).
[87] *Id.*
[88] *Id.*
[89] *See, e.g.,* Olga Elogolova, *Insiders: Energy Legislation Unlikely in 2012*, Nat'l J. (Jan. 31, 2012), http://mobile.nationaljournal.com/energy/insiders-energy-legislation-unlikely-in-2012-20120131?page=1 /.
[90] *See* UCL Carbon Capture Legal Programme, Liability: Australia, *supra* note 68; *see also* The Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2011, *supra* note 67.
[91] *See* Dep't of Primary Industries- Victoria *supra* note 66.
[92] *See* Ingelson et al. *supra* note 34, at 468; *see* The Carbon Capture and Sequestration Deployment Act of 2010, S. 3589, 111th Cong. (2010) [CCS Deployment Act].
[93] Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells, 237 Fed. Reg. 77,230, 77,272 (Dec. 10, 2010).
[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] *Id.*
[98] *See, e.g.*, Environmental Protection and Enhancement Act, R.S.A. 2000, s. 215 (providing that in Alberta, Canada, along with government liability schemes, tort liability is not prohibited as a remedy); *see also*, Alexandra B. Klass & Elizabeth J. Wilson, *Climate Change And Carbon Sequestration: Assessing A Liability Regime For Long-Term Storage Of Carbon Dioxide*, 58 Emory L.J. 103, 124 (2008) (highlighting that allowing for tort remedies along with liability schemes is crucial to regulating CCS).
[99] Ingelson et al. *supra* note 34, at 468 (highlighting the risk of owners/operators going bankrupt).
[100] *Id.*
[101] CCS Deployment Act*, supra* note 92.
[102] *Id.* § 406.
[103] CCS Deployment Act*, supra* note 92.
[104] CCS Deployment Act, *supra* note 92.
[105] *Id.* §§ 406, 407(d).
[106] 40 C.F.R. § 146.93(b) (2011) (noting that the government may approve an alternate timeframe if requested by the operator); Post-Injection Site Care and Closure, 40 C.F.R. § 146.93(c) (2011).
[107] CCS Deployment Act, *supra* note 92, § 406.
[108] *Id.* § 406.
[109] *Id.* § 405(b).
[110] *Id.* § 405(c)(1).
[111] *Id.* § 409.
[112] *Id.* § 405(c)(1).
[113] *Id.*
[114] *See* Abandoned Mine Reclamation Fund, 30 U.S.C. § 1231 (2006) *authorized by* Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. § 1201 et seq.; The Nuclear Waste Fund, 42 U.S.C. § 10222 (2011) *authorized by* Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10101 et seq.
[115] Dep't of the Treasury, *Treasury Bulletin: Financial Management Service*, Jan. 2011, at 142, http://www.fms.treas.gov/bulletin/b2011_1.pdf.
[116] *Id.*
[117] *Id.*
[118] U.S. Gov't Accountability Office, Update on federal financial risks and Claims Processing, GAO-11-397R (2011), http://www.gao.gov/products/GAO-11-397R.
[119] *See e.g.*, 10 C.F.R. § 40.28(a), *supra* note 56; The Department of Energy Carbon Capture and Sequestration Program Amendments Act of 2011, *supra* note 67; CCS Deployment Act, *supra* note 92.