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# Accelerating Carbon Capture and Sequestration Projects: Analysis and Comparison of Policy Approaches

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**Abstract**

Many states and countries have adopted or are in the process of crafting policies to enable geologic carbon sequestration projects. These efforts reflect the recognition that existing statutory and regulatory frameworks leave ambiguities or gaps that elevate project risk for private companies considering carbon sequestration projects, and/or are insufficient to address a government's mandate to protect the public interest. We have compared the various approaches that United States' state and federal governments have taken to provide regulatory frameworks to address carbon sequestration. A major purpose of our work is to inform the development of any future legislation in California, should it be deemed necessary to meet the goals of Assembly Bill 1925 (2006) to accelerate the adoption of cost-effective geologic sequestration strategies for the long-term management of industrial carbon dioxide in the state.

Our analysis shows that diverse issues are covered by adopted and proposed carbon capture and sequestration (CCS) legislation and that many of the new laws focus on defining regulatory frameworks for underground injection of $CO_2$, ambiguities in property issues, or assigning legal liability. While these approaches may enable the progress of early projects, future legislation requires a longer term and broader view that includes a quantified integration of CCS into a government's overall climate change mitigation strategy while considering potentially counterproductive impacts on CCS of other climate change mitigation strategies. Furthermore, legislation should be crafted in the context of a vision for CCS as an economically viable and widespread industry.

In California, CCS is not included quantitatively as a strategy to reduce future greenhouse gas (GHG) emissions. In part, this reflects the focus of most state agencies on short term goals, such as the AB 32 goal to return California emissions to 1990 levels by 2020. It also reflects the lack of data necessary to predict how rapidly and to what degree CCS could be deployed to meet short or long term goals. The lack of timely consideration of CCS as a mitigation alternative, however, has the potential to lead, albeit unintentionally, to policies which may make CCS adoption less likely and more expensive in the long run. For example, consideration of the economic and other risks associated with CCS is presently a disincentive to adopt CCS if other alternatives, such as fuel switching, can meet legislated requirements to reduce carbon emissions.

While an important function of new CCS legislation is enabling early projects, it must be kept in mind that applying the same laws or protocols in the future to a widespread CCS industry may result in business disincentives and compromise of the public interest in mitigating GHG emissions, particularly in cases where different stakeholders are responsible for capture, transport, and sequestration elements of a project. Protection of the public interest requires that monitoring and verification track the long term fate of pipelined $CO_2$ regardless of its end use in order to establish that climate change goals are being met. Legislative mandates that require $CO_2$ producers to verify carbon reductions via sequestration, and which are crafted under the assumption that $CO_2$ capture, transport and storage is linear and maintained under a single stewardship, may result in reducing the incentive to participate in the efficiencies of a collective transport and sequestration system.

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## 1. Introduction

The 2009 European Parliament Directive on geologic storage of $CO_2$ is one example of an effort toward comprehensive CCS legislation aiming to provide uniform regulatory and statutory criteria throughout the European Union [1]. This directive addresses exploration and permitting for $CO_2$ storage sites, regulation of storage site operations, monitoring and verification of containment, mitigation and remediation of damages associated with storage, closure of storage sites, and post-closure responsibilities. Long-term liability is addressed, but pore space ownership or unitization is not.

In contrast, in the United States in recent years, a diversity of legislative actions have been taken or proposed at both the national and state levels. Understanding the differences among these policies and how they impact the adoption of CCS is important for guiding both future CCS policy decisions and efforts to facilitate CCS commercialization. Numerous resources and databases are available that track CCS-related legislation in various countries and within the United States (e.g., [2], [3]). We have used these resources to examine differences among state and national approaches with the objective of providing guidance for future policy in California.

In California, consideration of CCS tends to lag behind other greenhouse gas (GHG) mitigation approaches, such as renewables, performance standards, or efficiency, which policy makers recognize and facilitate as components of the state's plan to meet climate change mitigation goals. To be adopted widely, not only does CCS have to be established within regulatory and legal frameworks, but it also has to be included as a viable and reliable technology in climate policy and GHG emissions mitigation roadmaps, plans, and other policy instruments. If there is ambiguity over CCS regulation and accounting, industry will turn to other approaches presenting less business risk.

So long as the world economy relies so substantially on fossil fuels to meet its energy needs, delaying the implementation of CCS will likely result in a dangerous shortfall in the GHG reductions needed over the next 10 to 50+ years. For this reason, it is essential for policy makers to recognize the urgency of facilitating CCS in all its potential forms.

It is important to note that CCS is often presumed to be synonymous with capture from large point sources and geologic sequestration in saline formations or nonproducing oil or gas reservoirs. However, there is growing recognition that permanent sequestration can also be achieved via use of the captured $CO_2$ for beneficial purposes, such as cement manufacturing, enhanced hydrocarbon recovery, or enhanced geothermal systems in which $CO_2$ is used as a working fluid. While $CO_2$ injection into the subsurface for permanent geologic sequestration has additional specific and unique regulatory and statutory needs, nearly all options for permanent sequestration require clear policies setting a predictable and sufficient value for carbon and establishing rules by which adopters of these technologies can obtain credit for sequestered carbon.

## 2. Overview of issues addressed by state laws and regulations on CCS

Based on the authors' opinions and those expressed in other published literature, e.g. [4], the key issues that a state or nation must address, at a minimum, to facilitate commercial-scale CCS are:

- Providing an economic driver or incentive for reducing $CO_2$ emissions from power and industrial sources
- Defining accounting methods which qualify or require CCS (including beneficial use) under GHG emission reduction programs
- For geologic storage, defining a site permitting process or delegating authority to a state agency to regulate CCS projects
- For geologic storage, assigning and aggregating pore-space ownership and related property rights
- Defining requirements and funding mechanisms for long-term liability and stewardship

As described below, various state or national policies have attempted diverse solutions to some of these issues, leaving some gaps as well as areas of potential conflict. The first two of these issues are discussed individually, whereas the last three are combined because many state legislatures to date have dealt with them collectively in single pieces of legislation

## 3. Economic Drivers for CCS

In August 2010, the U.S. government issued the "Report of the Interagency Task Force on Carbon Capture and Storage", which states that the key barrier to CCS deployment is the lack of comprehensive climate change legislation. It notes that Administration analyses suggest that CCS technologies will not be widely deployed in the next two decades absent financial incentives that supplement projected carbon prices. The driver for current CCS projects in the private sector is anticipation of requirements to reduce GHG emissions; but, with ongoing policy uncertainty regarding the value of GHG emissions reductions, it remains difficult to define the business case for pursuing these projects [5].

In general, two alternative approaches to providing a value for GHG emissions cuts are suggested: cap-and-trade or command-and-control. Worldwide, cap-and-trade seems to be the preferred approach. In the United States, GHG emissions are not currently regulated at the national level, although Congress may eventually pass legislation requiring "cap-and-trade." Some states already have mandated caps, such as California's AB 32 directive to reduce the state's emissions to 1990 levels by 2020.

In the absence of successful federal legislation for a cap-and-trade program, the United States Environmental Protection Agency (USEPA) is proceeding with GHG regulation under its Clean Air Act (CAA) authority, issuing an "endangerment finding" on December 7, 2009, which concluded that six GHGs, including $CO_2$, may reasonably be anticipated to endanger the public health and welfare [6]. The endangerment finding by the USEPA obligates that agency to resort to command-and-control methods to regulate GHG emissions.

From the standpoint of CCS, the endangerment finding sets the stage for regulation of GHG emissions from large stationary sources under the CAA Prevention of Significant Deterioration (PSD) and Operating Permit (Title V) Programs, and this should provide an impetus for adoption of CCS. However, PSD applies to pollutants from new major sources or major modifications at existing pollutant sources, where the source is located in attainment areas or is unclassifiable with the National Ambient Air Quality Standards (NAAQS). In order to reduce the number of regulated facilities to a manageable number, USEPA has proposed to initially limit PSD and Title V review to sources with over 25,000 tons of $CO_2$ equivalent emissions per year. PSD permits require the use of Best Available Control Technology (BACT), determined by an analysis of the maximum degree of control that is achievable for a facility through application of available technology, taking into account energy, environmental, and economic impacts and other costs. Currently, there is no consensus on what BACT means in the context of GHG emissions and whether or how any sequestration method would be included as BACT.

For geologic sequestration, sources emitting at the low end of the $CO_2$ emissions range proposed for regulation under the CAA would not be large enough to warrant development of a stand-alone project. Without a pipeline infrastructure to collect and transport such emissions and without a market for trading allowances or offsets, it is difficult to see how these sources will be able to comply with these regulations. In addition, these regulations would likely be applied to geologic sequestration as well as enhanced hydrocarbon recovery projects. A leakage or fugitive emissions rate of a few tenths of a percent per year for a large multi-million ton sequestration project would have emissions within the regulated range.

It is not clear, if a state or region already has a cap-and-trade system in place, how these systems would interface with the federal command-and-control methods. For example, the Regional Greenhouse Gas Initiative (RGGI) is a collaboration among ten northeastern and Mid-Atlantic States to create a cap-and-trade system with the goal of reducing $CO_2$ emissions from the power sector by 10% by 2018. The Western Climate Initiative (WCI), a collective agreement by seven western states and four Canadian provinces to reduce GHG emissions, also plans to roll out a cap-and-trade system. The WCI partner jurisdictions aim to reduce regional GHG emissions to 15 percent below 2005 levels by 2020, with a cap-and-trade program fully implemented across the partnership by 2015.

According to the Environmental Defense Fund [7], only six states actually have established caps for $CO_2$: California, Connecticut, New Jersey, Hawaii, Maryland and Massachusetts; of these, the CCSReg database lists only California and Massachusetts as having any legislation related to CCS. In Massachusetts, SB 2768 directs the

Department of Energy Resources to establish an alternate energy portfolio standard as long as the net emissions rate does not exceed the average emission of existing natural gas plants in the state, and allows CCS to meet this standard [8]. In California, SB 1368 sets a similar kind of standard and also allows CCS as a method to meet the standard [9]. However, in both states, no accounting protocols appear to be developed to establish how CCS would count toward reductions under a cap or as a method to generate offsets. Some states have limited $CO_2$ emissions for certain generators of GHG emissions with implicit reference to CCS, but without explicit direction on accounting; for example, Montana HB 25 prohibits approval of applications for equity interest or lease in facilities used to generate electricity with coal constructed after January 1, 2007 that do not capture and sequester a minimum of 50 percent of the $CO_2$ produced [10].

## 4. GHG Accounting

Because CCS can include diverse industry sectors, it is difficult to establish accounting systems for cap-and-trade or control-and-command programs. The accounting system could provide direct GHG reductions for capped sources, or be used to generate offsets for non-capped sources. However, it can provide neither of these kinds of credits for reductions unless accounting protocols are developed for both sequestration site operators and $CO_2$ generators.

The USEPA's proposed Mandatory GHG Reporting Rule [11] sets requirements for reporting GHG emissions for facilities that inject $CO_2$. For sequestration sites, Subpart RR of the rule explicitly includes reporting the amount of $CO_2$ sequestered using a mass balance approach and developing and implementing a monitoring, verification and reporting (MVR) plan approved by the USEPA. Whether these reporting rules will satisfy state regulators charged with determining credits for sequestration remains in question. The California Air Resources Board has put in place its own Mandatory Reporting Regulation to support compliance with AB 32.

For sequestration, accounting protocols involve more than reporting. They must consider issues such as the length of time defined as permanent sequestration, the allowable cumulative uncertainty in measurements, how much sequestration credit should be granted when $CO_2$ is used beneficially for EOR or other applications, what types of measurements should be required, the spatial and temporal distribution of measurements, and what criteria determine the period of time for geologic sequestration sites to be monitored after closure. Among regulators and stakeholders, there appears to be no consensus. Most existing state legislation and regulations do not address accounting, nor do the draft USEPA Class VI rules for $CO_2$ sequestration injection wells.

There are at least a few examples where the lack of accounting and economic drivers has resulted in delays or cancellation of CCS projects. A first-in-kind project in California, proposed by Hydrogen Energy California (HECA) and Occidental Petroleum, involves building a power plant to burn petcoke to produce hydrogen and electricity and to sequester $CO_2$ in Occidental's nearby Elk Hills oilfield. Permitting the plant under the California Environmental Quality Act (CEQA) and the SB 1368 cap requires documentation by the oil field operator that the $CO_2$ from the plant will be permanently sequestered. The permitting of the project involves several state agencies; however none of these agencies has protocols in place for accounting for the $CO_2$. EOR produces back some fraction of the injected $CO_2$, such that a diminishing fraction is repeatedly cycled through the system before an injected volume approaches complete sequestration. This cycling, fugitive emissions, and losses to produced saleable fluids, make defining accounting protocols particularly challenging. However, until the agencies involved can agree on such protocols, the plant's permit is unlikely to move forward. In another California example, even with anticipated AB 32-mandated caps on $CO_2$ emissions, a project developer cited the uncertainty in accounting for geologically sequestered $CO_2$ as a GHG reduction measure, coupled with the lack of a $CO_2$ price incentive, as important factors leading to the cancellation of a proposed project to geologically sequester its refinery emissions.

## 5. Geologic Site Permitting, Pore Space Ownership, Unitization, Liability and Long-term Stewardship

One of the first efforts in the U.S. to assess issues surrounding geologic sequestration was undertaken by the Interstate Oil and Gas Compact Commission (IOGCC). In 2002, it established a Geological $CO_2$ Sequestration Task Force and, in 2008, issued a legal and regulatory guide [12].

The USEPA Class VI rules were proposed in 2008 as amendments to Title 40 of the Code of Federal Regulations (CFR), parts 144 and 146, which establish federal requirements for injecting $CO_2$ for geologic sequestration under

the authority of the Safe Drinking Water Act (SDWA). Currently, there is inconsistency in the classification of $CO_2$ injection wells, which have been permitted in various states as Class I hazardous or non-hazardous, Class II, or Class V. The Class VI draft rules do not address long-term liability, pore space ownership, and unitization, and leave uncertainties in how other important issues would be addressed, for example, transitioning projects permitted as $CO_2$-EOR Class II wells.

According to the CCSReg database, ten states have passed legislation related to site permitting for geologic sequestration (Wyoming HB 90, Texas SB 1387, Washington ESSB 6001, North Dakota SB 2095, Oklahoma SB 610, Montana SB 498, Utah SB 202, Kansas HB 2419, Louisiana HB 661, and West Virginia HB 2860). These bills grant the authority to regulate geologic sequestration to a state agency or commission and instruct that entity to write detailed rules or regulatory requirements. In some cases, these bills were adopted prior to the USEPA's issuance of the draft rules for Class VI, or they anticipate that agencies within their states will be granted primacy for Class VI wells after the USEPA adopts the new rules later this year.

In some states, legislators also have addressed the issues of pore-space ownership, unitization, liability and long-term stewardship in these same bills or through separate legislation. For example, Louisiana HB 661 authorizes the state Department of Natural Resources to regulate the storage and transportation of $CO_2$, grants the power of eminent domain for geologic sequestration projects, authorizes the state to assume ownership of closed geologic storage facilities and release operators from liability, and creates a fund to pay administrative and long-term stewardship expenses [13]. Montana SB 498 authorizes the Montana Board of Oil and Gas Conservation to regulate CCS, declares pore space the property of the surface owner, authorizes the state to assume liability for closed geologic storage sites, creates a geologic storage reservoir program fund, and provides for unitization for geologic storage [14]. In Texas, SB 1387 instructs the Texas Railroad Commission to write rules for geologic storage of $CO_2$, creates the anthropogenic carbon dioxide storage trust fund to cover long-term monitoring of geologic storage facilities, and orders a study on management of geologic storage on state-owned lands. The bill also directs the Railroad Commission to seek primary enforcement authority for geologic storage from the federal government and creates the anthropogenic carbon dioxide storage trust fund to cover administrative costs associated with permitting, oversight, and remedial action for geologic storage facilities [15]. In Wyoming, HB 90 instructs the Wyoming Department of Environmental Quality to write rules for geologic sequestration of $CO_2$; HB 17 establishes a fund for long-term stewardship expenses [16, 17]. In North Dakota, SB 2095 instructs the Industrial Commission to write rules for geologic storage site permitting, provides for eminent domain and unitization, authorizes the state to assume liability for closed storage sites, and establishes funds for administration and long-term stewardship of geologic storage sites [18].

It is important to note that many of the states actively developing legal and regulatory frameworks for geologic sequestration are those with significant coal, or oil and gas resources. In most of these states, state agencies are already regulating $CO_2$ injection for EOR.

## 6. The California Case

California has been a frontrunner with respect to proactive legislation to deal with GHG emissions mitigation, as is highlighted by the Governor's Executive Order S-3-05 of 2005, which set goals of reducing emissions to: 2000 levels by 2010, 1990 levels by 2020 (which was codified into law by AB 32), and 80 percent below 1990 levels by 2050 [19]. However, with the exception of SB 1368 and AB 1925, which directed several state agencies to make recommendations on how to facilitate adoption of CCS to mitigate carbon dioxide emissions from industrial sources, CCS has been conspicuously absent from most GHG reductions policy and planning in the state.

It is important to note that California has a rather unique energy footprint among the states. Over 50 percent of its GHG emissions from the power sector come from imports from neighboring states, where most of that power is generated from coal. Within the state, most all power plants are fired by natural gas. In addition to natural gas plants, cement plants and refineries are the state's largest point sources of $CO_2$ emissions.

CCS is not included quantitatively as a strategy to reduce the state's future GHG emissions for 2020 or 2050. In part, this reflects the focus of most state agencies on the AB 32 goal. It also reflects the lack of data necessary to predict how rapidly and to what degree CCS could be deployed to meet short or long term goals. Furthermore, among state agencies, there is often an attitude that CCS is a technology for coal, and, if it plays a role in California's GHG mitigation strategy, it is through application to coal plants that export power into the state.

California counts the emissions associated with its imported electricity as part of its GHG emissions inventory. Emissions performance standards required by SB 1368 were set so that most natural gas plants within the state qualify under the cap of 1100 lbs $CO_2$/MWh, but which will require out-of-state coal plants to add CCS or switch to natural gas. Given that the cost of electricity generation is higher for natural gas than for coal and the cost of implementing CCS is greater for natural gas plants than for coal plants, the end result will likely be CCS implemented in the power sector at a higher overall cost.

Other initiatives, such as the low carbon fuel standard (LCFS) and the renewable portfolio standard (RPS) seem designed to keep high carbon fuels, to which CCS is most efficiently applied, out of the state's energy portfolio. While such measures may be sufficiently effective to meet the state's 2020 goals, it is unlikely that this approach will be sufficient to address the deep cuts necessary to meet 2050 goals. Consideration of the economic and other risks associated with CCS results in a disincentive to adopt CCS if other alternatives, such as fuel switching, can meet legislated requirements to reduce carbon emissions in the near term. The lack of timely consideration of CCS as a mitigation alternative has the potential to lead, albeit unintentionally, to policies which may make CCS adoption less likely and more expensive in the long run and to more costly energy.

Commercialization of sequestration technology requires incentivising industry to invest in projects and giving regulators the assurance that they can protect the public interest. Nevertheless, in the short term, facilitating CCS adoption also depends on establishing the commercial viability of the technologies, and this may mean allowing some early projects to go forward with special considerations. Examples of special considerations by legislation to enable early projects are the bills passed in Illinois and Texas to address FutureGen [20, 21]. However, it must be kept in mind that applying the same laws or protocols in the future to a widespread CCS industry may result in business disincentives and compromise of the public interest in mitigating GHG emissions, particularly in cases where different stakeholders are responsible for capture, transport, and sequestration elements of a project. Because geologic sequestration, in particular, involves cross-cutting industry sectors and regulatory agencies, legislation must also accommodate the differences among these sectors.

One example of potential conflict is enhancement of the business case for CCS by the option to sell captured $CO_2$ for beneficial uses, such as EOR, ECBM, natural gas storage cushion gas, or industrial processes. In this situation, the generation of the $CO_2$ is done by one stakeholder, the sequestration by another, and the goals of these stakeholders may be contradictory. For example, a California power company may need to verify a specific amount of sequestration in order to meet mandates such as the SB 1368 level, whereas an oilfield operator who purchases that $CO_2$ for EOR has incentive to maximize the recycling rather than the sequestering of his purchased $CO_2$.

However, these beneficial uses also may significantly improve the economics of a CCS project. For example, California's oil and gas fields are a ready market for significant quantities of captured $CO_2$ provided an accounting structure could accommodate the needs of purchasers and providers of the $CO_2$. Unlike oil-producing states further east, California does not have a readily available and inexpensive supply of $CO_2$. Pipelining $CO_2$ from out-of-state sources has been estimated as too costly in spite of the recent history of high oil prices [22]. However, pipelining $CO_2$ from local industrial sources may provide economically viable opportunities to sequester $CO_2$ in these fields while obtaining the added value of enhanced hydrocarbon recovery.

Enabling the growth of a $CO_2$-EOR/EGR industry in California would require construction of a $CO_2$ pipeline network into which numerous $CO_2$ producers could sell into a multi-user market for $CO_2$. As noted above for the HECA plant and the oil refinery cases, the lack of accounting protocols even for a simple case of single source-single sequestration site delays or derails projects. While legislative mandates should facilitate such early projects, they would be crafted for projects in which $CO_2$ capture, transport and storage is linear and maintained under a single, or at most dual, stewardship. Unless such mandates also are crafted with a view to the long run, they could result in reducing the incentive for CCS project developers to participate in the efficiencies of a collective transport and sequestration system. There are differences, albeit manageable ones, in accounting protocols for $CO_2$ commingled from multiple sources and sent to various sequestration sites or types compared to those for single source and sequestration site operations.

Finally, carbon sequestration options must be integrated into government energy policy and infrastructure planning. In California, widespread adoption of CCS, along with integration of 33 percent renewables, will require substantive changes in energy infrastructure and its operation. Studies which combine consideration of sequestration opportunities, renewable integration, and transmission infrastructure are more likely to result in achieving the state's

GHG mitigation goals for the power sector at lower cost and with greater reliability than those which consider these independently.

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## 8. References

1. European Parliament and the Council of the European Union, 2009, Directive 2009/31/Ec of the European Parliament and of the Council. [Online] April 23, 2009 [Cited August 31, 2010.] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF

2. CCSReg project (Engineering and Public Policy Department, College of Engineering, Carnegie Mellon University). CCS Reg. [Online] 2010. [Cited: August 27, 2010.] http://www.ccsreg.org/

3. University College London, Faculty of Laws. UCL Carbon Capture Legal Programme. [Online] 2007-2010 [Cited: August 10, 2010] http://ucl.ac.uk/cclp/ccsdedlegnat-UK.php#current

4. CCSReg project (Engineering and Public Policy Department, College of Engineering, Carnegie Mellon University). CCS Reg. [Online] 2010. [Cited: August 27, 2010.] http://www.ccsreg.org/pdf/Brief%20Summaries_01042010.pdf.

5. Interagency Task Force on Carbon Capture and Storage, *Report of the Interagency Task Force on Carbon Capture and Storage.* [Online] 2010 [Cited: August 13, 2010]. http://www.fossil.energy.gov/programs/sequestration/ccstf/CCSTaskForceReport2010.pdf

6. United States Environmental Protection Agency, Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act [Online] July 29, 2010. [Cited: August 10, 2010] http://www.epa.gov/climatechange/endangerment.html

7. Environmental Defense Fund, "California Releases Preliminary Draft Cap-and-Trade Climate Regulations" [Online] Posted: 24-Nov-2009 [Cited: August 25, 2010] http://www.edf.org/pressrelease.cfm?contentID=10623

8. Massachusetts Legislature, 2008, Senate Bill No. 2768: Chapter 169 of the Acts of 2008: An Act Relative to Green Communities [Online] July 2, 2008 [Cited: August 10, 2010] http://www.mass.gov/legis/laws/seslaw08/sl080169.htm
9. California Legislature, 2007, Senate Bill No. 1368 [Online] September 29, 2006 [Cited: August 10, 2010] http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_1351-1400/sb_1368_bill_20060929_chaptered.pdf
10. Montana Legislature, 2007, House Bill No. 25, Introduced by A. Olson, Laslovich by Request of the Energy and Telecommunications Interim Committee [Online] [Cited: August 25, 2010] http://data.opi.mt.gov/bills/2007/billpdf/HB0025.pdf
11. United States Environmental Protection Agency, 2009, Subpart RR–Carbon Dioxide Injection and Geologic Sequestration. [Online] August 19, 2010 [Cited: August 31, 2010.] http://www.epa.gov/climatechange/emissions/subpart/rr.html
12. The Interstate Oil and Gas Compact Commission, 2008, CO2 Storage: A Legal and Regulatory Guide for States. Oklahoma City, OK [Online] [Cited: August 31, 2010.] http://iogcc.publishpath.com/Websites/iogcc/pdfs/Road-to-a-Greener-Energy-Future.pdf
13. Louisiana Legislature, 2008, HB 661 [Online] 2008. [Cited: August 28, 2010.] http://www.legis.state.la.us/billdata/streamdocument.asp?did=659193.
14. Montana Legislature, 2009, Senate Bill No. 498 [Online] April 27, 2009 Senate Bill No. 498 Introduced by Bales, Essmann, Story, Keane [Cited: August 25, 2010] http://data.opi.mt.gov/bills/2009/billhtml/SB0498.htm
15. Texas Legislature, 2009, S.B. No. 1387, An Act Relating to the Implementation of Projects Involving the Capture, Injection, Sequestration, or Geologic Storage Of Carbon Dioxide [Online] [Cited: August 25, 2010] http://www.legis.state.tx.us/tlodocs/81R/billtext/html/SB01387F.htm
16. Wyoming Legislature, 2008, Original House Bill No. 0090, Enrolled Act No. 25, House of Representatives Fifty-Ninth Legislature of the State Of Wyoming, 2008 Budget Session. [Cited: August 31, 2010] http://legisweb.state.wy.us/2008/Enroll/HB0090.pdf
17. Wyoming Legislature, 2010, Original House Bill No. 0017, Enrolled Act No. 26, House of Representatives Sixtieth Legislature of the State of Wyoming 2010 Budget Session. [Cited: August 31, 2010] http://legisweb.state.wy.us/2010/Enroll/HB0017.pdf
18. North Dakota Legislature, 2009, SB 2094 [Online] 2009. [Cited: August 27, 2010.] http://www.legis.nd.gov/assembly/61-2009/bill-text/JQTA0300.pdf.
19. Executive Order S-03-05 by the Governor of the State of California, June 1, 2005. http://www.climatechange.ca.gov
20. Illinois General Assembly, 2007, SB1704 Enrolled LRB095 09141 RCE 29334 b, An Act Concerning Alternative Energy. [Online] [Cited: August 31, 2010] http://www.ilga.gov/legislation/fulltext.asp?DocName=&SessionId=51&GA=95&DocTypeId=SB&DocNum=1704&GAID=9&LegID=29844&SpecSess=&Session=
21. Texas Legislature, 2006, H.B. No.149 An Act Relating to the Ownership and Use of Carbon Dioxide Captured by a Clean Coal Project. [Online] [Cited: August 31, 2010] http://www.capitol.state.tx.us/tlodocs/793/billtext/pdf/HB00149F.pdf
22. Western States Petroleum Association, pers. comm.