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Via Electronic Mail and Hand Delivery

Docket ID No.: EPA-HQ-OW-2008-0390

Water Docket
Environmental Protection Agency
Docket Center (EPPA/DC)
EPA West Room 3334
1301 Constitution Avenue, N.W.
Washington, DC 20460

Re: Comments on the United States Environmental Protection Agency's Proposed Rule: Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells

Dear Sir or Madam:

The Carbon Capture and Storage Alliance ("CCS Alliance" or "Alliance") is pleased to submit its comments on the United States Environmental Protection Agency's ("EPA" or "Agency") Proposed Rule: *Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells,* which was released on July 25, 2008 for review and comment by the public.[1]

The CCS Alliance is a coalition of entities, spanning a number of economic sectors, that share a common interest in removing impediments to investment in and development of carbon capture and storage ("CCS"), as well as mitigating the potential risks associated with the deployment of this technology.[2] Its purpose is to promote development of policy by the states

[1] Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geological Sequestration (GS) Wells, 73 Fed. Reg. 43503 (proposed July 25, 2008) ("Proposed Rule").

[2] MidAmerican Energy Holdings Company, National Mining Association, National Rural Electric Cooperative Association, NRG Energy, Inc., PacifiCorp and Zurich North America.

and the federal government to appropriately address risks and potential liabilities, thereby enabling the further development and increased deployment of CCS. The CCS Alliance believes these technologies can be developed while protecting underground sources of drinking water, significantly reducing global and U.S. greenhouse gas ("GHG") emissions, and enhancing U.S. energy security.

A plethora of regulations affect the delivery of power using coal. We suggest that the Agency consider other regulations addressing the environment, human health and safety, and electricity cost and reliability, when drafting and implementing these regulations. The Alliance urges the Agency to consider the support of integrated energy, climate, and environmental policy as time progresses.

A central mission of the Alliance is to help ensure that the burden of regulations related to CCS, such as those proposed by EPA, and legislative proposals promote the mobilization of capital for use in CCS projects that have well managed risk profiles and help ensure that existing barriers to CCS created by laws and regulations are minimized, consistent with environmental, health, and safety objectives.

If promulgated as currently proposed, the Proposed Rule will have a significant and direct impact on the interests of the members of the CCS Alliance and their customers. The CCS Alliance believes the Proposed Rule is helpful in many ways, but also that it can be improved in a manner that will both promote good risk management and reduce barriers to CCS deployment.

I. INTRODUCTION

If atmospheric emissions of CO_2 are to be controlled, CCS is the only tool now on the horizon that may be capable of addressing in a major way and within a mid-term timeframe, the very large quantities of CO_2 emissions from fossil-fuel using facilities in the United States.

However, CCS still requires the definition of a stable and rational legal and regulatory regime before it can be widely deployed. EPA has clear regulatory authority over the injection of wastes and other substances into below-surface wells through the UIC program. The UIC program was created by Congress under the Safe Drinking Water Act ("SDWA") over 30 years ago, without consideration of potential interaction with policies to address climate change, for the protection of underground sources of drinking water ("USDW"). The Agency now proposes to use this framework to regulate below-ground CO_2 injection activities, an application not contemplated at the time SDWA was drafted. Rules for geologic sequestration ("GS") of CO_2 are timely and would be needed even if CCS is not deployed as quickly as many predict. While many projects are under development, many observers are operating under the assumption that it will be a decade or more before there can be wide deployment of CCS.[3] The future of CCS is and will be at a critical juncture for some years. The CCS Alliance seeks, through its comments, to help ensure that these regulatory activities promote well designed and implemented CCS projects with sound risk management practices, and do not preclude the responsible, cost effective commercial-scale sequestration of CO_2.

II. IMPORTANCE OF PROMOTING CCS TECHNOLOGIES

EPA agrees, given the United States' abundant coal resources and its reliance on coal for power generation, that "CCS could be a key mitigation technology for achieving domestic emissions reductions." As the following diagram demonstrates, coal is indispensable to meeting the country's electricity demands, regardless of region:

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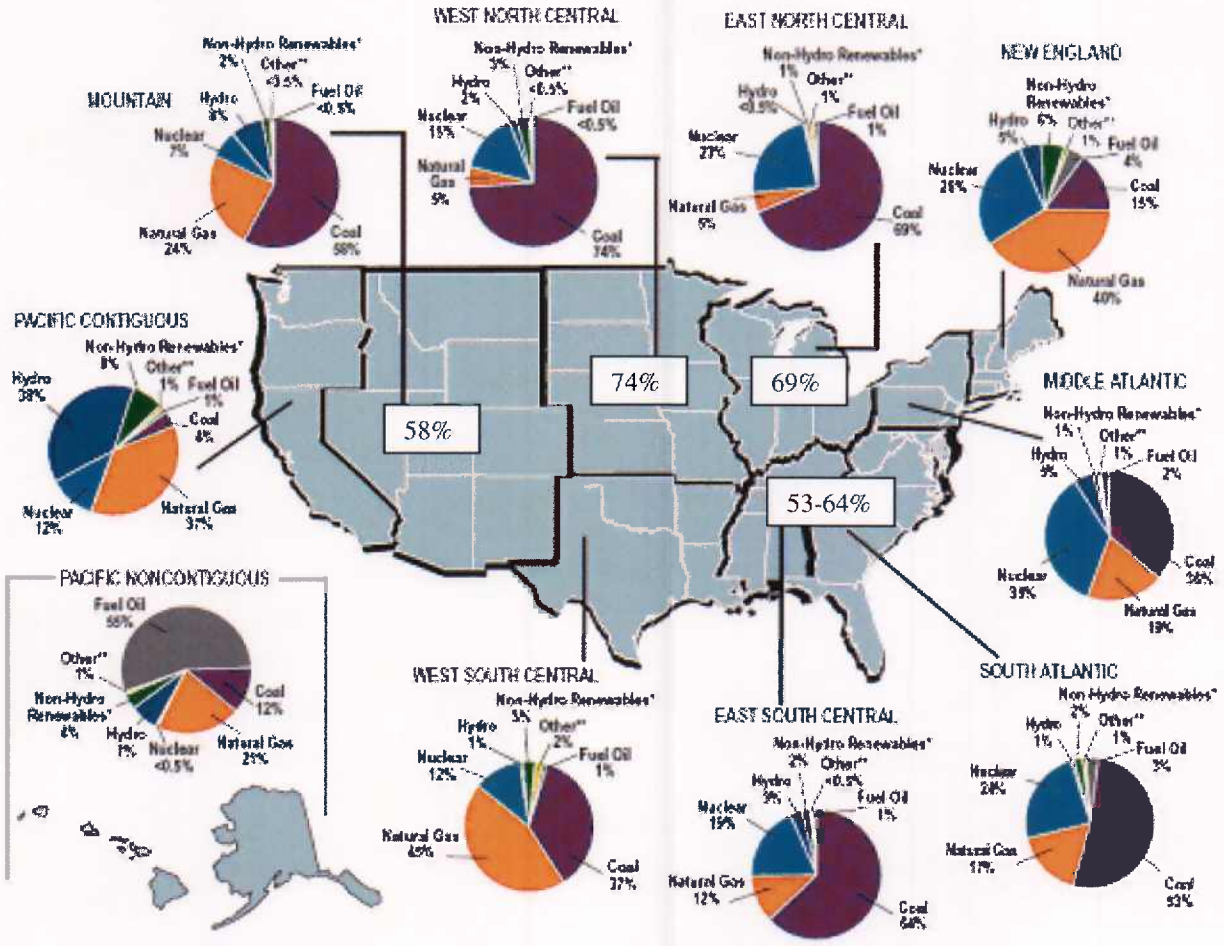
[3] See, *e.g.*, "EPRI Summer Seminar and Energy Technology Assessment Center (ETAC) Studies," presentation of Hank Courtright, Senior Vice President, Electric Power Research Institute, October 22, 2008.

Differing Electricity Mix by Region (EEI), 2008[4]



As the only significant technology to reduce atmospheric CO_2 emissions from coal, CCS is indispensable to reducing GHG emissions while meeting energy demand and achieving energy security. It is true, as EPA notes, that underground storage of CO_2 is "only one of a portfolio of options," including efficiency improvements, and the use of alternative and renewable energy sources. However, these other tools are not a substitute for baseload power generation, which comes primarily from fossil fuels. All GHG emission reduction options will need to be pursued

[4] Edison Electric Institute, *Different Regions of the Country Rely on Different Fuel Mixes* (April 2008), http://www.eei.com

to meet proposed emission reduction targets. The CCS Alliance urges that EPA, and those concerned with the Proposed Rule, consider the importance of CCS in the context of climate risk mitigation.

The U.S. population is expected to grow by 60 million by 2030. During that time, electricity demand is projected to increase by approximately 30 percent.[5] Without rapid deployment of technologies that have begun to show promise, such as CCS, it will not be possible to meet the GHG emission reduction goals being discussed by IPCC and others now for attainment by mid-century. While the thrust of this rulemaking is to protect and preserve USDWs, such environmental objectives should neither be viewed in isolation nor divorced from other environmental and policy considerations – including energy security, economic stability and trade considerations. A rational, comprehensive approach to the management of CO_2 emissions from GHG-emitting facilities must be undertaken if we are to simultaneously preserve economic stability, ensure returns on invested capital, enhance U.S. energy security, and mitigate the predicted effects of climate change.

III. SUMMARY OF SUGGESTED PRINCIPLES FOR A CCS POLICY STRUCTURE

The CCS Alliance supports a CCS policy structure with the following elements. While we recognize that some of these elements are beyond the purview of a UIC rule, we provide them for consideration.

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[5] Energy Information Administration, *Annual Energy Outlook 2008* (June 2008), http://www.eia.doe.gov/oiaf/aeo/electricity.html; U.S. Census Bureau, *Projections of the Population by Age and Sex for the United States: 2010 to 2050* (Aug. 2008), http://www.census.gov/population/www/projections/files/nation/summary/np2008-t12.xls.

Promote CCS Development

A CCS policy regime should be designed to encourage CCS, in addition to serving other public goals -- such as promotion of energy security, economic stability, and protection of USDWs, human health and the environment.

Sound Risk Management

Federal and state policy should encourage owners, operators, technology companies, engineering firms, utility regulators, and others involved in the CCS chain to take appropriate action to ensure safe and reliable operation of GS sites and systems, minimize risks, and allow CCS to earn broad public acceptance.

Single, Clear Liability Structure

To the extent possible, policymakers should put in place a single, clear liability regime for CCS activities. In the context of this rule, EPA has considered the possibility of cleanup liability both under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA" or "Superfund") and the Resource Conservation and Recovery Act ("RCRA"), in addition to the UIC program. There is also the possibility of liability under state statutes and common law. Parties who may be injured in the future must be able to resort to a fair liability scheme, but potential applicability of multiple schemes is likely to discourage CCS development.

Single, Clear Regulatory Structure

There should be a single, clear regulatory structure applicable to CCS rather than multiple, ill-suited regulatory and liability statutes and regulations that likely will discourage CCS. To that end, the CCS Alliance believes that a beneficial approach would be to enact at the federal level a new regulatory structure specific to CCS.

Site-Specific Approach

Policy regarding GS siting should reflect that conditions affecting risk differ by site and should be tailored to risks presented by specific sites. For example, CO_2 has been injected underground for several decades for EOR. This technique is well developed and there is now a history through which its risks can be assessed. This differs from injection for long-term storage in deep saline formations or unmineable coal seams, with which there is limited experience, particularly on the massive scale -- a million or more tons per year per site -- envisioned for the future. Policy must encourage development of new data, technology, and practices while recognizing that existing technology is readily applicable. It also should reflect that some long-term injection practices such as natural gas storage and EOR already are known to pose little risk. Sites also will differ based on reservoir and confinement geological details, proximity to USDWs and other resources, and other factors. In addition, it is not necessarily the case that injection always should have to occur beneath the lower most water source with a confining system in place as suggested by EPA. This should be determined on a case-by-case basis.

Liability and Site Care Responsibility Cannot be Unlimited

Site responsibility and liability of owners and operators should be designed to account not only for protection of the public, but recognizing that private parties cannot assume open-ended or unlimited risks. This includes site owners and operators, others involved in the CCS chain, and offerors of risk management products. There is not now, nor is there likely to be, a private market through which risks can be managed far beyond a reasonable post-operation site care period. In recognition of the market's limits, the duration and amount of site responsibility must be limited.

As a point of clarification, we use the following terms to denote different periods in the CCS chain:

- *Operation* is intended to mean the period during which CO_2 is injected at the injection site.
- *Post-operation site care period* or *closure period* is intended to mean the period of years after operation during which the owner or operator is required to meet State or EPA site care responsibilities.
- *Post-closure period* is intended to mean the period after State or EPA site care responsibilities end.

Allow a Broad Array of Financial Assurance Mechanisms

Government policy should allow a broad array of mechanisms, including trust funds, especially since the market is likely to be limited for risk management mechanisms for CCS. We provide suggested principles for financial assurance below.

Government Backstop Role

The government will need to step in beyond an owner and operator liability limit, as has been the case in many other areas in which the government has sought to encourage private action to achieve a public good. The private sector's capacity to manage risks is substantial, but not unlimited in either aggregate capital capacity or tenor and term. Government will need to accept responsibility beyond what the private market can manage. Because the goal in most cases will be long-term storage of CO_2, long beyond the typical lifespan of private entities, government should assume liability after injection operations cease and a reasonable closure period has elapsed.

State and Federal Regulatory Responsibility

State oil and gas commissions are repositories of expertise in regulating oil and gas industry underground injections, which have been safely undertaken for many decades. These commissions also have regulated CO_2 injections for enhanced oil and gas recovery, a practice that has been in use for 40 years. However, not all states have oil and gas regulatory experience. In states that do not have experience regulating oil and gas injections, EPA and the state should ensure the application of reasonable regulation that protects public health and the environment without discouraging CCS development and deployment.

IV. THE PROPOSED RULE: ASPECTS THE CCS ALLIANCE SUPPORTS

From the point of view of the CCS Alliance, the Proposed Rule has a number of positive aspects.

A. RECOGNITION OF THE IMPORTANCE OF SPURRING THE DEVELOPMENT OF CCS TECHNOLOGY

The Proposed Rule recognizes the value of promoting CCS technology. With further modification and a broader scope, these regulations could encourage substantially the safe deployment of CCS technologies, support the construction of new fossil fuel-fired generation, promote capital formation, and broaden the availability of risk management mechanisms for CCS projects. The costs and benefits associated with protecting USDWs must be the focus of the Proposed Rule, but account has to be taken of the reality that such protection is inextricably linked to the mitigation of climate change risk.

B. SDWA AUTHORITY IS LIMITED

The CCS Alliance agrees with EPA's view of its authority under the SDWA as limited to preventing endangerment of USDWs by the underground injection of CO_2. The Agency properly notes that regulating surface water and atmospheric releases is outside the scope of this

proposal and SDWA authority. Though EPA regulates both pollutants and commodities under the UIC provisions, it is clear that the proposal does not address the status of CO_2 whether as a pollutant or commodity.

C. VIEW OF GS RISKS AND HAZARDS

The CCS Alliance concurs with the Agency's identification of the risks and hazards, to the extent these are understood and can be reasonably predicted, that likely are posed by underground injection. The U.S. oil and gas industry, as EPA has pointed out, has had decades of experience drilling through highly pressurized formations and injecting significant amounts of CO_2 for purposes of enhanced recovery. The Agency rightly notes that CO_2 has been successfully injected on much larger scale at several sites outside the United States. However, broad scale, large CCS injections pose new considerations, and CCS requires site-specific review.

D. WELL CLASS APPROACH

The creation of a new class of wells (Class VI) to cover underground injection of CO_2 outside the context of EOR (existing Class II or Class V wells already permitted are properly left outside the scope of the Class VI proposal) is a reasonable approach due to the unique features of CCS, including the low viscosity of supercritical CO_2, its high buoyancy, and injection volumes that could dwarf those of other well classes. There is important recognition that such an approach should not impede the development of CCS technology but should "support the development of a key climate change" risk "mitigation technology".[6] The CCS Alliance agrees that where there is an EOR component in a project, that project should continue to be permitted and regulated under the Class II program. It is also positive that EPA is proposing that Directors

[6] Proposed Rule, 73 Fed. Reg. at p. 43,495.

have authority to grandfather certain requirements for Class V experimental project wells and other wells (Class II) when they are converted to full scale Class VI wells. The Alliance suggests that EPA should consider whether grandfathering the existing siting, AoR, operations, and monitoring plans for Class II and Class V wells when they are converted to full scale Class VI wells would protect USDWs while avoiding additional regulatory burden.

E. Reasonable Limits on Post-Closure Care and Assurances Against Leakage

The notion of owners and operators being responsible in perpetuity should continue to be avoided. Washington State has instituted the requirement that there be a "high degree of confidence that substantially 99 percent of the GHGs will remain contained for at least one thousand years."[7] Such a standard would be inappropriate for CO_2 injection wells, and is not related to effects on human health or the environment from a potential leak. The CCS Alliance is encouraged by EPA's apparent focus on a workable approach to such matters as casing and cement quality, and on instituting a monitoring, mitigation and validation program that provides assurance of safe, long-term storage, in conjunction with setting a defined financial responsibility period that enables financing and risk management of CCS. Ultimately, needs associated with risk management of emissions to the atmosphere must be balanced against needs to manage risk to the water supply, as well as other public policy issues mentioned above. This points to why the Alliance suggests an integrated policy management approach to CCS technology.

V. THE PROPOSED RULE: ASPECTS OF CONCERN TO THE CCS ALLIANCE

A. Fifty Year Time Frame for Post-Closure Site Care Responsibility

The Proposed Rule states that the timeframe over which CO_2 will be trapped depends on the properties of the receiving formation and the injected CO_2 stream. Currently available

[7] WASH. ADMIN. CODE 173-407-110 (2008) (*see* definition of "Permanent Sequestration").

information does not provide a complete understanding of the time required to stabilize geologically sequestered CO_2 under various conditions; however, some experience does exist and has led some to develop extrapolative estimates for related geologies. Some believe that in a significant number of cases, a 10 to 30 year timeframe will be sufficient to determine that the remaining pressure in plugged wells will not lift fluid to overlying strata. Any uncertainty in characterizing post-injection site care timeframes for GS, while challenging, could be dealt with through a maximum time period, performance standards, and Director discretion.

The CCS Alliance recommends establishing a maximum 30-year post-operation site care and financial responsibility period. The Director would have discretion to shorten -- but not to lengthen -- this period if the owner or operator meets certain enumerated performance standards based on available data on pressure, fluid movement, mineralization and/or dissolution reactions to show whether movement of the plume and pressure front have ceased. Once the thirty-year period is reached -- or shorter if the performance standards are met -- a government backstop would be triggered, thereby ensuring that a risk management mechanism is in place beyond the responsibility of the owner or operator. Investment requires assumptions about the amount of capital required and for how long it is required. If either the maximum amount of capital or the term cannot be established, investment is deterred. Further, because most capital available will not commit for terms longer than thirty years, and the duration for which it is available is generally inversely proportional to risk. Thus, long term capital for even low frequency but high severity risks is difficult to obtain. To assure public funds can be leveraged with private investment to assure widespread deployment of this climate risk mitigating technology, a balance of risk and reward is required in the policy development that underpins this UIC regulation.

B. POTENTIAL APPLICABILITY OF RCRA AND CERCLA

As discussed in greater detail below, the potential applicability of RCRA and CERCLA is a key concern. These statutes simply are not designed with the thought in mind of encouraging the safe and widespread deployment of a new technology. The CCS Alliance believes that many parties involved in the CCS chain of events should bear responsibility for safe operation. Rather than apply environmental statutes with contentious and litigious histories, Congress should enact a new regulatory and liability framework for CCS in place of the multiple regimes that now may apply. This is not meant to detract from the progress EPA is making in this rulemaking. It merely recognizes the limitations and overlapping structures EPA itself has noted. CCS should be subject to a single, clear regulatory structure, and a single, clear liability structure. In the meantime, EPA should use what interpretive authority it has to limit the applicability of multiple statutes and provisions, the applicability of which would discourage CCS.

C. GUIDANCE FOR EPA REGIONAL ADMINISTRATORS AND STATE OFFICIALS

Broad responsibility and decision making authority is centered in the EPA Regional Administrators (for UIC programs administered by EPA) and in non-EPA officials (responsible for permitting, implementation and compliance of state, territorial or tribal UIC programs). However, no guidance is provided as to how these individuals are to exercise such wide discretion. They will have the authority to determine whether large pilot projects should be considered Class V (experimental) or Class VI wells, but on what basis such a decision is to be made is not clear. In accordance with OMB's Final Bulletin for Agency Good Guidance Practices,[8] EPA should consider developing additional guidelines that limit the ability of mid-

[8] *Final Bulletin for Agency Good Guidance Practices*, 72 Fed. Reg. 3432 (Jan. 25, 2007).

level officials to implement and alter the program without review by the EPA Administrator or other organs of the U.S. Government.

D. INSUFFICIENT RECOGNITION OF LIKELIHOOD OF TECHNICAL ADVANCES

CO_2 injection has been successfully utilized in the EOR process for decades. As such, even though CCS technology has not been widely deployed, the technology and industry knowledge are nevertheless presently sufficient to commence CCS activities. However, significant advances in technology and understanding are likely to be made in the future. The Proposed Rule fails to fully recognize or otherwise take into account that technology and the state of knowledge almost certainly will improve and continue to evolve. EPA, therefore, should better reflect that as technology and understanding improves, the risks associated with CCS will be reduced and the ability to mitigate remaining risks will be improved.

E. SECONDARY CONTAINMENT SHOULD NOT BE REQUIRED

Secondary containment (*i.e.*, a second formation of "caprock" above the initial formation) should not be required because it could limit the eligibility of potential storage sites, raise costs due to extra transportation, and add to the considerable regulatory burden of regulating site characterization. The standards of the Safe Drinking Water Act require that any injection that does occur will not result in endangerment of USDWs. This should be sufficient, without imposing in addition an arbitrary additional standard.

F. GEOLOGIC SEQUESTRATION OF CO_2 NEED NOT BE, IN EVERY INSTANCE, BENEATH THE LOWERMOST FORMATION CONTAINING A USDW

Geologic sequestration of CO_2 need not be, in every instance, beneath the lowermost formation containing a USDW, as is the case with Class I wells. Such a requirement likely would preclude injection into certain targeted geologic formations, which may include storage sites currently under consideration for GS. The Director should be given discretion, but to act in

accordance with guidelines, to allow injection above or between USDWs in specific geological settings where the depth of the USDW would preclude GS and where there are thousands (or only hundreds) of feet of rock strata between the injection zone and the underlying or overlying USDW. This could in many instances open up more areas for CO_2 storage without endangering USDWs.

G. Vague Language and Definitional Problems

There are many words and phrases in the draft regulations that are not well defined, and the meaning of which ought to be expanded upon. For instance, what might constitute "significant leakage" in the context of mechanical integrity testing should be identified.

H. Non-Compliance

If a site is not in compliance, there should be no requirement that injection cease immediately, unless an imminent threat of harm to human health or the environment is posed.

VI. SPECIAL FOCUS: FINANCIAL ASSURANCE AND LONG TERM SITE RESPONSIBILITY

Financial assurance and long-term site responsibility are an area of special focus for the CCS Alliance. As noted above, we believe the proposed 50-year time frame for site care responsibility after a GS facility has ceased operation is too long, and there should be a known end point for site care responsibility up front. In addition to these concerns, we offer the following comments on financial assurance.

A. The Purpose of Financial Assurance

EPA's Geologic Sequestration Stewardship paper, released in conjunction with the Proposed Rule in July, states that the purpose of financial assurance is "to minimize the number

of facilities that are orphaned and abandoned; thereby, reducing the potential that these costs will be borne by the public."[9]

This goal must be considered in the context of the facts surrounding CCS. It is an activity the government wants to encourage, the risks attendant to which may be significant if they occur but likely are of low probability, and for which the private risk management market will not cover the full amount or duration of the risks. To fail to implement CCS at this juncture, is not an option if we are to serve other public priorities, such as addressing climate change and energy security, which depends in part on utilizing domestic resources like coal. For CCS to occur on a broad-scale basis, "costs," in the form of long-term risk, will have to be borne by the public. A question is how to define and shape the public role.

Insuring or otherwise managing risk at a complex industrial facility requires specialty risk products, not ordinary property and casualty coverage.[10] In the broader environmental risk insurance market, only four or five insurers offer products. In the energy market, the number is roughly the same. Private risk managers must have experts in place with appropriate perspective to analyze the risks and calculate probabilities of the activity. Few risk management entities likely will develop this capability for CCS. Each may be willing to take a portion of the risk with respect to an individual project. However, consider that today there are 1,493 coal-fired

[9] U.S. ENVIRONMENTAL PROTECTION AGENCY, *Approaches to Geologic Sequestration Site Stewardship After Site Closure*, n.2 (July 2008).

[10] Chiara Trabucchi and Lindene Patton, *Storing Carbon: Options for Liability Risk Management, Financial Responsibility*, BNA Daily Environment Report at p. 9 (Sept. 3, 2008). "Because CCS is what the financial services sector would call a specialty risk, only a small part of the sector would be equipped and qualified to analyze the risks and place capital thereon."

electric generating units in the United States.[11] This suggests a large potential need for risk management mechanisms.

Forecasting for CCS can be difficult because there is no established track record in some formations where GS is envisioned to occur, such as deep saline aquifers, or on the scale envisioned for facilities generating electricity. Each risk management company will have differing conditions under which it will or will not accept risk. These might be based on factors such as geography, due diligence in siting, formation pressure and chemistry, type of geologic formation, proximity to population, and the applicable legal and liability regimes. These factors are not yet actual factors, as CCS as envisioned by policymakers has yet to emerge, but are based on the considerations in other fields.

Companies may further specialize in the layer of risk they are willing to accept. For example, one risk management company may be comfortable writing coverage for the initial tranche of risk - perhaps the first $30 million in potential damages, above the first $10 million, which it may require that the policyholder bear. Another may be willing to write coverage for the next $30 million, liability for which would only arise if damages were beyond the $40 million borne by the policy holder and the first insurer. Others may not be willing to provide coverage until after the first $100 million or more in risk is covered. A small pool of reinsurers may be willing to help further spread some of these risks.

In considering financial assurance requirements, EPA and stakeholders should distinguish financial assurance from liability. Regardless of the length of time EPA establishes in the final rule for a GS facility owner or operator to maintain financial instruments to pay to clean up potential USDW contamination, liability for such cleanup may last longer, depending on which

[11] Energy Information Administration, *Electric Power Annual, Existing Capacity by Energy Source*, Table 2-2 (Oct. 22, 2007).

statutory provisions are applicable, as well as state law. While EPA is limited in its ability to address potential liability, it should seek to do so, as findings of the Risk Study conducted by the CCS Alliance (discussed below) show that potential long-term liability is a significant barrier to CCS development.

B. CONSIDERATIONS IN VIEWING RISK

Risk managers - insurers, sureties, banks, and others - will determine whether to provide financial assurance based on a calculation of the severity of risks and probability that they will occur over a given time period and the terms and conditions of the obligation.

The severity and probability of risk is defined not just by physical dimensions, such as fractures and leaks, but by the regulatory and liability structure that is in place. A party may be in violation of a rule or may trigger large potential liability, notwithstanding that the risk to USDWs or human health or the environment may be minimal.

One may look at the risks of a CCS project in two ways: by the activity being performed in the CCS chain (*i.e.*, generation, compression, transportation, injection, long-term storage), or by the phase of the project (*i.e.*, operation, closure, post-closure). The CCS activity being performed, as well as other site-specific conditions, will affect the availability of risk management products:

> In the context of CCS, different risks are likely to present themselves at different stages during the facility's life-cycle, resulting in a range of consequences the financial materiality of which will depend on the site-specific characteristics and location of each CCS project. For these reasons, different phases of the CCS process will warrant different financial (risk) management mechanisms.[12]

[12] Chiara Trabucchi and Lindene Patton, *Storing Carbon: Options for Liability Risk Management, Financial Responsibility*, BNA Daily Environment Report at p. 3 (Sept. 3, 2008).

Some risks will be more easily addressed by the market than others. Risks in the generation and carbon capture phase are manageable under standard mechanisms such as bonds and insurance, or are retained by the operator. The same is true for risks during the transportation phase.[13] However, the long-term storage phase presents a set of risks the duration of which is beyond the scope of the market. The market will not take on liabilities beyond a defined amount for a defined period. Granger Morgan of Carnegie Mellon University's CCS Regulatory Project said, "[t]hey don't know how to write a policy that goes on forever."[14] It is not a matter of knowing how - it is a matter of not being willing to provide risk management for such duration.

Underwriters look to a variety of factors in determining whether to offer a risk management product, what its features and conditions will be, and how to price it:

> An underwriter will look to the fundamentals of the technology itself when undertaking risk analysis. Technical specialists are assigned (such as engineers, geologists, chemists or the like) to develop an understanding of the technology's functionality and its potential failure points. The underwriter will ask for testing and performance data, including the conditions of performance - especially scale. In the area of technology, scalability presents substantial risk for many reasons, including - but not limited to - basic theory extensions, specific chemical or physical behavioral changes associated with volume or environmental factors (such as temperature or humidity) and supply-chain risks, to name a few.[15]

Many of these issues are key considerations in evaluating CCS risks. As noted above, few risk management companies may undertake to develop this information.

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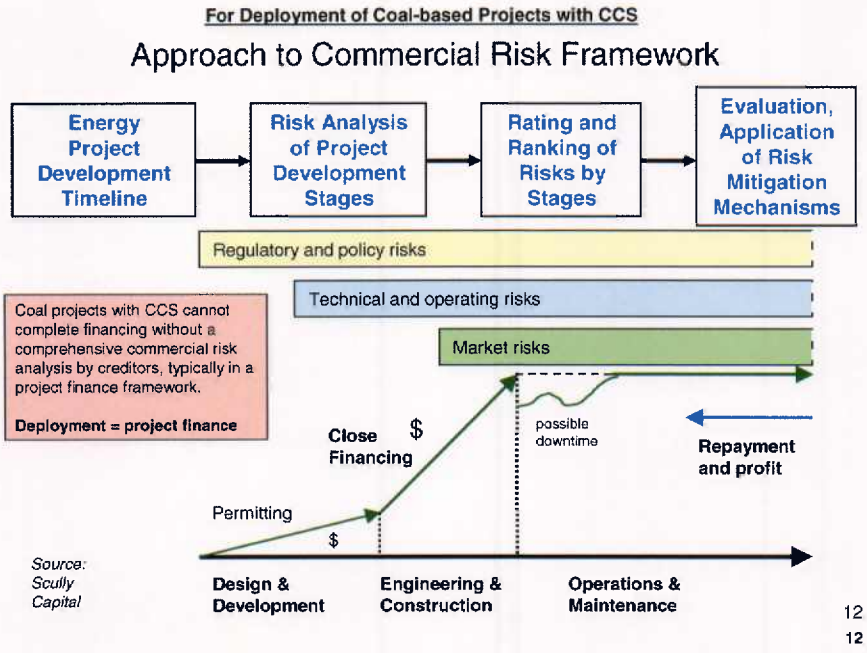
[13] *Id.* at 9.

[14] Evan Lehmann, *Wanted: 1,000 Year Insurance Policy*, ClimateWire, Aug. 19, 2008, http://www.eenews.net/climatewire/2008/08/19/1/.

[15] Lindene Patton, *Beyond Rising Sea Levels*, THE EUROPEAN BUSINESS REVIEW (Mar./Apr. 2008).

C. WHAT MARKET PARTICIPANTS SAY ABOUT RISK

The framework for approaching the commercial risk in the development and deployment of coal-based projects with CCS is demonstrated by the following chart:



The CCS Alliance has evaluated technical, market, and policy risks associated with CCS deployment. On behalf of the CCS Alliance, Andrew Paterson of Econergy International interviewed dozens of market participants earlier this year, including project developers, utilities, technology vendors, risk managers, and financial providers to assess which risks were considered most likely to occur, and which, if they occurred, would be considered to have the greatest impact to the project.

The results can be viewed graphically in a Cartesian coordinate analysis, as follows:

The CCS Alliance analysis confirms that market participants concur with the view of the Intergovernmental Panel on Climate Change ("IPCC") that physical risks such as an operating accident or geologic sequestration site failure are low probability, high impact risks.[16] However, they view as higher probability the risk of policy failure.

In the CCS Alliance Risk Study, the highest rated risks for companies and investors considering investment in projects with CCS were focused on:

- Higher capital costs for capture, compression, transport, injection and storage.

[16] IPCC, *Special Report on Carbon Dioxide Capture and Storage* (2005). IPCC report states that there is only a one percent chance that CO_2 would escape into the atmosphere in 100 years.

- Uncertainty about the extent and timing of legislation and regulations for carbon emission constraints – in other words, a regulatory basis for pursuing CCS at all.
- Unclear rules at the federal and state level for CCS injection (which the UIC Proposed Rule is seeking to address), creating some uncertainty about specific liabilities.
- Lack of clarity about long-term ultimate liability for CO_2 leakage after injection and storage for some commercially relevant time period (*e.g.*, 10 to 30 years). The Proposed Rule also seeks to address this issue.
- Electricity (or fuel) prices – in the regional market or set by state utility commissions – which are too low to cover costs for CCS.

Some mechanisms, as either subsidies or for risk transfer, exist to address these issues, but as depicted in the table below, they are concentrated in the area of either reducing capital costs and other CCS related expenses, or in dealing with electricity rates and adjusting revenues in some manner. Subsidies to cover higher costs include: federal grants for new facilities, tax credits, and state grants. Other mechanisms, such as a federal loan guarantee (Section 1703 of EPAct 2005) or rate-basing a plant with CCS, remove substantial risk for capital recovery by providing alternative recovery or prevention of default.