



APPROACHES TO GEOLOGIC SEQUESTRATION SITE STEWARDSHIP AFTER SITE CLOSURE

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BACKGROUND

This paper describes stakeholder-developed models for site stewardship at geologic sequestration (GS) sites, and summarizes examples of federal programs that may inform development of alternative models for stewardship of GS after site closure.¹

EPA's proposed rulemaking, *Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells*, describes a new class of well and technical criteria for the geologic site characterization, fluid movement, area of review (AoR) and corrective action, well construction, operation, mechanical integrity testing, monitoring, well plugging, post-injection site care, and site closure to protect underground sources of drinking water (USDWs). As part of this proposal, EPA lays out general requirements for financial responsibility,² and plans to clarify in guidance the types of financial mechanisms that owners or operators can use to meet financial responsibility requirements for new GS wells. The financial responsibility requirements would include provisions requiring that owners and operators demonstrate and maintain financial responsibility during operation, closure, and the post-injection site care period. This ensures that owners and operators have the resources to carry out activities related to closing and remediating GS sites if needed during injection or after wells are plugged, so that they do not endanger USDWs.

Issues, such as the long timeframes anticipated for CO₂ sequestration, the absence of provisions in the Safe Drinking Water Act (SDWA) to allow transfer of liability to other government

¹ For the purposes of this paper, "site closure" refers to the period of time after the end of the post-injection site care phase of the GS project.

² Financial responsibility (also referred to as financial assurance) programs represent a form of risk management. The intent of financial responsibility is to ensure the safe closure and responsible post-site-closure monitoring of regulated sites such as landfills, hazardous waste facilities, underground storage tanks, and oil and gas wells. Specifically, financial responsibility regulations are designed to ensure that owners and operators maintain adequate financial resources to fulfill their current and future environmental obligations, including closure, post-site-closure, and as applicable, corrective action. In so doing, the intent of the financial responsibility standards 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.

entities, and the requirement under SDWA that the responsibility for potential impacts to USDWs all have resulted in stakeholder requests for a discussion of alternative approaches to liability for GS sites. In addition, owners and operators may need to address liability related to potential impacts to air, ecosystems, and human health beyond the scope of the SDWA. These considerations, and the fact that the GS storage timeframe may exceed the lifetime of a typical owner or operator of a GS site, have led to requests that EPA provide information on site stewardship after site closure as part of its proposed rulemaking for GS wells.

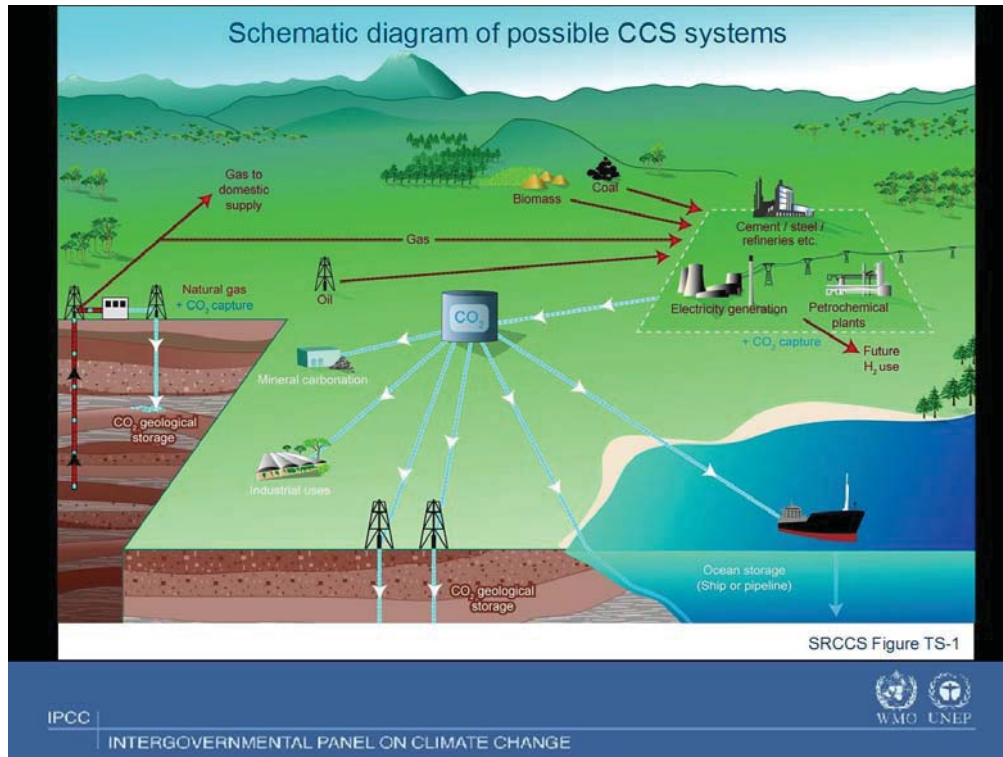
Accordingly, EPA has developed this paper to provide additional information on approaches to stewardship of carbon dioxide GS sites after site closure. Since the SDWA does not explicitly provide EPA the authority to transfer liability from the owner/operator to another entity, this paper is for informational purposes only.

INTRODUCTION

GS is considered a key climate change mitigation technology. The Intergovernmental Panel on Climate Change (IPCC) concluded that GS could be an effective way to achieve significant greenhouse gas emission reductions.^{3,4} As shown in the schematic below, GS involves capturing CO₂ generated from fossil fuel combustion or industrial processes, injecting it deep underground, and permanently sequestering the CO₂ in deep geologic formations. At this time there are a small number of commercial-scale GS operations (all outside the US), injecting several million tonnes of CO₂ annually. However, the number of projects throughout the world, both pilot and commercial-scale, has the potential to expand.

³ Intergovernmental Panel on Climate Change (IPCC). 2005. Special Report on Carbon Dioxide Capture and Storage. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [Metz, B., O. Davidson, H. de Coninck, M. Loos, and L. Meyer (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

⁴ Intergovernmental Panel on Climate Change (IPCC). 2007. Climate Change 2007, Synthesis Report.



GS can be a safe technology when conducted in accordance with regulations to ensure the protection of human health and the environment.⁵ Underground injection of fluids, including CO₂, is regulated under the authority of Part C of the Safe Drinking Water Act. The SDWA protects the quality of USDWs in the U.S. and requires that minimum requirements be set to prevent underground injection which endangers drinking water sources. EPA Regions and State Programs take responsibility for implementing Underground Injection Control Regulations and states must adopt requirements that are at least as stringent as the federal requirements. When finalized, EPA's proposed regulations will ensure that GS does not endanger USDWs.

One aspect of federal regulations protecting USDWs is the provision for financial responsibility. EPA's proposal for managing underground injection of CO₂ would require that owners or operators demonstrate and maintain financial responsibility and have the resources for activities related to remediating and closing GS sites.

⁵ Ibid.

The financial assurance obligation would end at the end of post injection site care period (i.e., when the owner/operator submits a post-injection site care plan, and the Director determines that the site does not pose a danger to USDWs based on a demonstration using a combination of monitoring and modeling data). Although obligation for financial responsibility would end for the owner/operator after the state or EPA Region has approved the post-injection site care and site closure plan, owners and operators may still be responsible after site closure (e.g., for unanticipated migration that endangers a USDW).

Stewardship after site closure can include activities ranging from monitoring the site after site closure, detecting unanticipated movement of fluids, and taking action to protect USDWs if the unanticipated movement endangers USDWs. While not covered by the SDWA impacts to air, ecosystems, and human health may also be considered part of stewardship activities, depending on the model.

The Agency has not made a determination as to whether the solutions in the models and federal programs described in this paper are appropriate for GS wells, and does not intend to specify which models or programs may be applied to GS wells. Although stakeholder discussion typically focuses on issues such as liability and federally-backed indemnification approaches, in describing these models, the Agency does not make an endorsement. However, EPA provides them because they may contain important concepts that may become useful in developing an approach to post-site-closure stewardship in the future. In addition, EPA recognizes that states and other stakeholders can play a key role in the design and implementation of approaches to addressing site stewardship after site closure and that a number of states are considering or have passed legislation to address GS post-site-closure stewardship.

As noted above, this paper was prepared to provide a preliminary overview of important considerations related to provision of post-site-closure site stewardship. Although the paper discusses a number of existing laws and regulations, it does not change or replace any legal requirement, and is not legally enforceable. To the extent that legal terms and concepts are discussed or defined, this paper only does so for context. The use and description of such terms is not intended to provide legally binding norms or standards or to supplant the meaning those terms may have under various statutes or regulations. The use of non-mandatory words like “should,” “could,” “would,” “may,” “might,” “encourage,” “expect,” and “can,” in this

document means solely that something is suggested or recommended, and not that it is legally required, or that the suggestion or recommendation imposes legally binding requirements. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

OVERVIEW OF STAKEHOLDER-DEVELOPED GS STEWARDSHIP MODELS AND FEDERAL MECHANISMS

Stakeholder-Developed Models for GS Site Stewardship and Federal Mechanisms

EPA gathered information about the stakeholder models and federal mechanisms below from a variety of stakeholders including the Interstate Oil and Gas Compact Commission, the International Risk Governance Council, World Resources International; and federal sources. The models and approaches include components which are not currently available under SDWA.

As discussed earlier, EPA has not determined whether any of the stakeholder-developed models and federal approaches are appropriate for GS wells, but believes that they may provide a useful starting place for considering approaches to providing stewardship if needed after GS sites closure.

Stakeholder-Developed Models. Some independent organizations interested in alternatives for post injection site care and closure have developed their own approaches to GS site stewardship. These include:

- i. Interstate Oil & Gas Compact Commission (IOGCC)
- ii. World Resources Institute (WRI)
- iii. International Risk Governance Council (IRGC)

Federal Mechanisms. Congress has provided varying mechanisms which. respond to needs in areas other than GS, but may provide useful information in considering approaches to stewardship for GS sites after site closure:

- i. Price-Anderson Nuclear Industries Indemnity Act of 1957

- ii. Support Anti-Terrorism by Fostering Effective Technologies Act of 2002
- iii. National Flood Insurance Act of 1968
- iv. Trans-Alaska Pipeline Authorization Act of 1973 / Oil Pollution Act of 1990
- v. Comprehensive Environmental Response, Compensation, and Liability Act of 1980

Stakeholder-Developed Models

- i. Interstate Oil and Gas Compact Commission⁶

Objective of Model. A state or a state-contracted entity would engage in monitoring and remediation activities necessary to ensure the security of the storage site, using resources from an industry-funded, state-administered trust fund. However, the model proposed by the IOGCC is silent on the how to address potential loss or injury that may result from an adverse occurrence at a GS site.

Post-site-closure Stewardship Approach. State-administered compensation fund based on existing models developed by the states for addressing abandoned and orphaned oil and gas wells. IOGCC concluded that states are “likely to be best positioned to provide the necessary 'cradle to grave' regulatory oversight of geologic storage of CO₂.”

Policy Considerations:

1. **Funding Mechanism.** A trust fund would be funded by an injection fee (to be determined). This fee would be assessed to the site operator at the point of custody transfer of the CO₂ from the generator to the operator and calculated on a per-ton basis. The model proposed by the IOGCC does not address the varying degree of risk that may exist across GS sites. Others have suggested that contributions to

⁶ The Interstate Oil and Gas Compact Commission. 2007. A Legal and Regulatory Guide for States and Provinces. Task Force on Carbon Capture and Storage, IOGCC, September 25, 2007.

mechanisms such as trust funds for post-site-closure stewardship could be made when the site is operating, to better match the timing of costs and benefits.

2. **Fund Administration.** The IOGCC model does not address state jurisdiction for GS sites that cross state boundaries.
3. **Nature of risk.** Not explicitly addressed.
4. **Degree of Financial Responsibility.** After site closure (as defined), the liability for ensuring that the site remains a secure storage site during the post-site-closure period would transfer to the state.
5. **Fosters Project Development.** Not explicitly addressed.

- ii. World Resources Institute Issue Brief: Liability and Financial Responsibility Frameworks for Carbon Capture and Sequestration⁷

Objective of Model. Ensure that adequate funds for post-site-closure stewardship are readily accessible, if and when needed; avoid imposing excessive barriers to projects that have public benefits; and ensure that risks are borne by those who share in the benefit of GS.

Liability Model. Considers two options: (1) federal indemnity and (2) hybrid approach.

Policy Considerations:

⁷ Wilson, E.J., M.A. De Figueiredo, C. Trabucchi, and K. Larsen. 2007. Liability and Financial Responsibility Frameworks for Carbon Capture and Sequestration. In World Resource Institute: WRI Issue Brief Carbon Capture and Sequestration, No. 3.

1. **Funding Mechanism.** A federal indemnity program, which may be “limited to a discrete set of pilot projects designed to test the parameters and scope of CCS technology, and limited only to discrete risks....”
2. **Fund Administration.** *Not Addressed*
3. **Nature of risk.** Assumes risks continue to diminish after site closure.
4. **Degree of Financial Responsibility.** Under a performance-based standard of liability transfer, the project owner, operator or developer could be required to re-assume financial responsibility (and attendant liability) if the GS site fails to maintain prescribed standards at set monitoring periods over time. While the WRI issue paper acknowledges the importance of fostering CCS technologies, the authors caution that “an indemnity program for CCS projects should clearly articulate limits of liability and be accurately priced – the public should not be asked to unnecessarily subsidize private development and implementation of CCS technologies indefinitely.” The WRI issue brief suggests that the transfer of post-site-closure responsibility could be performance-based (when site performance achieves certain predetermined metrics) or prescriptive (for example, a certain number of years after site closure).
5. **Fosters Project Development.** WRI suggests this objective may be best met by different approaches as the technology matures.

iii. International Risk Governance Council (IRGC)⁸

The International Risk Governance Council prepared an issue brief that focuses on all aspects of regulation for carbon capture and storage (CCS). While the report does not present a model for post-site-closure stewardship of GS sites, it includes a number of concepts intended to inform discussion of the design of such models.

⁸ International Risk Governance Council. 2008. Regulation of Carbon Capture and Storage, Policy Brief for International Risk Governance Council.

The authors frame the general discussion of CCS regulation with a number of principles relevant to GS site stewardship:

- Regulations should encourage responsible operation and investment, balance stability and predictability with flexibility and adaptability to new scientific information, be based on solid technical findings and provide ease of implementation for both regulators and industry. In addition, it is important to equitably balance the risks of CCS between public and private actors.
- Regulations should balance the needs of all stakeholders through the project cycle, including:
 - _ the public--including concerns associated with climate change and economic competitiveness, including the cost of electricity
 - _ site developers, who need an approach that is both legal and profitable
 - _ climate regime administrators
 - _ insurers--the ability of insurers and reinsurers to assess risk will depend on which activities they are asked to cover and the limits on liability (if any) provided under national, state, or provincial law
 - _ financial underwriting companies, which will require that CCS be profitable, and will require clarification of ownership and responsibility for injected CO₂, among other matters.

Responsibility after site closure. The IRGC recommendations assume that “[p]ublic assumption of long-term responsibility will probably be required at some point after site closure, conditional upon proof that CO₂ storage is behaving predictably, as nations are the only entities that can make credible commitments over such long storage time periods.” Special arrangements for post-site-closure stewardship may also be considered for a limited number of demonstration projects. The report also suggests that if public assumption of long-term responsibility does occur, regulations would need to specify the technical requirements both to qualify for ownership transfer and for when the transfer may take place.

Locating regulatory responsibility. The report suggests that it is not clear whether the same regulatory entity that is responsible for permitting through site closure should also assume long-term oversight responsibility, noting that industry would prefer the continuity of a single regulator but that a separate regulatory entity would be more objective in assessing whether to accept transfer of liability to the public.

Slow long-term leakage. IRGC suggests that in the event such leakage were to occur, it would create liabilities within a climate regime even if it presents no health or local environmental hazard, and that policymakers will need to provide technically grounded guidance on acceptable levels of CO₂ leakage from storage, and on definitions of leakage.

Post-site-closure stewardship expenses. IRGC proposes that expenses for long-term care of CCS sites must be funded during site operations, which could be accomplished through operator payments into a national stewardship sinking fund, and that such a risk-pooling approach may be most efficient. Alternatively, an operator could pay into a dedicated fund for each site although the report notes that if each site must accumulate enough money to cover a worst-case remediation scenario such an approach would be unnecessarily expensive. The discussion concludes with the observation that “linking funding of long-term CCS liabilities to the industries that generate CO₂ will allow cost internalization by industry. Additionally, it is wise for industry as a whole to maintain responsibility, because of inevitable information asymmetries: even with high levels of transparency, industry will know more about CCS than regulators.”

Industry credibility. “Efforts to secure public assumption of long-term liability must take care to avoid damaging the industry’s credibility. Arguments to transfer responsibility from project operators to the government too quickly, too completely, or without adequately funding post-transfer care, run the risk of undermining public acceptance.”

Insurance industry. The report observes that insurance companies could play an important role in structuring the financial mechanisms to cover potential post-site-closure liabilities.

Federal Approaches to Liability

i. Price-Anderson Nuclear Industries Indemnity Act of 1957⁹

Program Objective. The Price-Anderson Act was enacted in 1957¹⁰ to achieve two objectives: (1) to ensure that adequate funds would be available to satisfy liability claims of members of the public for personal injury or property damage in the event of a catastrophic nuclear accident; and (2) to help encourage private investment in commercial nuclear power by placing a cap, or ceiling on the total amount of liability each holder of a nuclear power plant license faced in the event of a catastrophic accident. Over the years, the “limit of liability” for a catastrophic nuclear accident has increased the insurance pool to over \$10 billion.¹¹

Liability Model. Indemnification and limitation of liability¹² model that includes (1) site-specific private insurance, (2) industry-wide pooled insurance and (3) federal indemnity.

Policy Considerations:

1. **Funding Mechanism.** Three-tiered coverage system, which requires licensed nuclear facilities to maintain both site-specific liability insurance (Tier 1) and industry-pooled liability insurance (Tier 2). In the event that the private claims against a licensee exceed the amounts available in both the site-specific, individual insurance and the industry-pooled insurance, the federal government (Tier 3) provides the licensee with indemnity. Specifically:¹³

⁹ 42 U.S.C. Sec. 2210

¹⁰ The Energy Policy Act of 2005 extended the Price-Anderson Act to December 31, 2025.

¹¹ U.S. Nuclear Regulatory Commission. Fact Sheet on Nuclear Insurance and Disaster Relief Funds. Retrieved on June 8, 2008. Available online at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/funds-fs.html>

¹² 10 C.F.R. § 140.1(a)

¹³ 10 C.F.R. § 140.11

- X **Tier 1 (individual financing)** requires the individual nuclear plant to obtain primary insurance coverage up to a mandated level (currently \$300 million¹⁴) from private sources.¹⁵ Demonstration can be in the form of private insurance, self-insurance or other proof of financial responsibility.

- X **Tier 2 (pooled-industry insurance)** requires payment of 'retrospective premiums' of \$15 million per year up to a maximum of \$95.8 million¹⁶ per incident for each of its plants, in the event that claims exceed the amount of Tier 1 financing.¹⁷ Licensees are required to maintain one of six types of guarantees for payment of retrospective premiums (e.g. surety bonds).

- X **Tier 3 (federal indemnity)** indemnifies licensees from liability arising from nuclear incidents, once the individual and industry caps are reached.¹⁸

All claims filed to date under the Price-Anderson model have been covered through the individual financing under Tier 1.

¹⁴ Regulations are periodically revised to require licensees to increase their coverage level as the private insurance market increases the maximum level of primary insurance that it is willing to offer. For example, the required coverage was increased from \$200 million to \$300 million in January 2003. (GAO report to Congressional Requesters GAO-04-654. Nuclear Regulation: NRC's Liability Insurance Requirements for Nuclear Power Plants Owned by Limited Liability Companies, May 2004.)

¹⁵ Insurance is provided by American Nuclear Insurers, the joint underwriting association that provides insurance for U.S. nuclear power plants.

¹⁶ These amounts were increased to these levels by the Energy Policy Act of 2005, which also requires periodic inflation adjustments (at least every five years).

¹⁷ Retrospective premiums are collected by American Nuclear Insurers. If a licensee did not pay its share of these premiums, American Nuclear Insurers would, under its agreement with the licensees, pay up to \$30 million of the premiums in one year and attempt to collect this amount later from the licensees (U.S. General Accountability Office (GAO). 2004. Nuclear Regulation: NRC's Liability Insurance Requirements for Nuclear Power Plants Owned by Limited Liability Companies. Report to Congressional Requesters. May 2004.)

¹⁸ "The Price-Anderson Act also provides a process to deal with incidents in which the damages exceed the primary and secondary insurance coverage. Under the act, NRC shall survey the causes and extent of the damage and submit a report on the results to, among others, the Congress and the courts. The courts must determine whether public liability exceeds the liability limits available in the primary insurance and secondary retrospective premiums. Then the President would submit to the Congress an estimate of the financial extent of damages, recommendations for additional sources of funds, and one or more compensation plans for full and prompt compensation for all valid claims. In addition, NRC can request the Congress to appropriate funds." See U.S. General Accountability Office (GAO). 2004. Nuclear Regulation: NRC's Liability Insurance Requirements for Nuclear Power Plants Owned by Limited Liability Companies. May 2004.

2. **Fund Administration.** Funds are readily accessible and distributed under individual and collective insurance policies established under Tier 1 and Tier 2.
 3. **Nature of risk.** Nuclear power is characterized by a low probability of risk, but potential catastrophic loss or injury. The Price-Anderson Act provides financial protection during the operating life of a nuclear facility.
 4. **Degree of Financial Responsibility.** Plant operators maintain insurance and guarantees with a combined value of over \$10 billion.¹⁹
 5. **Fosters Project Development.** Currently 104 nuclear facilities are licensed to operate in the U.S.²⁰
- ii. Support Anti-Terrorism by Fostering Effective Technologies Act of 2002²¹

Program Objective. The Support Anti-Terrorism by Fostering Effective Technologies Act (SAFETY) was enacted in 2002, to provide critical incentives for the development and deployment of anti-terrorism technologies by providing liability protections for providers of “qualified anti-terrorism technologies.”²²

¹⁹ U.S. Nuclear Regulatory Commission. Fact Sheet on Nuclear Insurance and Disaster Relief Funds. Retrieved on June 8, 2008. Available online at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/funds-fs.html>. Last updated on February 22, 2008. Retrieved on June 20, 2008.

²⁰ Price-Anderson Act, 42 USC 2011 et seq., Section 2131. Number of licensed operating nuclear facilities obtained from the NRC. Accessed at: <http://www.nrc.gov/info-finder/reactor>. Last updated on February 14, 2008. Retrieved on June 20, 2008.

²¹ Regulations Implementing the Support Anti-Terrorism by Fostering Effective Technologies Act of 2002. Final rule. June 8, 2006. 6 CFR 25. Published in 71 FR, No. 110, page 33147 et seq. June 8, 2006.

²² Ibid.

Liability Model.

- X Exclusive jurisdiction in federal court for suits against sellers of “Qualified Anti-Terrorism Technology” (QATT).

- X A limitation on the liability of sellers of QATT to a specified amount of liability insurance coverage for each QATT, provided that sellers cannot be required to obtain any more liability insurance coverage than is reasonably available “at prices and terms that will not unreasonably distort the sales price” of the technology. Beyond that limit of liability, indemnity is provided for claims arising out of, relating to, or resulting from an act of terrorism, where QATT has been deployed. Indemnity is fully transferable; that is, the Seller can transfer indemnity to entities that have the right to manufacture, use, or sell QATT. The length of indemnity is capped between five and eight years, as determined by the Under Secretary.²³

- X A prohibition on joint and several liability such that sellers can only be liable for the percentage of non-economic damages that is proportionate to their responsibility, along with other liability limitations.

Policy Considerations:

1. **Funding Mechanism.** Insurance premiums paid by sellers of QATT, subject to limitations described above.

2. **Fund Administration.** Funds are available up to the liability limits of the individual policies maintained by sellers of QATT, which vary depending on the product-specific level of coverage mandated by the Homeland Security Secretary.

²³ A Designation shall be valid and effective for a term of five to eight years (as determined by the Under Secretary) commencing on the date of issuance, and the protections conferred by the Designation shall continue in full force and effect indefinitely to all sales of Qualified Anti-Terrorism Technologies covered by the Designation. At any time within two years prior to the expiration of the term of the Designation, the Seller may apply for renewal of the Designation.

3. **Nature of risk.** The risks under SAFETY are characterized by a low probability of occurrence, but potentially high magnitude of damages. The probability of risk under SAFETY is dependent on the likelihood of largely unpredictable, catastrophic events (e.g., a terrorist attack). The magnitude of damages may be a function of factors such as design, manufacturing, and testing, among other factors.
4. **Degree of Financial Responsibility.** Under SAFETY, the insurer bears financial responsibility for claims made up to the limit of liability of the sellers' insurance coverage. Because information on claims made against insurance policies required under SAFETY is not publicly available, it is unclear how insurance policy limits compare to the magnitude of claims.
5. **Fosters Project Development.** Under SAFETY, the Department of Homeland Security approved the 200th Qualified Anti-Terrorism Technology on February 21, 2008.

iii. National Flood Insurance Act of 1968

Program Objective. The National Flood Insurance Act (NFIA) was enacted in 1968. The objective of the NFIA is to:²⁴

- X More effectively indemnify individuals for flood losses through insurance;
- X Reduce future flood damage through State and community floodplain management regulations; and
- X Reduce federal expenditures for disaster assistance and flood control.

Liability Model. Pooled insurance²⁵ model. Insurance coverage is capped by the statute.²⁶

²⁴ National Flood Insurance Act of 1968, 42 USC 4001 et seq., Section 4001(a) and (c).

²⁵ National Flood Insurance Act of 1968, 42 USC 4001 et seq., Section 4011(c).

²⁶ National Flood Insurance Act of 1968, 42 USC 4001 et seq., Section 4016(a).

Policy Considerations:

1. **Funding Mechanism.** Insurers issue insurance policies for flood coverage to eligible property owners. Premiums collected under these policies are deposited into the National Flood Insurance Fund. Any claims made under these policies (as well as any administrative costs) are paid from the Fund.²⁷

In addition to funds collected from premiums, NFIP has the authority to borrow funds from the US Treasury to cover potential shortfalls in the Fund. Borrowed funds must be repaid with interest.²⁸

2. **Fund Administration.** Funds are distributed in response to eligible claims made under the insurance policies.
3. **Nature of Risk.** For the National Flood Insurance Program the probability of risk (i.e., the probability of flood damage) varies depending on the magnitude of the naturally occurring weather event. Moreover, the extent of damage varies depending on the risk mitigation strategies undertaken by municipalities, states and homeowners. Similarities exist between the nature of risks covered by NFIA and GS. For example, management practices would be expected to minimize the probability, number, and severity of claims made against the National Flood Insurance Fund.
4. **Degree of Financial Responsibility.** Private sector insurers pay claims using funds generated from premium payments. In specific cases, the federal government subsidizes the insurance premiums.²⁹ For a number of reasons, primarily claims experience that is very different than predicted when premiums were established,

²⁷ National Flood Insurance Act of 1968, 42 USC 4001 et seq., Sections 4016 and 4017.

²⁸ Ibid.

²⁹ Ibid.

claims have substantially exceeded premium income. As of August 2007 over \$17.5 billion was owed to the U.S. Treasury by the NFIP.³⁰

5. **Fosters Project Development.** Not applicable.

iv. Trans-Alaska Pipeline Authorization Act of 1973 / Oil Pollution Act of 1990

Program Objective. The Trans-Alaska Pipeline Authorization Act (TAPAA) of 1973 authorized the development and construction of a major pipeline in order to facilitate delivery of oil from the Alaska's North Slope to domestic markets. The TAPAA states "early development and delivery of oil and gas from Alaska's North Slope to domestic markets is in the national interest because of growing domestic shortages and increasing dependence upon insecure foreign sources."³¹ TAPAA established a long-term liability and financial responsibility model. In August 1990, Congress passed the Oil Pollution Act (OPA), which generally consolidated the liability and compensation schemes of the TAPAA and other federal oil pollution laws and authorized the use of the Oil Spill Liability Trust Fund, which consolidated the funds supporting the TAPAA and other federal oil pollution laws.³²

Liability Model. A responsible party's liability for removal costs and damages is limited, unless the incident is caused by gross negligence or willful misconduct or is the result of violation of an applicable federal regulation. Liability limits related to oil spills were established for holders of the pipeline right of way or permits. Liability limits for vessel owners are based on a formula that considers the vessel type and tonnage. Liability limits for onshore facilities, offshore facilities, and deepwater ports are set at established amounts.³³ If a responsible party pays or incurs removal (e.g. oil spill

³⁰ U.S. General Accountability Office (GAO). "Federal Emergency Management Agency: Ongoing Challenges Facing the National Flood Insurance Program." GAO-08-118T, October 2007.

³¹ 43 U.S.C. §1651.

³² US Department of Interior, <http://www.gomr.mms.gov/homepg/regulate/regs/laws/osltf.html>. Last updated on January 11, 2000. Retrieved on June 20, 2008.

³³ The OPA requires the President to adjust the limits of liability by regulation to reflect 'significant' increases in the Consumer Price Index not less than every 3 years. These limits have not been adjusted as of June 2008.

cleanup) costs or damages in excess of an applicable liability limit, the responsible party may present a claim to the OSLTF for compensation of the excess amount.³⁴

Expenditures from the Fund for any one oil pollution incident are limited to \$1 billion or the balance of the Fund, whichever is less. Natural resource damage assessments and claims in connection with any one incident are limited to \$500 million of the \$1 billion per incident limit.³⁵ Limitations on liability were modified by the OPA.

To better address funding needs, the OSLTF has been subdivided into an Emergency Fund and a Main Fund. The Emergency Fund ensures rapid and effective response to oil spills without requiring further Congressional appropriations. Through this portion of the OSLTF, up to \$50 million is provided each year to fund removal activities and to initiate natural resource damage assessments. Money available in the Emergency Fund also includes a carryover from prior years.

Policy Considerations:

1. **Funding Mechanism.** The OSLTF receives funds from four primary sources: (1) an oil tax (five cents a barrel on domestically produced or imported oil collected from the oil industry; this is suspended when the fund reaches \$1 billion but may be reinstated by Congress if the fund falls below this amount); (2) interest on fund principal; (3) cost recovery from responsible parties; and (4) penalties (to include civil penalties assessed to the responsible parties).

OSTLF has the authority to borrow funds from the U.S. Treasury to cover potential shortfalls in the Fund. In 2005, the Energy Policy Act of 2005 increased the borrowing limit of the OSTLF to \$2.7 billion.³⁶ At the same time, a five-cents per

³⁴ US Department of Homeland Security, United States Coast Guard. Report on Implementation of the Oil Pollution Act of 1990. 2005.

³⁵ US Coast Guard, National Pollution Funds Center, Oil Pollution Act Frequently Asked Questions http://www.uscg.mil/npfc/About_NPFC/opa_faqs.asp#faq5. Last updated on May 21, 2008. Retrieved on June 20, 2008.

³⁶ Energy Policy Act of 2005, P.L. 109-58, August 8, 2005, Section 1361. Dollar estimates are as referenced in the statutory language, and unless otherwise noted have not been inflated to current year's dollars.

barrel tax was reinstated with a cap on the collection of fees once the fund maximum is reached (the balance of OSLTF is mandated to be between \$2 billion and \$2.7 billion).³⁷ If funds accumulated in the OTSLF fall below \$2 billion, collection of per-barrel tax resumes.

2. **Fund Administration.** Federal On-Scene Coordinators can access OSTLF funds up to an established amount for immediate removal, mitigation, or prevention of a discharge. States also can be reimbursed by the OSTLF for removal and monitoring costs incurred during oil spill response and cleanup efforts.
3. **Nature of Risk.** The liability model established by the TAPAA, and later revised by the OPA, provides financial protection during the active use of the Trans-Alaska Pipeline by owners and operators. Similarities exist between the nature of risks covered by OPA and GS. For example, operating decisions made by pipeline owners and operators will affect the likelihood, magnitude, and timing of claims made against the OSTLF.
4. **Degree of Financial Responsibility.** Under the TAPAA/OPA, the private sector retains financial responsibility for claims made up to the established limits of liability. Pipeline right-of-way or permit holders, offshore facilities, vessels, and deepwater ports are required to maintain evidence of financial responsibility. Claims for removal costs and damages may be asserted directly against the guarantor providing evidence of financial responsibility.³⁸
5. **Fosters Project Development.** Over 15 billion barrels of oil have been transported through the pipeline since construction completion in 1977.³⁹

³⁷ Ibid.

³⁸ 33 U.S.C. § 2716(f)(1).

³⁹ Alyeska Pipeline. Pipeline Facts. Last Updated on May 9, 2008. Retrieved on June 10, 2008. Available online at: <http://www.alyeska-pipe.com/pipelinefacts.html>

v. Comprehensive Environmental Response, Compensation, and Liability Act of 1980⁴⁰

Program Objective. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.⁴¹

Liability Model. Compensation fund⁴² model. The statute also imposes joint, strict and several⁴³ liability on potentially responsible parties (PRPs).⁴⁴ Responsible parties are liable for damage to injured natural resources. CERCLA also provides indemnity to remediation contractors working at Superfund sites.

Policy Considerations:

1. **Funding Mechanism.** The Superfund compensation trust fund is financed through several means:

- X The Superfund tax levied on industry. The tax included: a petroleum excise tax, a chemical feedstock tax, and a corporate environmental tax (CEIT).⁴⁵ The taxing authority expired in 1995. Over five years, \$1.6 billion was collected.⁴⁶
- X Costs recovered on behalf of the Superfund under CERCLA, as well as interest, fines, penalties and punitive damages assessed under CERCLA.⁴⁷

⁴⁰ CERCLA, 42 USC 9601 et seq., Section 111.

⁴¹ US EPA, CERCLA Overview. Available online at: <http://www.epa.gov/superfund/policy/cercla.htm>. Last updated on July 17, 2007. Retrieved on June 20, 2007.

⁴² See Internal Revenue Code, 26 USC 1 et seq., Section 9507.

⁴³ Strict liability is a doctrine under which entities remain responsible for damages caused by their actions or products, regardless of any “fault” on their part. Under joint and several liability, each PRP is potentially liable for the whole cost of cleanup no matter how much of the total contamination is directly a result of their activities.

⁴⁴ CERCLA, 42 USC 9601 et seq., Section 107.

⁴⁵ Internal Revenue Code, 26 USC 1 et seq., Sections 59A, 4611, 4661, 4671.

⁴⁶ US EPA, CERCLA Overview.

X Appropriations from the US Treasury.⁴⁸

Cleanups are also funded by PRPs, who have made commitments since program inception in excess of \$20 billion.⁴⁹

2. **Fund Administration.** Funds are disbursed from Superfund under the terms of Section 111 of the Act to pay for cleanups and related program activities, primarily based on eligibility criteria which target the most seriously contaminated sites. In 2002, EPA requested creation of a Superfund Subcommittee, under the auspices of the National Advisory Council for Environmental Policy and Technology (NACEPT), to provide guidance on program progress criteria, among other issues.⁵⁰ EPA also implemented new Superfund environmental indicators concurrent with the NACEPT process.
3. **Nature of risk.** The Superfund trust fund was designed to consider the risk that project owners, operators, and developers may no longer exist at the time a liability occurs. In addition CERCLA supposes that risks to human health and the environment can be reduced through sound operating decisions by site owners, operators and developers. The magnitude of damages varies widely under CERCLA, depending on the nature and the extent of the hazardous release.
4. **Degree of Financial Responsibility.** Through the Superfund tax levied on industry, the private sector contributed approximately \$6.3 billion in taxes to the fund between

⁴⁷ Internal Revenue Code, 26 USC et seq., Section 9507.

⁴⁸ U.S. General Accountability Office (GAO). 2003. Superfund Program: Current Status and Future Fiscal Challenges. Report to the Chairman, Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia, Committee on Governmental Affairs, U.S. Senate. July 2003.

⁴⁹ Ibid., p 38, letter from EPA.

⁵⁰ Ibid.

1993 and 2002.⁵¹ When a past owner or operator of a site is identified, it retains liability for the site under Section 107 of the Act.⁵²

5. Fosters Project Development. *Not Applicable.*

⁵¹ GAO, 2003. Amount is in 2002 dollars.

⁵² CERCLA, 42 USC 9601 et seq., Section 107.

Characteristics of Stewardship Approaches

In considering alternative approaches to stewardship, several characteristics are likely to be key components of any stewardship approach. Many of these characteristics are apparent in the models discussed earlier in this paper. These include 1) funds that are available in appropriate amounts, 2) funds that the responsible party can collect, manage, and disburse, 3) fund values that are tailored to the risk of the project, 4) appropriate owner/operator incentive to reduce risk, and 5) absence of barriers that could deter beneficial projects. This section briefly summarizes several key components of stewardship approaches, and describes how they may be relevant for GS.

1. **Available funding:** Because GS for long-term storage is a new practice, it may be difficult to estimate the appropriate amount of funds that may be required at either an individual site or collectively at all sites. A primary challenge for post-site-closure stewardship is ensuring adequate funds are available if needed. It is equally important to avoid collecting excessive funds, which would be economically inefficient. Potential GS approaches may need to consider site-specific issues which may influence funding needs such as geologic characteristics, site design, management practices, and the nature of nearby human populations and ecosystems.
2. **Administrative ability to collect, manage and disburse dedicated funds:** Federal and/or state entities must be able to readily access the funds in the amounts and timing necessary. Many states and federal agencies do not have the authority to collect, manage and disburse dedicated (i.e., earmarked) funds. For example, funds received by a state typically are deposited into a state's general fund, and the amount of funds that a state legislature appropriates for the purpose may not match the funds required to pay for costs associated with site stewardship. In such cases, legislation establishing a dedicated fund or similar arrangement may be necessary.
3. **Approach appropriate to risk of GS project:** Risks associated with GS sites after site closure will likely decline over time and the possibility of an adverse occurrence will likely increase as the number of sites grows. An approach for addressing post-site-closure stewardship for GS may be designed to address risks of this nature.

4. **Approach should ensure that owners and operators bear appropriate responsibility for the financial consequences of site selection, design, and operational decisions:** An approach for addressing post-site-closure stewardship for GS should ensure that any liability protection extended to owners and operators does not result in the unintended consequence of reducing their incentive to appropriately consider environmental/public health risks in the design, siting and operation of GS sites.

5. **Approach should not deter development of projects that have public benefits:** Approaches should not result in excessive barriers to commercial-scale development of GS, or deprive the general public of the benefits of reduced CO₂ emissions due to GS technologies.

Other Considerations

Jurisdiction. Approaches should consider applicable provisions of federal and state law. The nature of an adverse occurrence and attendant loss or injury will influence where the jurisdiction lies (federal and/or state), and thereby influence which (if any) party can transfer or assume liability.

Cross-Boundary Considerations. Approaches should consider how to administer funds for GS sites that cross state boundaries. For example, designers of approaches to post-site-closure stewardship may consider establishing sub-limits by site and/or by state. If so, a key consideration would be the basis for establishing such sub-limits, and whether these sub-limits would change over time to account for corresponding changes in GS risk(s).⁵³

CONCLUSION

As noted earlier, the primary purpose of this paper is to describe the approaches that may help inform an approach for GS stewardship after site closure. However, they are not the only models that the Agency may consider as it develops a final approach. There are many factors that will need to be taken into consideration as EPA evaluates potential options. The perspectives of stakeholders, including state governments and the business community will be critical in helping EPA develop an appropriate framework.

⁵³ For example, a sub-limit by site would define the maximum coverage available to that site to satisfy liabilities.

