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# Underground Injection Control (UIC) Class VI Program

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Research and Analysis  
in Support of  
UIC Class VI Program  
Financial Responsibility  
Requirements and Guidance

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December 2010

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## Contents

1.	Introduction.....	5
2.	Summary of April and May 2009 Financial Responsibility Webcast Discussions .....	6
3.	Research and Analysis on Financial Responsibility Instruments .....	15
I.	Summary Matrices.....	16
A.	General Financial Considerations.....	16
B.	Considerations for GS.....	23
II.	Research and Preliminary Analysis .....	28
A.	General Financial Considerations.....	28
B.	Considerations for GS.....	44
4.	Rationale for Financial Responsibility Instrument Selection .....	59
I.	Introduction.....	59
A.	Summary.....	59
II.	Historical Precedent.....	60
III.	Potential for Instrument Failure .....	60
A.	Owner or Operator Failure.....	61
B.	Third Party Failure.....	61
C.	Other Factors.....	61
IV.	Resource Implications for the Owner or Operator and the Director.....	62
A.	Director’s Review and Monitoring.....	63
V.	Recommendations and Rationale.....	63
A.	Trust Funds .....	65
B.	Letters of Credit.....	65
C.	Surety Bonds.....	66
D.	Insurance.....	66
E.	Escrow Account.....	66
F.	Financial Tests and Corporate Guarantees .....	66
G.	Minimizing Instrument Weakness by Combining Instruments .....	67
5.	Presentation on Financial Responsibility to Ground Water Protection Council.....	68
I.	Summary of Meeting Discussion.....	68
II.	Presentation.....	70
6.	Director’s Examination of Third Party Stability.....	74
I.	Financial strength requirement based on credit ratings .....	74
A.	Credit rating requirements consistent with self-insurance requirements.....	74
B.	Credit rating by any Nationally Recognized Statistical Ratings Organization (NRSRO).....	75
C.	<b>[SELECTED]</b> Hybrid of Option 1 and Option 2.....	75
II.	Minimum Rating.....	75
A.	<b>[SELECTED]</b> Minimum credit rating using the same option chosen for the credit rating requirement.....	75
B.	Broader range of minimum rating options.....	76
III.	Minimum Capitalization .....	76
A.	<b>[SELECTED]</b> Financial ratios consistent with the financial ratio test requirements for self-insurance .....	76
B.	Specific dollar value capital requirements.....	76
C.	Minimum capital standards prescribed by the appropriate Federal banking agency..	76

D.	Successful completion of the new comprehensive stress test for banks.....	77
IV.	Ability to pass the bond rating when applicable.....	77
A.	Financial ratios consistent with the bond rating test requirements for self-insurance	77
B.	Bond rating by any Nationally Recognized Statistical Ratings Organization ("NRSRO").....	78
C.	<b>[SELECTED]</b> Hybrid of Option 1 and Option 2.....	78
7.	Rationale for the Selection of Self Insurance Requirements.....	79
I.	Financial Coverage Criteria.....	80
II.	Bond Rating Test.....	80
III.	Financial Ratio Test.....	81
IV.	Corporate Guarantee.....	82
8.	Evaluation of Minimum Tangible Net Worth.....	83
	Options.....	83
	Objective for Setting TNW.....	84
	Calibrated Model.....	85
	Results.....	86
	Context.....	87
Appendix A:	Costs to the Owner or Operator for each Mechanism.....	88
Appendix B.	Technical Description of Geologic Sequestration (GS) Financial Responsibility (FR) Model.....	90
Appendix C.	Calibration of GS FR Model Parameters.....	96

## Tables and Figures

Table 2.1:	Summary of Topics in Webcast Discussion organized by Type of Financial Mechanism.....	6
Table 3.1:	How is the financial stability of a third party provider determined?.....	16
Table 3.2:	What weaknesses are associated with the third party's financial stability determination?.....	17
Table 3.3:	Under what conditions are the full estimated costs not covered? Does the mechanism manage uncertainty in cost?.....	18
Table 3.4:	What factors drive the costs associated with the securing/maintaining the instrument? What is the relative cost of the instrument to the owner or operator?.....	19
Table 3.5:	What is the historical use of the instrument? For environmental obligations?.....	20
Table 3.6:	Under what scenario is the instrument best or most commonly utilized?.....	21
Table 3.7:	Which conditions may lead to instrument failure (e.g., cancelation or non-renewal, breach of contract, misrepresentation, the agency does not take action)?.....	22
Table 3.8:	Do states prohibit the use of certain mechanisms? How accessible is the instrument in states where GS is likely to take place?.....	23
Table 3.9:	What factors make the instrument more/less easy for the Director to review or use?.....	24
Table 3.10:	What is the likely total administrative burden/complexity of the review for the Director (i.e., EPA or the state regulator)?.....	25
Table 3.11:	Which GS phase(s) is the instrument best suited for?.....	26
Table 3.12:	For each individual GS phase, can the specific weaknesses of an instrument be minimized by combining it with another mechanism?.....	27
Figure 4.1:	GS Project Activities.....	59
Table 4.1:	Instruments Best Suited for GS Activities.....	60

Table 4.2: Regulatory Risk, Oversight Effort, and Costs to Owners or Operators.....	63
Table 4.3: Instruments Best Suited for GS Activities.....	65
Table 6.1: Definitions of Financial Coverage Criteria.....	80
Table 6.2: Explanation of Bond Rating Test .....	80
Table 6.3: List of Financial Ratios.....	81
Table 6.4: Explanation of Corporate Guarantee .....	82
Figure 8.1: Coverage Criteria and Tests for Qualifying for Self-Insurance .....	83
Figure 8.2: Chart of Criteria Thresholds for Self-Insurance.....	87

## **1. Introduction**

This document provides some of the supporting research and analysis for the financial responsibility requirements (40 CFR 146.85) and guidance (EPA 816-D-10-010) for the Underground Injection Control (UIC) Class VI Program. It is intended to provide insight for the Program's Directors, Geologic Sequestration (GS) well owners or operators, independent third-party providers, and the general public. Financial responsibility requirements are designed to ensure that owners or operators have the resources to carry out required GS activities related to closing and remediating GS sites if needed, during injection or after wells are plugged, so that they do not endanger Underground Sources of Drinking Water (USDWs). These requirements are also designed to ensure that the private costs of GS are not passed along to the public. This document describes the following research, analysis, and stakeholder input:

- Summary of Financial Responsibility Webcast Discussions
- Research and Analysis on Financial Responsibility Instruments
- Rationale for Financial Responsibility Instrument Selection
- Presentation on Financial Responsibility to Ground Water Protection Council
- Rationale for the Selection of Third Party Stability Evaluation Recommendations
- Rationale for the Selection of Self Insurance Test Requirements
- Evaluation of Minimum Tangible Net Worth

## 2. Summary of April and May 2009 Financial Responsibility Webcast Discussions

In April and May 2009, EPA sponsored a series of webcasts on financial responsibility for carbon dioxide geologic sequestration (GS) wells. The goal of the series was to encourage information sharing on potential financial mechanisms that well owners and operators could use to meet the financial responsibility requirements for GS projects. EPA used the information gathered through the webcast series to inform its decisions as it developed guidance related to financial responsibility for GS wells. The webcasts addressed the following topics:

- Trust Funds, Letters of Credit, and Surety Bonds with Standby Trust Agreements (April 28, 2009)
- Insurance (May 20, 2009)
- Self-Insurance: Financial Test and Corporate Guarantee (May 26, 2009)

EPA provided the following disclaimer to the webcast participants:

*“The purpose of this public webcast series is information sharing. Views or opinions expressed during the presentation belong to the speaker and do not necessarily represent the views and opinions of the U.S. EPA.*

*EPA does not have express authority in the Safe Drinking Water Act to accept and use funds for financial assurance. Consequently, the Agency cannot implement some of the financial assurance mechanisms described in these webcasts due to the requirement under the Miscellaneous Receipt Act to deposit funds EPA receives for the use of the Government into the Treasury.”*

The following matrix summarizes the webcast discussions by financial mechanism.

**Table 2.1: Summary of Topics in Webcast Discussion organized by Type of Financial Mechanism**

<b>Strengths</b>	
<b>Availability and applicability to GS based on participant experience</b>	
Trust Fund	<ul style="list-style-type: none"> <li>• Small operators commonly use them with standby trusts.</li> <li>• May be easier to obtain than other instruments.</li> <li>• Used regularly and they work fairly well.</li> </ul>
Standby Trusts	<ul style="list-style-type: none"> <li>• Two participants said that they are easy to obtain.</li> <li>• May require the least amount of money. Costs vary from \$900 to \$3000 annually.</li> <li>• Small operators may commonly use them with trust funds.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>• In areas with many Class II wells, banks may be accustomed to issuing them.</li> <li>• Typical for small operators in at least one Region.</li> <li>• Three participants said they are frequently used during permitting because they are easy for operators to obtain and administer.</li> <li>• Work fairly well and are less of a burden for implementation.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>• In areas with many Class II wells, banks may be accustomed to issuing surety bonds.</li> <li>• May be used often because they are easy for operators to obtain and administer.</li> <li>• Frequently used during permitting.</li> <li>• Work fairly well and are less burdensome during implementation.</li> </ul>

Insurance	<ul style="list-style-type: none"> <li>· Commercial scale implementation will reassure mainline carriers who fear losses, so that they will start to accept risk of GS projects.</li> <li>· FutureGen, which was sited but then cancelled, proposed insurance as a financial mechanism. Similarly the state of Texas chose insurance, which eliminated the issue of which events are covered by which mechanisms.</li> <li>· Companies have explored specific insurance avenues in both mutual and commercial insurance (Zurich, etc.).</li> <li>· DOE worked with environmental insurers to determine how to manage their risk by using environmental markets to fill in gaps of risk management.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· Self-insurance has been successful in other programs; there is a lack of evidence to suggest it should not be an acceptable instrument in the UIC program.</li> </ul>
<b>Appropriateness of instruments for different project phases</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· At least one state is considering trust funds for longer-term phases of GS.</li> <li>· It makes sense that trust funds would apply to construction and operation, but it is not clear that they would apply to closure.</li> <li>· Two participants said that for the short term initial phases, trust funds make sense but they may not be the best instrument for longer term closure and monitoring phases.</li> <li>· There could be uncertain long-term applicability if these instruments must be drawn upon in 40 or 50 years.</li> <li>· It may be more useful to have money in the second phase in the event that something occurs.</li> <li>· A trust fund would be more appropriate than insurance for closure and post-closure.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· It makes sense that letters of credit would apply to construction and operation, but it is not clear that they would apply to closure.</li> <li>· For the short term (initial phases) letters of credit make sense but they may not be the best instrument for longer term closure and monitoring phases (two participants).</li> <li>· Uncertain long-term applicability if these instruments must be drawn upon in 40 or 50 years.</li> <li>· May be more useful to have money in the second phase in the event that something occurs.</li> <li>· May be difficult over the long term because it may be necessary to deal with two different entities.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>· At least one state is considering them for early project phases.</li> <li>· Although surety bonds are historically thought of as go-to mechanisms for liability coverage, the availability of multiple mechanisms could help keep prices down.</li> <li>· Surety bonds could apply to construction and operation, but it is not clear that they would apply to closure.</li> <li>· Uncertain long-term (closure and monitoring) applicability if these instruments must be drawn upon in 40 or 50 years.</li> <li>· It may be more useful to have money in the second phase in the event that something occurs.</li> <li>· Surety bonds may be difficult over the long term because of working with two different entities.</li> <li>· A surety bond would be more appropriate than insurance for closure and post-closure.</li> </ul>



Insurance	<ul style="list-style-type: none"> <li>· Differences exist between coverage of liabilities versus performance, as in plugging and closure. The proposed rule may fall into the category of performance-based liability.</li> <li>· When combining an insurance policy with other FA mechanisms like a surety bond for a single activity, which mechanism would kick-in first if a GS owner/operator fails?</li> <li>· Insurance probably works best for the operational phases of a facility because activities are well established. Insurance becomes problematic during site closure and post-closure care.</li> <li>· Insurance would be a viable option through well construction.</li> <li>· The usefulness of insurance depends on the time frame of the project. May be less effective during post-closure, but also not ideal during operation. Insurer would hopefully remedy the situation of a company going out of business.</li> <li>· Insurance could be used successfully during closure period, but has risks during construction if the policy is not fully funded.</li> <li>· The possible failure of the insurance company is a problem.</li> <li>· The insurance timeframe is typically long-term and would pair well with the long-term nature of GS such as final care of a plugged well.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· A participant suggested that EPA should estimate the risks and costs associated with GS wells, such as extreme events. This analysis would help inform what size a company needs to be to pass a financial test.</li> <li>· With more GS experience there will be more certainty regarding the best financial mechanisms. There may be benefits to focusing on near term – first address plugging then site closure and long-term care (two big unknowns).</li> <li>· Self-insurance mechanisms are great while the companies are making money, but the economy may not be reliable.</li> <li>· Several participants expressed that they have reservations about the use of these mechanisms for any phase.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Interest exists in mechanisms for long-term phases.</li> <li>· Which issues and events are covered under emergency and remedial response? FR is based on events that threaten USDWs.</li> <li>· Any mechanisms for GS FR would need to have longevity to outlast the project lifespan.</li> <li>· There is experience under RCRA to define which mechanisms apply to which phase.</li> <li>· A forfeiture bond would be more appropriate than insurance for closure and post-closure.</li> <li>· One GS project has provided experience through the injection well plugging phase, which costs approximately \$8 million; costs associated with site care and closure are unknown.</li> <li>· Different phases of the projects may require different types of instruments – some instruments may be applicable to some phases but not others.</li> <li>· The different phases of GS projects have not been sufficiently defined to assess the applicability of one instrument versus another.</li> <li>· The typical time period/longevity of the instrument (and the companies providing the instrument) should match the project phase.</li> </ul>
<b>Participants' assessments of relative strengths of each instrument</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· Third-party mechanisms such as trust funds are acceptable.</li> </ul>
Standby Trusts	<ul style="list-style-type: none"> <li>· Standby trusts are acceptable with letters of credit and surety bonds.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· Third-party mechanisms, including letters of credit are acceptable.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>· Surety bonds stand “head and shoulders” above other options.</li> <li>· Surety bonds are less inconvenient than letters of credit and trust funds.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· Insurance can be categorized into more than two options. Instead of just captive and third-party, there are three choices: single, captive, and group.</li> </ul>

Other	<ul style="list-style-type: none"> <li>· Can one mechanism provide more environmental certainty than others?</li> <li>· Can EPA determine the relative efficiency of each mechanism?</li> </ul>
<b>Participant Concerns</b>	
<b>Specific requirements of the rule</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· There is concern about the regulatory wording for trust funds. A trust fund should be fully funded before it is accepted by EPA.</li> </ul>
Standby Trusts	<ul style="list-style-type: none"> <li>· Standby trusts are only needed for DI programs.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· Letters of credit are sometimes tied to a bond.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· Specific requirements should not be written into the GS rule. Because of the economic downturn, insurance companies have suffered losses in investment portfolios.</li> <li>· Two participants said that specific rules may discourage participation in a down market.</li> <li>· It is important for underwriters to have the best information possible.</li> <li>· EPA should specify the appropriate part(s) of the project cycle where insurance may be used.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· Self-insurance mechanisms need to be available. An adaptive approach would solve the unknowns relating to financial assurance.</li> <li>· It will be important to get mechanisms in place that share liability to get projects moving.</li> <li>· Operator should be required to provide results of the financial tests and CFOs should provide Income and Bank Statements (including where the actual figures came from and if they differ from what is published) and attest to their validity.</li> <li>· If financial tests are allowed, the criteria should be set conservatively so that only the very strongest companies qualify.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Will the final GS rule include the type of detailed FA requirements now spelled out for Class I hazardous wells in 40 CFR 144 Subpart F or will guidance provide more detail?</li> <li>· How long will the proposed post-injection site care requirement be?</li> </ul>
<b>How often are particular instruments used?</b>	
Standby Trusts	<ul style="list-style-type: none"> <li>· They are used less often and may be more typical for small operators who use them with surety bonds.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>· Often used in DI programs.</li> <li>· They are used less often and may be more typical for small operators who use them with standby trusts.</li> </ul>
<b>How to prevent fraud and failures?</b>	
Letter of Credit	<ul style="list-style-type: none"> <li>· Does U.S. Dept. of Treasury have an approved list for sureties?</li> <li>· Regions should resolve situations when a bank changes hands and transfers funds from letter of credit to trust.</li> <li>· Some EPA regions use Standard and Poor's and Moody's but not A.M. Best's surety rating service.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>· Bond ratings may not be a good measure due to recent failure of several AAA-rated companies. However, there may not be a better alternative.</li> <li>· At the beginning of the project there needs to be a process in place to manage surety bonds.</li> </ul>

Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· Captive insurance has the potential for “smoke and mirrors.”</li> <li>· At least one Region has not had a business failure in cases where a Class I or Class II UIC owner/operator relied on these mechanisms.</li> <li>· A Class I operator in MI used a financial test for FA but the Region did not adequately review the financial test and later the company went bankrupt.</li> <li>· A Class I operator received a permit in December, and they were bankrupt by the following September.</li> <li>· Most companies favor the financial test and corporate guarantee, despite their problems.</li> <li>· The bond rating test may not update company performance frequently enough.</li> <li>· It may be sufficient for net worth to be 6 to 10 times the cost of the phase.</li> <li>· Concerns exist about sole reliance on self-insurance. Corporations are often complex and may obscure who has responsibility. The recent, collapse of some large corporations suggests it’s hard to gauge corporate health.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Two participants asked, “What happens if a company fails?”</li> <li>· EPA has no plugging funds, whereas some other programs have plugging funds that are industry supported. Therefore, if the owner/operator fails, EPA has no financial means to plug wells.</li> <li>· There are differences in the content of the income statement and what a CPA provides. Regulator must work to ensure that the numbers can be duplicated. The Form 10-K, for publicly traded companies, is often better than the annual report to shareholders.</li> </ul>
<b>Mechanism may be less readily available than others</b>	
Standby Trusts	<ul style="list-style-type: none"> <li>· Banks are not always willing to offer these agreements and their availability may vary across the nation.</li> <li>· Standby trusts are not easy to obtain and typically include additional bank charges/fees.</li> <li>· Standby trusts can be more problematic and banks may be reluctant to establish these agreements.</li> <li>· Some operators may not want to pay a fee for an empty account.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· Two participants noted that they are not as available as they once were.</li> <li>· A lack of availability may not hinder large corporations that might be involved in GS.</li> </ul>
Surety Bond	<ul style="list-style-type: none"> <li>· Not as available as once were, but more available than letters of credit.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· It may be worth asking insurers what new types of instruments may become available.</li> <li>· There is some interest in using gas and electric mutuals for insurance, but mutual companies may be reluctant to provide the high levels of coverage that may be needed for GS.</li> <li>· It is uncertain what insurers will be willing to offer and if insurance is appropriate.</li> <li>· There is a limited insurance marketplace.</li> <li>· Companies may use captive insurance to manage risk if the market seems too expensive (e.g. wants a \$100,000 premium for \$10,000,000 in coverage).</li> <li>· There are currently very few third party mechanisms available for GS. Some insurance companies will only insure during the phase where the company is making money (i.e., injection).</li> <li>· Pooling risk may be a good option, but it can take time for a pool to grow.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· With limited third party options, it may not work well to eliminate self-insurance as an option.</li> </ul>
<b>Mechanism may be less attractive than others due to convenience or applicability</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· Trust funds have high “hassle factor.”</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· Letters of credit have high “hassle factor.”</li> </ul>

Surety Bond	<ul style="list-style-type: none"> <li>When bonds and activities are worth well over a million dollars for wells, it requires significant effort every year for evaluation, especially with a change of ownership.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>States “get stuck” with self-insurance since Federal Law allows it.</li> <li>Financial tests do not accurately reflect company health.</li> </ul>
Other	<ul style="list-style-type: none"> <li>Trust funds have high “hassle factor.”</li> </ul>
<b>Cancellation of FR policies</b>	
Insurance	<ul style="list-style-type: none"> <li>Other than non-payment of premiums, under what conditions is cancellation possible?</li> <li>If the insurer thinks the owner did not disclose all available project information, then the policy is void from the beginning. See case with Zurich and EPA.</li> <li>UIC does not have a provision for cancellation with notice for fraud.</li> <li>EPA should reduce the possibility of cancellation.</li> <li>It is important to consider whether the event is covered by insurance and to think about who certifies a valid claim. EPA should be careful about what provisions are allowed for cancellation, such as only for non-payment of a premium but not for bankruptcy.</li> </ul>
<b>Other Considerations</b>	
<b>Use of forms and form language</b>	
Insurance	<ul style="list-style-type: none"> <li>A certificate shows evidence of a policy, but does not ensure conformance to regulations.</li> <li>One company has been working with underwriters for 2.5 years. AEGIS &amp; EIM coverage forms are very broad with the specific language written into the policies. It is very important to understand policy coverage (e.g. definition and coverage associated with “waste products” could be critical). There is an ongoing debate between underwriters and industry; Zurich is developing a paper on this topic.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>ORCR said that they do not specify how companies must prepare their financial statements.</li> </ul>
Other	<ul style="list-style-type: none"> <li>Operators should use language from forms that the Region provides. Region experience comes from CO2 companies who submitted financial statements.</li> <li>Guidance on specific language to use in mechanisms should be provided.</li> <li>IL uses language from RCRA for UIC.</li> </ul>
<b>Development of guidance</b>	
Trust Fund	<ul style="list-style-type: none"> <li>Two participants said that EPA should develop strong guidance on trust funds.</li> <li>It is necessary to have a good foundation in the regulations and to provide guidance that deals with specifics.</li> <li>Two participants said that there should be more guidance on the transfer of ownership, including an emphasis on the responsibility of the present operator to notify the Region about transfer of ownership.</li> <li>Two participants said that guidance can expand on what is in the rule, but the regulation is also important since it is enforceable. The rule and guidance need to be clear.</li> <li>There is an advantage to having certain elements in the rule.</li> <li>Requirements should be included in the rule.</li> <li>Companies with a bond or trust agreement are held liable until a new company steps in.</li> <li>Need to develop FR language for Class II guidance since it is currently lacking. Language used in Class I FR is inappropriate for Class II due to differences in authority.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>EPA should develop strong guidance on letters of credit.</li> </ul>

Surety Bond	<ul style="list-style-type: none"> <li>· EPA should develop strong guidance on surety bonds.</li> <li>· Companies with a bond or trust agreement are held liable until a new company steps in.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· One issue that may require guidance is specifying who will pay the premium for the insurance. Operating companies tend to come and go and insurance companies will likely outlive them.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· Some Regions need to turn to a specialist in their financial mechanism evaluations to assure that the information is correct. One Region has an expert who works specifically on financial responsibility for Class I wells.</li> <li>· The financial statement could leave taxpayers in a vulnerable position. One Region has taken enforcement action against companies that failed to meet their performance ratio for Class II wells. In such cases, they have worked with an outside contractor who was knowledgeable about finance.</li> <li>· Reliance on a financial test creates enforcement problems.</li> <li>· States often have a need for expert assistance. OECA has provided financial assurance training to regions and states, which has been a large undertaking.</li> <li>· EPA should consider the multiplier requirement, which may be more protective than a set number.</li> <li>· Financial statement text should require a paragraph that directly indicates that money has been set aside for a particular action, like plugging. This should be clearly spelled out in the regulation.</li> <li>· The lack of corporate finance expertise within EPA means it would be important for corporations to take the lead in ensuring that the information provided to EPA is clear and concise.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Will guidance coincide with final promulgation of the GS rule?</li> <li>· What types of financial assurance do other countries require?</li> <li>· EPA should create guidance that is simple to use, such as a checklist, so that operators, banks, surety bond officers, and Regions are aware of the various mechanisms.</li> <li>· Guidance should be similar to the 1990 Class II well guidance document, as well as include a system to determine plugging costs.</li> <li>· Guidance should not be modeled too closely on the Class II guidance. Guidance is not easily tied to enforcement, and it would be better to have requirements in a regulation.</li> <li>· Class II guidance could not have same level of detail as the Class I regulations regarding FR because of statutory authority constraints.</li> </ul>
<b>Issues regarding pay-in periods</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· Pay-in periods are allowed because they give small operators opportunity to manage FR over time with limited capital.</li> <li>· At least one state is looking at pay-in periods for long-term FR over the life of the project.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· There is an existing enforcement case involving pay-in period with letter of credit.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Do pay-in periods meet the intent of FR demonstration?</li> <li>· Pay-in periods may be appropriate in some situations. FA would be a small portion of project cost for large corporations.</li> <li>· Is there any experience with failures during the pay-in period?</li> <li>· One Region does not allow pay-in periods longer than 2-3 years. They also set requirements in an administrative order or other enforcement action.</li> </ul>
<b>Legal Issues</b>	
Letter of Credit	<ul style="list-style-type: none"> <li>· States and EPA do not have legal resources to use letters of credit.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· Owners could use a disclosed document endorsement to substantiate which documents are disclosed and that they are acceptable to all parties.</li> </ul>

Other	<ul style="list-style-type: none"> <li>· Who is the most appropriate signatory for FR?</li> <li>· Although corporations are set up to minimize risk, those signing FR papers may not be as familiar with risk or GS work as GS project engineers are.</li> <li>· With complex corporate structures, EPA needs to ensure the proper legal entity has responsibility for providing the financial assurance.</li> </ul>
<b>Costs</b>	
Letter of Credit	<ul style="list-style-type: none"> <li>· Letters of credit can tie up \$500,000 to \$1,000,000.</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>· The applicability of insurance and the costs involved are site-specific.</li> <li>· How do underwriters come to decide on the price of a policy and whether they have sufficient knowledge of GS to make accurate estimates?</li> <li>· There is concern about regulators needing to rely solely on the work of underwriters. Regulators have a limited ability to evaluate the appropriateness of costs for corrective action, emergency response, and closure.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· There is concern that large companies would not want to tie up a lot of money in a financial mechanism and will instead want to submit financial statements.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· The cost of well plugging should be based on contractor's cost for remediation.</li> </ul>
<b>Ability of mechanisms to manage risk</b>	
Insurance	<ul style="list-style-type: none"> <li>· Utility companies may utilize captive insurance, but they are interested in the ability of third party insurance to use the marketplace to absorb some financial risk.</li> <li>· There is concern that EPA, rather than states, would end up implementing GS programs, potentially leaving the federal government with the risk.</li> <li>· Regions without a Class I program do not have experience with insurance. There may be problems related to the differences in how underwriters and owner/operators view risk and cost parameters. The Agency may need to come up with a risk assessment tool.</li> <li>· Captive insurance is less reliable, but a standby trust agreement may provide a mechanism for the insurer to pay for corrective action in the event of bankruptcy.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· The financial test and corporate guarantee is a high risk FR mechanism and requires a lot of information to provide effective assurance.</li> <li>· Two participants said that self-insurance is high risk and even an independent third-party analysis is unlikely to provide additional information. Overall, the process takes a lot of time.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· There are differences in mechanisms based on the risk covered and the willingness of third parties to cover that risk.</li> </ul>
<b>Rating systems and standards</b>	
Trust Fund	<ul style="list-style-type: none"> <li>· The need to constantly monitor the company, plus other complications, indicate why trust funds are a simpler approach to demonstrating financial responsibility.</li> </ul>
Letter of Credit	<ul style="list-style-type: none"> <li>· The need to constantly monitor the company, plus other complications, indicate why letters of credit are a simpler approach to demonstrating financial responsibility.</li> <li>· The success of letters of credit depend on a company's relationship with the bank and the amount of liquid assets the company has. Letters of credit are secure from bankruptcy because they are not part of the companies' assets. In addition, a state-administered fund is more like a risk retention group.</li> <li>· The question of appropriateness of bond ratings applies to these instruments.</li> </ul>

Insurance	<ul style="list-style-type: none"> <li>· For group insurance, states and the federal government should build off of the IRS' criteria. · EPA should look at how insurance is financed for various organizations – whether it is rated or unrated, and various measurements. · EPA should, at least, consider captive insurance.</li> <li>· EPA should not propose eligibility requirements for insurers. Participant believes the market will drive the selection of financially viable insurers.</li> <li>· Even the most stringent or specific criteria would not restrain market forces. In New York, where there is a robust insurance commissioner, established criteria have not prevented financial problems from occurring.</li> <li>· It would be nice for EPA to provide a list of approved insurance providers.</li> <li>· Would the list of insurers change based on ratings? This may be one reason that this type of list would not be found in the regulations. Insurer's current financial health may not be a predictor of their financial health 50 years from now.</li> </ul>
Financial Test and Corporate Guarantee	<ul style="list-style-type: none"> <li>· Two participants said that a \$10 million threshold seems low relative to the size of GS projects and what needs to be covered.</li> <li>· A \$10 million threshold does not even seem sufficient for the well drilling.</li> <li>· Even with 10 day notice after bankruptcy proceedings have started, there is very little the regulator can do.</li> <li>· Third-party methods provide more protection than self-insurance.</li> <li>· Financial tests are difficult to conduct on multi-level companies because it may not be clear which level of the company is responsible.</li> <li>· There is concern about date of financial test vis-à-vis post-injection site care timeframe.</li> <li>· The regulator needs to know the rationale behind a company's bond rating to know whether it is high or low risk.</li> <li>· Numbers can be manipulated; passing the ratios may give a sense that a company can meet their FR obligations. However, these ratios may not be as secure as other mechanisms where money is set aside.</li> </ul>
Other	<ul style="list-style-type: none"> <li>· Since the companies pay the rating agencies, the rating agencies may resist giving a company a rating below investment-grade. The rating agencies know the negative effect that such ratings have on companies. Moreover, ratings tend to lag behind the company's performance if they are close to the threshold.</li> </ul>

### 3. Research and Analysis on Financial Responsibility Instruments

This chapter includes two sections. The first section contains matrices summarizing EPA's research and preliminary analysis related to the various financial responsibility instruments. Detailed notes are provided in the second section. Both sections address the following questions based on comments to the proposed rule; public financial responsibility webcasts held in spring 2009;<sup>1</sup> and publicly available literature, including peer-reviewed journal articles and government and non-government reports:

1. How is the financial responsibility of a third party provider determined?
2. What weaknesses are associated with the third party's financial stability determination?
3. Under what conditions are the full estimated costs not covered? Does the mechanism manage uncertainty in cost?
4. What factors drive the costs associated with the securing/maintaining the instrument? What is the relative cost of the instrument to the owner or operator?
5. What is the historical use of the instrument? For environmental obligations?
6. Under what scenario is the instrument best or most commonly utilized?
7. Which conditions may lead to instrument failure (e.g., cancellation or non-renewal, breach of contract, misrepresentation, the agency does not take action)?
8. Do states prohibit the use of certain mechanisms? How accessible is the instrument in states where GS is likely to take place?
9. What factors make the instrument more/less easy for the Director to review or use?
10. What is the likely total administrative burden/complexity of the review for the Director (i.e., EPA or the state agency)?
11. Which GS phase(s) is the instrument best suited for?
12. For each individual GS phase, can the specific weakness of an instrument be minimized by combining it with another mechanism?

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<sup>1</sup> EPA. 2009. Webcasts on Financial Responsibility Instruments for Geologic Sequestration (GS) Wells. EPA 815-D-09-001. ([http://www.epa.gov/safewater/uic/pdfs/meetings\\_uic\\_summarywebinars\\_financial\\_responsibility.pdf](http://www.epa.gov/safewater/uic/pdfs/meetings_uic_summarywebinars_financial_responsibility.pdf)).



I. Summary Matrices

The following matrices summarize research and analysis on financial responsibility instruments for geologic sequestration wells.

A. General Financial Considerations

**Table 3.1: How is the financial stability of a third party provider determined?**

	Type of third party	Financial Regulator (Non-environmental)	Non-government Rating	Relative Ease of Monitoring Third Party	Key Considerations
Trust Fund	Banks, savings and loans, credit unions	<u>State or Federal</u> Depends on charter type of institution	Credit rating agency	Easier	<ul style="list-style-type: none"> <li>• Third party must be regulated and examined</li> <li>• Third party must be in good standing</li> </ul>
Standby Trust					
Letter of Credit					
Surety Bond	Insurance company	<u>State or Federal</u> Listed on Treasury Circular 570		Harder	<ul style="list-style-type: none"> <li>• Third party must be listed on Treasury Circular 570</li> <li>• Third party must be in good standing</li> </ul>
Insurance		<u>State</u>		Hardest	<ul style="list-style-type: none"> <li>• Third party must be regulated and examined</li> <li>• Third party must be in good standing</li> <li>• <b>Captive insurance</b> inherits the risk of self-insurance</li> </ul>
Financial Test and Corporate Guarantee	N/A – By definition, no third party is involved				
Escrow Account	Banks, savings and loans, credit unions	<u>State or Federal</u> Depends on charter type of institution	Credit rating agency	Easier	<ul style="list-style-type: none"> <li>• Third party must be regulated and examined</li> <li>• Third party must be in good standing</li> </ul>

**Table 3.2: What weaknesses are associated with the third party’s financial stability determination?**

	Stability Demonstration’s Relative Ability to Predict Third-party Bankruptcy or Insolvency	Federal Finance Regulator	State Finance Regulator	Non-government Rating	Key Considerations
Trust Fund	Strong	<u>Variable Review Period</u> Examinations are likely to be infrequent, or based on complaints	<u>Variable Review Period</u> Examinations are likely to vary by state and be infrequent, or based on complaints	<u>Variable Review Period</u> Credit rating agencies may be reluctant to lower credit ratings of client companies	<ul style="list-style-type: none"> <li>Government examinations and non-government ratings should be frequent</li> <li>Accuracy and value of examinations and ratings diminish over time</li> <li>Third-party institution’s financial condition can change quickly</li> </ul>
Standby Trust					
Letter of Credit					
Surety Bond	Strongest	<u>Annual Review</u> Institutions reviewed and listed (and unlisted) annually			
Insurance	Weak	None			<ul style="list-style-type: none"> <li><b>Captive insurance</b> inherits the risk of self-insurance</li> </ul>
Financial Test and Corporate Guarantee	N/A – By definition, no third party is involved				
Escrow Account	Strong	<u>Variable Review Period</u> Examinations are likely to be infrequent or based on complaints	Examinations are likely to vary by state	Credit rating agencies may be reluctant to lower the credit ratings of client companies	<ul style="list-style-type: none"> <li>Frequency of government examinations and non-government ratings</li> <li>Accuracy and value of examinations and ratings diminish over time</li> <li>Third-party institution’s financial condition can change quickly</li> </ul>

**Table 3.3: Under what conditions are the full estimated costs not covered? Does the mechanism manage uncertainty in cost?**

	Adverse Conditions/Risks Leading to Inadequate Coverage of Estimated Costs					Key Considerations
	Owner/operator fails	Investment Risk (Market volatility or mis-management)	Third-party Litigation (leading to inadequate funds)	Cost Under-estimation by Owner/operator	Policy Exclusions or Payment Limitations Imposed by Third Party	
Trust Fund	X	X		X		<ul style="list-style-type: none"> <li>• Owner/operator could become insolvent before trust fully funded</li> <li>• Pay-in period should be short and/or include an enforcement order to ensure that trust is fully funded</li> <li>• Risk level of investment portfolio is important</li> <li>• If trust fund fully funded at its inception, then coverage based on cost estimation will be adequate</li> </ul>
Standby Trust	N/A - Not a stand-alone instrument					
Letter of Credit				X		<ul style="list-style-type: none"> <li>• Incentive to underestimate costs to lower amount of credit held as liability</li> <li>• If letter of credit obtained for full amount of covered activities then coverage based on cost estimation will be adequate</li> </ul>
Surety Bond			X	X		<ul style="list-style-type: none"> <li>• Litigation delays have negative effects on environmental results and lead to inadequate funds to cover activities</li> <li>• If estimates increase on a surety bond, RCRA requires the Company to make up the shortfall</li> </ul>
Insurance				X	X	<ul style="list-style-type: none"> <li>• Incentive to underestimate costs or seek one policy for multiple facilities to lower premiums</li> <li>• Drawing on insurance policies may require litigation for abandoned facilities or the bankrupt companies</li> <li>• Boilerplate language proposed by Director can minimize exclusions</li> <li>• “Cap policies” could guard against expenses beyond original estimates</li> <li>• UIC Class I requires guarantee that funds available when coverage begins</li> </ul>
Financial Test and Corporate Guarantee	X	X		X		<ul style="list-style-type: none"> <li>• Only financially strong companies can/should be selected to use this mechanism</li> <li>• Decision for coverage must be based on highly accurate financial information</li> <li>• Insurance underwriters do risk analysis to determine appropriate costs for policy; owner/operator attests to accuracy of information they provide</li> </ul>
Escrow Account		X		X		<ul style="list-style-type: none"> <li>• Analogous to holding funds in low interest account</li> <li>• Investment risk is based on possible mismanagement of funds</li> <li>• If escrow is fully funded at its inception, then coverage based on cost estimation will be adequate</li> </ul>

**Table 3.4: What factors drive the costs associated with the securing/maintaining the instrument? What is the relative cost of the instrument to the owner or operator?**

	Fees	Collateral/ Deposits	Premiums	Estimate of Costs as % of Total Cost	Logistics of Claim Payment	Key Considerations
Trust Fund	X			~2% (total)	Third party uses fund to meet obligations, otherwise assets returned to the owner/operator after it meets obligations	<ul style="list-style-type: none"> <li>• Cost is full cost of environmental obligation; funded by owner or operator with third-party administration</li> <li>• Annual costs determined by pay-in schedule (if any); can be limited (2-3 years in one EPA Region) and enforcement actions are taken if necessary</li> <li>• Fees vary by institution, fund amount, what other services from same institution used, investment activity, and trustee involvement</li> </ul>
Standby Trust	X			No data available		<ul style="list-style-type: none"> <li>• Cost is typically an annual fee; fees vary by institution, fund amount, what other services from same institution used, investment activity, trustee involvement</li> </ul>
Letter of Credit	X	X		1.5 - 2% (annual)		<ul style="list-style-type: none"> <li>• Cost based on small percent of face value, paid on an annual basis; interest fees at market rate if credit drawn</li> <li>• Financial health of purchaser determines whether collateral and/or deposits required</li> <li>• Letter of credit is classified as an accounting liability; relative cost may include limits to borrowing power</li> </ul>
Surety Bond			X	0.5 - 15% (total)	Surety seeks reimbursement from purchaser for claims paid	<ul style="list-style-type: none"> <li>• Cost is a function of credit-worthiness of purchaser; emphasis on prequalification</li> <li>• Typically, premium paid based on face value of bond prior to project start; premiums often on a sliding scale</li> <li>• Each state has provisions for when to release a bond</li> </ul>
Insurance	X		X	No data available	Typically pay claims for both solvent and insolvent clients	<ul style="list-style-type: none"> <li>• Cost is premium established by underwriter's assessment of site-specific risks; price reflects greater likelihood and range of possible claims</li> <li>• May be fee for initial risk assessment</li> </ul>
Financial Test and Corporate Guarantee				<0.5% (total)	Ability to fulfill obligations is based on financial health at time payment is needed	<ul style="list-style-type: none"> <li>• Cost is limited to securing an accountant's review of financial statements prepared for other purposes</li> <li>• Least expensive option for owner/operator; based on assessment of company worth; does not require third-party backing or setting funds aside</li> </ul>
Escrow Account	X			1 - 2% (total)		<ul style="list-style-type: none"> <li>• Cost is full cost of environmental obligation; funded by owner or operator with third-party administration</li> <li>• Fees paid to third-party administrator to open and maintain account; managed accounts typically have a minimum investment requirement</li> <li>• Account may accrue interest to cover administrative costs defined in agreement</li> </ul>

**Table 3.5: What is the historical use of the instrument? For environmental obligations?**

	Used under RCRA since 1982 (including Class I Hazardous)	Listed in Class II Guidance	Other Non-UIC Programs	Key Considerations
Trust Fund	X	X	X	<ul style="list-style-type: none"> <li>Under UIC, funds may be deposited into the trust in phases; either over the term of initial permit or over remaining operating life of injection well (whichever is shorter)</li> <li>EPA has administered trusts under other environmental statutes such as CERCLA</li> </ul>
Standby Trust	Not a stand-alone instrument, but historically used with letter of credit and surety bond for Direct Implementation programs			
Letter of Credit	X	X	X	<ul style="list-style-type: none"> <li>Used in some State Revolving Fund programs</li> <li>Used for other environmental programs</li> </ul>
Surety Bond	X	X	X	<ul style="list-style-type: none"> <li>Used under Surface Mining Coal and Reclamation Act of 1977</li> <li>Banks may be accustomed to issuing bonds in areas with many Class II wells</li> <li>Bonds may be used often because they are easy for operators to obtain and administer</li> <li>Used regularly in direct implementation programs</li> <li>Used frequently in permitting</li> </ul>
Insurance	X	No	X	<ul style="list-style-type: none"> <li>Used for environmental risk management since 1957 Price-Anderson Act</li> <li>Not listed in Class II Guidance, but not prohibited</li> <li>Nuclear project licensees required to obtain maximum amount of private liability insurance available on the market, and licensees are strictly liable for “extraordinary nuclear occurrences”</li> </ul>
Financial Test and Corporate Guarantee	X	X	X	<ul style="list-style-type: none"> <li>Used for other environmental programs</li> <li>Controversial</li> <li>Historically justified to minimize the sum of costs to public and industry</li> </ul>
Escrow Account	No	No	X	<ul style="list-style-type: none"> <li>Used for ground water discharge and wastewater system permits in MA, MI, and TN; preferred mechanism for MA DEP over letters of credit which are less secure</li> <li>Magnitude of dollar amount in escrow and time period held in escrow are likely significantly shorter than for some GS activities</li> <li>Used in environmental liability court cases</li> <li>Certificate of Deposit (cash holding similar to escrow account) has been used by MT and MI UIC programs</li> </ul>

**Table 3.6: Under what scenario is the instrument best or most commonly utilized?**

	<b>Size of Firm</b>	<b>Type of Activity</b> (certain vs. uncertain)	<b>Key Considerations</b>
Trust Fund	<u>Varies</u> Small operators benefit from pay-in period	<u>Certain</u> Full amount set aside	<ul style="list-style-type: none"> <li>• Low uncertainty depends on pay-in period; Director must monitor payments into the trust</li> </ul>
Standby Trust	Not a stand-alone instrument, but typically used with letter of credit and surety bond for Direct Implementation programs		
Letter of Credit	<u>Varies</u> Firm must be financially healthy	<u>Certain and uncertain</u> In short term, given credit limit not exceeded	<ul style="list-style-type: none"> <li>• May be appropriate for company with good financial health/creditworthiness</li> <li>• Bank takes risk of project failure, but bank could fail; firm may provide deposit/collateral to secure</li> <li>• Risk of shock to creditworthiness; may affect ability to borrow, but less impact on cash flow than trust funds</li> </ul>
Surety Bond	<u>Varies</u> Requires demonstration of significant cash flow which may limit small operators	<u>Certain</u> Performs best with known, future obligations	<ul style="list-style-type: none"> <li>• For guaranteeing performance of known, future obligation</li> <li>• Provider pays if principal cannot (insolvency/ abandonment)</li> <li>• May be available only to projects that are many years from closure</li> </ul>
Insurance	<u>Varies</u> Cost of policies driven by market and site-specific factors, which will dictate size of participating firms	<u>Uncertain</u> Designed for uncertain risks with a known probability of occurring	<ul style="list-style-type: none"> <li>• Occurrence policies better for long term; allows claims to be filed after end of policy if cause of claim occurred during policy period); not preferable for insurers</li> <li>• Long-term policy may be difficult to obtain, and risk of insurance firm solvency</li> <li>• Insurance on certain activities is conceptually similar to a surety bond</li> </ul>
Financial Test and Corporate Guarantee	<u>Large</u> Company must have high net worth; financially stable	<u>Certain and uncertain</u> High financial assurance risk	<ul style="list-style-type: none"> <li>• Evaluation of actual financial strength can be difficult</li> <li>• Company net worth must be significant (i.e., sufficient to exclude under-capitalized firms); financial health and stability are key</li> <li>• Overall gives less protective coverage</li> </ul>
Escrow Account	<u>Varies</u> Must be able to make onetime payment to account	<u>Certain</u> Full amount set aside	<ul style="list-style-type: none"> <li>• Typically used (in non-GS scenarios) as short-term method to compel buyer to finalize transaction</li> <li>• Certificate of Deposit (cash holding similar to escrow account) has been used by MT and MI UIC programs</li> </ul>

**Table 3.7: Which conditions may lead to instrument failure (e.g., cancelation or non-renewal, breach of contract, misrepresentation, the agency does not take action)?**

	Owner/ operator Failure	Failure of Third Party <sup>2</sup>	Cancellation or Non- renewal	Inaccurate Assessment of Owner/operator Health	Key Considerations
Trust Fund		X <sup>3</sup>			<ul style="list-style-type: none"> <li>Partially fails if not fully funded at time that is needed</li> <li>Low risk that firm that administers trust could go out of business</li> </ul>
Standby Trust		X	X		<ul style="list-style-type: none"> <li>May fail if allowed to close (i.e., maintenance fees not paid)</li> <li>Low risk that firm that administers trust could go out of business</li> </ul>
Letter of Credit		X	X		<ul style="list-style-type: none"> <li>For Class I hazardous wells under RCRA, letter must be irrevocable and issued for 1 year minimum, 120 day notice for cancellation</li> <li>Could fail if change of bank ownership could transfer to a trust; requires good rating for new bank for financial demonstration</li> <li>Not insured by FDIC</li> </ul>
Surety Bond		X	X	X	<ul style="list-style-type: none"> <li>Refusal of issuing entity to honor bond requirements</li> <li>RCRA requires 120 day notification of cancellation</li> <li>If too many bonds issued to one corporation, risk may not be adequately diversified in terms of reinsurance</li> <li>Inadequate bond ratings and risk of assesor financial failure may cause instrument failure</li> </ul>
Insurance		X	X	X	<ul style="list-style-type: none"> <li>Cancellation terms and exclusions typically agreed upon by both parties (e.g. non-payment of premiums, perhaps due to bankruptcy)</li> <li>May feature exclusions that weaken coverage (e.g. pre-existing conditions)</li> <li>Captive insurance is likely to fail if parent company becomes insolvent</li> <li>Class I hazardous wells must contain provision to allow transfer of policy to a successor owner or operator with consent of insurer</li> </ul>
Financial Test and Corporate Guarantee	X	N/A <sup>4</sup>		X	<ul style="list-style-type: none"> <li>Failure may be caused by bankruptcy of entity that has passed a Corporate Financial Test</li> <li>Difficult to assess all environmental obligations of a single firm</li> <li>Bond ratings may not be adequate given recent economic trends</li> <li>Multilevel companies have complex finances; subsidiaries that become autonomous from parent companies must put new financial assurance in place</li> </ul>
Escrow Account		X			<ul style="list-style-type: none"> <li>Partially fails if not fully funded at time that is needed</li> <li>Low risk that firm that administers trust could go out of business</li> </ul>

<sup>2</sup> Including lack of third-party independence from covered activity

<sup>3</sup> Primacy states may have the ability to establish individual or pooled trusts, in which case there is no risk of third party failure because the state itself is the trustee

<sup>4</sup> Independent auditor could be considered third party

B. Considerations for GS

**Table 3.8: Do states prohibit the use of certain mechanisms? How accessible is the instrument in states where GS is likely to take place?**

	Allow	Likely to Allow	Prohibit	Likely Level of Accessibility	Key Considerations
Trust Fund		X		<u>High</u> Based on firm's ability to contribute cash or cash equivalents	<ul style="list-style-type: none"> <li>A preferred method for states; secure and readily available</li> </ul>
Standby Trust		X		Unknown	<ul style="list-style-type: none"> <li>Must be combined with letter of credit or surety bond</li> </ul>
Letter of Credit		X		<u>High</u> At least one region agrees they are one of most common instruments	<ul style="list-style-type: none"> <li>Not known to be prohibited in states where GS likely to take place: CO, IL, KS, KY, LA, MI, MS, MT, NM, NY, ND, OK, PA, TX, UT, WA, WV, and WY</li> </ul>
Surety Bond	X	X		<u>Medium</u> Historically available; potentially difficult to secure in future	<ul style="list-style-type: none"> <li>WA specifically allows use for GS facilities</li> <li>May be difficult to secure in future due to increased costs and risks of unknown obligations; access also limited by phase, site characteristics, or accuracy of costs</li> </ul>
Insurance		X	Some prohibit captive insurance for RCRA	<u>High</u> Private insurance used in 26 states for environmental risks	<ul style="list-style-type: none"> <li>Not all insurance products available in every state</li> <li><b>Captive insurance</b> is prohibited for RCRA financial assurance in AL, NY, TX, and VA; allowed in CA, CT, MO, OH, and WA</li> </ul>
Financial Test and Corporate Guarantee		X	Some prohibit	<u>High</u> Accessible but test must be set at appropriate level	<ul style="list-style-type: none"> <li>At least one state (MT) has banned financial test for UIC demonstrations</li> <li>Some states do not allow use for mining reclamation; not allowed under BLM 3809 regulation or on federal lands administered by USFS</li> <li>Some firms may meet financial tests immediately prior to filing for bankruptcy protection</li> </ul>
Escrow Account		X		Unknown	<ul style="list-style-type: none"> <li>Escrow accounts are typically used for transactions and holding money over a short period of time</li> <li>Some states set maximums on the length of time that a lender can request the money to be held in escrow</li> </ul>



**Table 3.9: What factors make the instrument more/less easy for the Director to review or use?**

	Instrument Regulated by Financial Industry Regulator	Relative Level of Effort Required to Review/Use	Risks to Director	Key Considerations
Trust Fund	X	Low or Medium Review trust fund balance with cost estimate	Some vulnerability to insolvency of trustee	<ul style="list-style-type: none"> <li>Liquid assets are easy to use and review</li> <li>Trust funds are regulated under state and federal regulatory regimes</li> <li>Some primacy states may be able to act the trustee and establish individual or pooled trust funds</li> </ul>
Standby Trust	N/A - Not a stand-alone instrument		Sometimes difficult to obtain	
Letter of Credit	X	Low Less frequent monitoring	Litigation to obtain funds	<ul style="list-style-type: none"> <li>Can only be altered with agreement of purchaser, provider, and beneficiary</li> <li>Level of effort for initial review is greater than that for long-term monitoring</li> <li>Automatic renewals reduce administrative burden</li> <li>Reliant on federal or state review of third party</li> </ul>
Surety Bond	X	Low May be more convenient to review and use		<ul style="list-style-type: none"> <li>May be less liquid but more convenient than letters of credit and trust funds</li> </ul>
Insurance	X	High Complex evaluation due to different state regulations and lack of transparency	Variation in quality, eligibility, and transparency of insurance company	<ul style="list-style-type: none"> <li>Owners/operators influenced by market factors</li> <li>Company objectives, methodology, and evaluations could be considered proprietary business information</li> <li><i>Insurance policies</i> are regulated under state regulatory regimes</li> </ul>
Financial Test and Corporate Guarantee	X <sup>5</sup>	High Regular financial monitoring for solvency	Corporate financial auditing not an in-house strength of UIC program	<ul style="list-style-type: none"> <li>Solvency determinations require extensive commitment to monitoring and verification</li> <li>Option for third-party audits</li> </ul>
Escrow Account	X	Medium Review bank statements to compare with cost estimate	Instrument not yet tested for GS project magnitude	<ul style="list-style-type: none"> <li>Some risk of insolvency of trustee dependent on economic climate</li> <li>MA DEP: instrument easy to review relative to letters of credit</li> </ul>

<sup>5</sup>Independent auditor is regulated

**Table 3.10: What is the likely total administrative burden/complexity of the review for the Director (i.e., EPA or the state regulator)?**

	Level of Administrative Burden	Implementation Steps Needed					Key Considerations
		Initial Demonstration	Annual Valuation	Readjustment	Withdraw	Termination	
Trust Fund	<u>Low</u> Less frequent monitoring	X	X	X		X	<ul style="list-style-type: none"> <li>• Director is unlikely to have challenges accessing funds since funds are liquid and set aside/dedicated to specific activity</li> <li>• Annual valuation/re-adjustment to ensure fund provides total coverage and firm meets schedule during pay-in period</li> <li>• Lack of monitoring increases risk of funding shortfalls</li> <li>• Some primacy states may be able to act as the trustee and establish individual or pooled trust funds, relative to a third-party trust, this may increase the initial burden but decrease the annual valuation burden</li> </ul>
Standby Trust	<u>Low</u> Less frequent monitoring	X	X			X	<ul style="list-style-type: none"> <li>• Initial demonstration to review language and verify that trustee is appropriate</li> <li>• Must be used with surety bond or letter of credit; account for additional burden</li> <li>• Annual valuation needed to ensure funds as standby trust</li> </ul>
Letter of Credit	<u>Medium</u> Less frequent monitoring; potential for re-demonstration and/or negotiation and litigation	X	X	X	X	X	<ul style="list-style-type: none"> <li>• Annual valuation needed to ensure total coverage</li> <li>• Initial demonstration depends on Director's review of financial institution's solvency</li> <li>• May be issued for short periods, therefore many opportunities for non-renewal; may need frequent re-demonstration if finances fluctuate over time</li> <li>• Withdrawal depends on third party; may require negotiation or litigation</li> </ul>
Surety Bond	<u>Medium</u> Annual evaluation; potential for re-demonstration and/or negotiation and litigation	X	X	X	X	X	<ul style="list-style-type: none"> <li>• Annual valuation needed to ensure bond provides total coverage</li> <li>• Initial demonstration depends on Director's review of financial institution's solvency</li> <li>• Surety may cancel agreement: potential need for re-demonstration if fluctuation in financial condition</li> <li>• Withdrawal depends on third party; may require negotiation or litigation</li> </ul>
Insurance	<u>High</u> Policies complex due to site-specific variations and differences by state	X	X	X	X	X	<ul style="list-style-type: none"> <li>• Initial demonstration depends on Director's review of financial institution's solvency; possible re-demonstrations to avoid cancellation of policy or if finances fluctuate over time</li> <li>• Withdrawal depends on third party; may require negotiation or litigation</li> <li>• Agency capacity for review</li> </ul>
Financial Test and Corporate Guarantee	<u>High</u> Evaluations and re-evaluations are frequent and data intensive	X	X	X			<ul style="list-style-type: none"> <li>• Director must perform initial and annual review of financial condition (e.g., financial statements and calculations/ratios) and ensure solvency; may be substantial effort</li> <li>• If owner/operator fails to perform obligations, Director may have to negotiate or litigate</li> <li>• Agency capacity for review</li> </ul>
Escrow Account	<u>Medium</u> No history of use for large magnitude projects	X	X	X		X	<ul style="list-style-type: none"> <li>• Total burden likely to be substantial until history of using escrow with FR</li> <li>• Director, owner/operator, and escrow agent likely to work together to ensure instrument established with appropriate provisions for obligation and timeframe</li> </ul>

**Table 3.11: Which GS phase(s) is the instrument best suited for?**

	Corrective Action and Phased Corrective Action	Injection Well Plugging	Post-injection Site Care and Site Closure	Emergency and Remedial Response	Key considerations
Trust Fund	<u>Best</u> Fully-funded trust minimizes the risk to the public for well defined activities. Beyond third-party failure and cost escalation, risk is limited to investment portfolio risk (typically low)			Funds will be available but there may be too little money (public pays) or too much money (inefficient use of funds)	<ul style="list-style-type: none"> <li>Strength of trust fund is based on being fully funded (i.e., 100% of estimated costs set aside)</li> <li>Most costly to owner or operator because funds must be set aside in advance</li> </ul>
Standby Trust	N/A - Not a stand alone instrument				
Letter of Credit	<u>Best</u> Beyond third-party failure and cost escalation, risk stems from the appropriateness of the defined credit limit	May be unreliable for longer time periods, but some regions have had success over periods of time up to 20 years		Appropriate for emergency and remedial response in construction and operation phases but may be unreliable or unavailable for post injection site care period because of uncertainty and risk over long time periods	<ul style="list-style-type: none"> <li>Perform well so long as the credit limit is not exceeded</li> <li>Risk of exceeding the limit is not pooled across owner or operator</li> <li>Risk of third-party failure is higher than for a surety</li> </ul>
Surety Bond	<u>Good</u> Beyond third-party failure and cost escalation, risk stems from the appropriateness of the defined credit limit	Surety providers are unlikely to underwrite bonds over longer time periods where there is considerable uncertainty, however some regions have had success over periods of time up to 20 years			<ul style="list-style-type: none"> <li>Perform equally well so long as the credit limit is not exceeded</li> <li><b>Blanket bonds</b> (multiple sites under a single bond) present a much higher risk</li> </ul>
Insurance	Can be used for either short-term or long-term applications depending on the terms of the policy; likely best and most readily available in the operational phases because the activities and timeframe are well-defined (operator is making money and can pay premiums)			<u>Best</u> Ideal for activities with uncertain frequency and costs to diversifying environmental risk and handling the numerous possible scenarios	<ul style="list-style-type: none"> <li>Timing is a significant issue as insurers prefer to restrict the scale, timeframe, and predictability of exposures</li> <li>Best applied to operational phases.</li> <li><b>Captive insurance</b> inherits the risk of self-insurance</li> </ul>
Financial Test and Corporate Guarantee	<u>Good, but provides no financial recourse if owner or operator fails</u> Performs well when used for uncertain and certain risks; however, high financial assurance risk to the public				<ul style="list-style-type: none"> <li>Equivalent to a waiver of third-party instruments for large and historically financially stable firms</li> <li>Primary reason to allow self-insurance is for public policy, not for financial responsibility</li> </ul>
Escrow Account	<u>Good</u> Historically utilized for well defined short-term costs	Trust funds may be preferred over the mid and long term, funds in escrow would likely generate less interest		Likely to perform poorly when used for uncertain risks; funds do not respond to contingencies beyond cost estimate	<ul style="list-style-type: none"> <li>Never used in UIC program</li> <li>May not require a pay-in period like a trust fund</li> </ul>

**Table 3.12: For each individual GS phase, can the specific weaknesses of an instrument be minimized by combining it with another mechanism?**

	Potentially Effective Combination					Weakness Minimized Through Combination	Key Considerations
	Trust Fund	Letter of Credit	Surety Bond	Insurance	Escrow Account		
Trust Fund		X	X	X		<u>Long-term cost uncertainty</u> Associated with emergency and remedial response	<ul style="list-style-type: none"> <li>Trust fund could be used for response activities up to a threshold value, then an alternative instrument could be used only when costs exceed the threshold</li> <li>Additional administrative burden may be undesirable</li> </ul>
Standby Trust	Not considered a stand-alone instrument						
Letter of Credit	X			X		<u>Changes in financial markets or firm's credit &amp; long-term cost uncertainty</u> Affects cost and availability	<ul style="list-style-type: none"> <li>Letter of credit has a fixed value; response activities may exceed that value</li> <li>Trust fund may split up potential costs for post-injection site care and site closure; insurance may help manage long-term cost uncertainty</li> <li>Additional administrative burden may be undesirable</li> </ul>
Surety Bond <i>(Note differences in payment bond vs. performance bond)</i>	X					<u>Long-term cost uncertainty</u> Associated with emergency and remedial response	<ul style="list-style-type: none"> <li>Surety bond has a fixed value; response activities may exceed that value</li> <li>Trust fund could be used for response activities up to a threshold value, then a payment bond could be used only when costs exceed the threshold</li> <li>Additional administrative burden may be undesirable</li> <li><b>Payment bonds</b>, trust funds, letters of credit, and insurance can be combined for a facility if together their value is at least equal to estimated costs</li> <li><b>Performance bonds</b>, financial tests, and corporate guarantees cannot be combined with other instruments</li> </ul>
Insurance	X				X	<u>High premiums</u> Associated with well-defined activities	<ul style="list-style-type: none"> <li>Firms lower premiums by utilizing trust fund or escrow account to cover activities up to pre-established value; insurance used to cover uncertain costs</li> <li>Provides additional stability and lower risk</li> <li>Additional administrative burden may be undesirable</li> </ul>
Financial Test and Corporate Guarantee	The primary driver for utilizing the financial test and corporate guarantee is to avoid the use of other third-party mechanisms						
Escrow Account		X	X	X		<u>Long-term cost uncertainty</u> Associated with emergency and remedial response	<ul style="list-style-type: none"> <li>Escrow accounts only desirable for short-term activities</li> <li>May be desirable to utilize another instrument or combination of instruments instead of escrow accounts</li> </ul>

## II. Research and Preliminary Analysis

### Notes:

- All information that can be attributed to a source is cited with a footnote.
- Analysis is tailored to answer the questions in this matrix, and carries no citations.
- Information on captive insurance is grouped with third-party insurance. Discussions related to captive insurance are called out in bold text.

### A. *General Financial Considerations*

#### 1) **How is the financial stability of a third-party provider determined?**

##### **Trust Fund & Standby Trust**

- Trust funds and standby trusts are typically provided/administered by regulated financial institutions, such as commercial banks, savings and loans, mutual savings banks, credit unions, and licensed foreign banks.<sup>6</sup> The financial strength of the trust fund or standby trust provider is relatively easy to monitor because oversight is usually already in place.<sup>7</sup> The stability of the institutions could be inferred by whether or not the institution (1) is regulated and examined by a federal or state agency,<sup>8</sup> and (2) is in good standing with its respective federal or state financial regulator (depends on state vs. national charter). The financial institution's standing may be inferred by the number (and frequency) of enforcement actions taken by the financial regulator.

##### **Letter of Credit**

- Letters of credit are typically provided by regulated financial institutions, including commercial banks, savings and loans, mutual savings banks, credit unions, and licensed foreign banks.<sup>9</sup> The financial strength of the letter of credit provider is relatively easy to monitor because oversight is usually already in place.<sup>10</sup> The stability of the institutions could be inferred by whether or not the institution (1) is regulated and examined by a federal or state agency,<sup>11</sup> and (2) is in good standing with its respective federal or state regulator (depends on state vs. national charter). The financial institution's standing may be inferred by the number (and frequency) of enforcement actions taken by the financial regulator.

##### **Surety Bond**

- A surety bond is usually issued by an insurance company, however, surety bonds are not insurance. The surety becomes liable only when the owner or operator fails to comply with requirements.<sup>12</sup> The financial strength of the surety bond provider may be relatively

<sup>6</sup> U.S. EPA. 2009. RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Trust Fund. United States Environmental Protection Agency. Available online at: <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/tfund-fs.pdf>

<sup>7</sup> Boyd, James. 2001. Financial Responsibility for Environmental Obligations: Are Bonding and Assurance Rules Fulfilling Their Promise? Resources for the Future. Discussion Paper 01-42. Available online at: <http://www.rff.org/documents/RFF-DP-01-42.pdf>

<sup>8</sup> For example, see 40 CFR 144.63(a)(1) or U.S. EPA. 1990. Federal Financial Responsibility Demonstrations for Owners or Operators of Class II Oil- and Gas-Related Injection Wells. United States Environmental Protection Agency. EPA 570/9-90-003. Available online at: [www.epa.gov/R5water/uic/ftp/ffrdooc2.doc](http://www.epa.gov/R5water/uic/ftp/ffrdooc2.doc)

<sup>9</sup> U.S. EPA. 2009. RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Letter of Credit. United States Environmental Protection Agency. Available online at: <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/loc-fs.pdf>

<sup>10</sup> Boyd. 2001.

<sup>11</sup> For example, see 40 CFR 144.63(d)(1) or U.S. EPA. 1990.

<sup>12</sup> U.S. EPA OIG. 2001. RCRA Financial Assurance for Closure and Post-Closure. 2001-P-007. Available online at <http://www.epa.gov/oig/reports/2001/finalreport330.pdf>

easy to monitor because oversight is usually already in place.<sup>13</sup> However, the same difficulties in oversight that apply to insurance (e.g., complex finances obscuring credit ratings) may apply to surety bonds.<sup>14</sup> The stability of these institutions could be inferred by whether or not the institution (1) is listed on U.S. Department of the Treasury, Circular 570<sup>15</sup> (consistent with Class I requirements and Class II guidance<sup>16</sup>) and (2) is in good standing with its respective federal or state regulator (depends on state vs. national charter). The financial institution's standing may be inferred by the number (and frequency) of enforcement actions taken by the regulator.

- Circular 570 is published annually and lists firms qualified to write surety bonds, provides information on admitted reinsurers, pools and associations, Lloyd's syndicates and surety underwriting limitations.<sup>17</sup>

### **Insurance**

- Insurance is typically issued by an insurance company. Under Class I Hazardous requirements, the insurance company must be “licensed to transact the business of insurance, or eligible to provide insurance as an excess or surplus lines insurer, in one or more States.”<sup>18</sup> The financial strength of insurers may be monitored through credit ratings. Companies like A.M. Best and Standard & Poor's provide in-depth reports and ratings such as the Financial Strength Rating to evaluate the financial health of insurance companies based on measurements of their ability to pay back claims based on the policies and contracts that they hold.<sup>19</sup> However, the financial stability of independent third-party insurance providers may be difficult to determine because reinsurance or fronting may further obscure the financial stability of an insurance policy or provider.<sup>20</sup>

### **Financial Test and Corporate Guarantee**

- N/A

### **Escrow Account**

- Like trust funds and letters of credit, escrow accounts are typically administered by regulated financial institutions, including commercial banks, savings and loans, mutual savings banks, credit unions, and licensed foreign banks. The financial strength of these institutions is easy to monitor because oversight is usually already in place. The stability of these institutions could be inferred by whether or not the institution (1) is regulated and examined by a federal or state agency, and (2) is in good standing with its respective federal or state regulator (depends on state vs. national charter). The financial institution's standing may be inferred by the number (and frequency) of enforcement actions taken by the regulator.

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<sup>13</sup> Boyd. 2001.

<sup>14</sup> U.S. EPA OIG. 2001.

<sup>15</sup> Department of the Treasury, Circular 570, is available online at: <http://www.fms.treas.gov/c570/>.

<sup>16</sup> For example, see 40 CFR 144.63(b)(1) or U.S. EPA. 1990. Federal Financial Responsibility Demonstrations for Owners or Operators of Class II Oil- and Gas-Related Injection Wells. United States Environmental Protection Agency. EPA 570/9-90-003. Available online at: [www.epa.gov/R5water/uic/ftp/ffrdooc2.doc](http://www.epa.gov/R5water/uic/ftp/ffrdooc2.doc)

<sup>17</sup> U.S. EPA. 2009. United States Environmental Protection Agency RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Surety Bond. Available online at: <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/sbond-fs.pdf>.

<sup>18</sup> 40 CFR 144.63(e)(1)

<sup>19</sup> Sources available online at: <http://www.ambest.com/about/>; <http://www3.ambest.com/ratings/default.asp>;

<http://www.insure.com/articles/interactivetools/ratingslookuptool/sandp/define.jsp>; <http://www.standardandpoors.com/ratings/insurance/en/us>

<sup>20</sup> U.S. EPA OIG. 2001.

## 2) What weaknesses are associated with the third-party's financial stability determination?

### Trust Fund & Standby Trust

- A trust fund and standby trust may be vulnerable to bankruptcy of the financial institution serving as trustee. Limiting acceptable trustees to regulated entities minimizes the risk of bankruptcy of the trustee. This reduces the risk of non-payment substantially.<sup>21</sup>
- Using credit ratings provided by a credit rating agency.<sup>22</sup>
  - Firms are reviewed frequently by credit rating agencies. In recent years, rating agencies have made an effort to review institutions seeking credit more frequently.
  - No hard and fast rule for how often ratings are done. At a minimum, ratings are done every time the institution seeks credit, or every year (or two at the most), whichever is more frequent.
  - For institutions seeking credit regularly, this may mean several reviews each year.
  - Although the ratings are public, the reports providing more detail are by subscription only.

### Letter of Credit

- Although bank and saving and loan deposits are covered by federal deposit insurance (e.g., escrow account), the courts have explicitly ruled that this coverage does not extend to standby letters of credit.<sup>23</sup> During the webcast discussion, a participant suggested that Regions should resolve situations when a bank changes hands and transfers funds from letter of credit to trust.<sup>24</sup>

### Surety Bond

- A potential weakness associated with the Circular 570 listing for certified surety bonds includes annual authorization or listing. Additionally, although underwriting limitations for bonds exist, it is possible for these limits to be exceeded by the company if reinsurance or co-insurance is used to cover the “excess risk.”<sup>25</sup>
- During the FR webcasts, a participant noted that A.M. Best's Issuer Credit Rating can be used in addition to Standard & Poor's and Moody's and stated that bond ratings might have historically been a good measure, but now several AAA-rated companies are receiving TARP money, so it may not be a good measure anymore. Several webinar participants suggested that surety bonds were “head and shoulders” above other financial mechanisms, but they also may be less convenient than trust funds and letters of credit.<sup>26</sup>

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<sup>21</sup> U.S. EPA. 1996. Subtitle C and D Corporate Financial Test Analysis Issue Paper: Assessment of Financial Assurance Risk of Subtitles C and D Corporate Financial Test and Third-Party Financial Assurance Mechanisms. March, 18, 1996. Available online at: <http://www.epa.gov/osw/nonhaz/municipal/landfill/financial/fame/paper10.pdf>.

<sup>22</sup> Susan Kendall. 2010. Moody's Investor Service. Personal communication with Charles Hernick, January 25, 2010.

<sup>23</sup> U.S. EPA. 1996.

<sup>24</sup> U.S. EPA. Unpublished. Notes from EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Trust Funds, Letters of Credit, and Surety Bonds with Standby Trust Agreements (April 28, 2009)

<sup>25</sup> Treasury Department. 2009. Department of the Treasury's Listing of Approved Sureties (Department Circular 570). Available online at <http://www.fms.treas.gov/c570/notes.html>.

<sup>26</sup> U.S. EPA. Unpublished. Notes from EPA Webcast on Financial Responsibility for Geologic Sequestration Wells: Trust Funds, Letters of Credit, and Surety Bonds with Standby Trust Agreements (April 28, 2009)

## **Insurance**

- Ratings and other measures of financial health of an insurance company will reflect the health of the company at the time of the assessment – this determination will lose accuracy over time and will need to be revisited periodically.<sup>27</sup>
- Rating services do not guarantee the financial health of an insurance company nor do they address the performance or appropriateness of specific policies for a given purpose. They also do not consider deductibles, penalties for cancellation or surrender, timeliness of claim payments, or the likeliness of denying claims for reasons such as fraud.<sup>28</sup>
- During the FR webcasts, a participant noted that the rating agencies know that below investment grade ratings (indicating a high credit risk) can have negative consequences on financial institutions. Since companies pay the rating agencies, there is some concern that the ratings may not always reflect the current company performance accurately (potential weakness for all instruments).
- In the case of **captive insurance**, in which financial assurance is provided through a wholly-owned insurance company subsidiary, the financial stability of the parent firm will dictate the ability of the insurance plan to cover necessary remediation costs; this poses an unacceptable level of risk. Financial stability of independent third-party insurance providers may be difficult to determine. Reinsurance (by the captive) or fronting arrangements which transfer risk from a commercial insurer to a captive may further obscure the financial stability of a captive insurance policy or provider.<sup>29</sup>

## **Financial Test and Corporate Guarantee**

- N/A

## **Escrow Account**

- Like a trust fund or letter of credit, an escrow account may be vulnerable to bankruptcy of the financial institution providing financial assurance. Limiting financial institutions to regulated entities may help minimize the risk of bankruptcy. Additionally, FDIC insurance coverage may guarantee that up to \$100,000 in funds would be available even if the financial institution was insolvent.

### **3) Under what conditions are the full estimated costs not covered? How do cost estimates inform the establishment/use of the instrument? How well does the mechanism handle uncertainty in cost?**

## **Trust Fund**

- Trust funds are funded with the amount of money estimated to pay for the full cost of covered events. If a trust fund is fully funded at its inception, then coverage based on the cost estimation will be adequate. Depending on the estimated costs of covered events, owners or operators may opt to fund the trust over time through the use of a pay-in period. Thus, incompletely funded trusts are relatively common. However, when a pay-in-period is allowed, if a firm becomes insolvent before a trust is fully funded, the actual

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<sup>27</sup> U.S. EPA. Unpublished. Notes from EPA Webcast on Financial Responsibility for Geologic Sequestration Wells: Insurance (May 20, 2009).

<sup>28</sup> Source online at: <http://www.insure.com/articles/interactivetools/ratingslookuptool/sandp/define.jsp>

<sup>29</sup> U.S. EPA OIG. 2001.



amount of available coverage will be inadequate.<sup>30</sup> Accordingly, shorter term pay-in periods are preferable.<sup>31</sup>

- Investment risks will also impact the ability of the instrument to cover all estimated costs. The assurance risk of a trust fund invested with a low risk investment policy (e.g., Treasury Bills) is negligible (i.e., virtually assures that at least 100 percent of the invested funds will be available when needed). The moderate to high risk investment policy (e.g., stocks, futures, and stock or commodity options) poses some degree of assurance risk, but the difference is not significant.<sup>32</sup> A fully funded trust fund invested conservatively has virtually no risk of failure, but this low risk depends heavily on an accurate cost estimate. Typically, the major risk is that a trust fund will not be fully funded when the facility becomes insolvent.<sup>33</sup>

### **Standby Trust**

- N/A. Standby trust funds are not considered stand alone instruments.

### **Letter of Credit**

- The amount of credit required for letters of credit depends on the cost estimate of covered events. Owners or operators may have an incentive to underestimate costs in order to lower the amount of credit they hold as an accounting liability.<sup>34</sup>

### **Surety Bond**

- Surety bonds also rely heavily on accurate cost estimates. Under RCRA, if the cost estimate increases on a surety bond the Company must either increase the value of the bond, or obtain alternate financial assurance mechanisms to make up the shortfall. If the estimates decrease, the Regulator may approve a reduction in the face value of the surety bond.<sup>35</sup>
- The Office of Inspector General (OIG) noted that litigation may result if an insurance company acting as the surety refuses to comply with the terms of the bond. The delays and resources spent on litigation have negative effects on environmental results, resulting in inadequate funds available to pay for both performance of covered activities and any litigation fees.<sup>36</sup>

### **Insurance**

- In the process of procuring insurance, owners or operators will typically approach potential insurers with information about their site, the coverage they are seeking, and the range of pricing they anticipate. Then the insurers will respond to indicate what type of policy they are willing to offer to the owner or operator.<sup>37</sup> Owners or operators as insured entities have an incentive to underestimate costs in order to lower premiums or other payments.<sup>38</sup> However, at the time that the owner or operator applies for the insurance policy, they will often be required to attest to the accuracy of the information that they

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<sup>30</sup> Boyd. 2001.

<sup>31</sup> Boyd. 2001.

<sup>32</sup> U.S. EPA. 1996.

<sup>33</sup> U.S. EPA OIG. 2001. Page 21.

<sup>34</sup> U.S. EPA OIG. 2001.

<sup>35</sup> U.S. EPA. 2009. United States Environmental Protection Agency RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Surety Bond. Available online at <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/sbond-fs.pdf>

<sup>36</sup> U.S. EPA OIG. 2001. Page 19.

<sup>37</sup> Northern Kentucky University and University of Louisville. 2005. Brownfields Insurance for Public Sector-led Development Projects: Experience and Methods. [http://www.brownfieldstsc.org/pdfs/bf\\_case\\_studies\\_report.pdf](http://www.brownfieldstsc.org/pdfs/bf_case_studies_report.pdf)

<sup>38</sup> U.S. EPA OIG. 2001.

have provided – any false information or omissions can result in the cancellation of the policy by the insurance company. Insurance underwriters will also do their own risk analysis (i.e., cost estimation and probability assessment) based on their own experience and site-specific characteristics to determine an appropriate cost for a policy.<sup>39</sup>

- UIC Class I Hazardous Wells: Require that the “face amount” of the policy must equal at least the current cost of closure or post-closure, i.e. the policy must guarantee that funds will be available for closure or post-closure whenever it occurs. The “face amount” is the total amount the insurer is obligated to pay.<sup>40</sup>
- If an owner or operator runs multiple facilities but insurance does not account for multiple facilities, insurance coverage may not be sufficient to satisfy all activities. For example, owners or operators of hazardous waste treatment, storage or disposal facilities are required to have liability coverage for accidental occurrences. The amount of insurance required is per owner or operator, regardless of the number of facilities operated.<sup>41</sup>
- The regulator’s ability to use funds may be limited by an insurance company’s procedures and payment schedule, such as reimbursing the regulator for cleanup costs instead of providing direct access to the funds. States have also expressed concern that drawing on an insurance policy may require litigation, especially if the facility has been abandoned or the company is in bankruptcy.<sup>42</sup>
- Exclusions may be included to reduce the insurer’s risk exposure and, correspondingly, the customer’s cost of coverage. However, these voluntary coverage limitations are inappropriate for the purposes of environmental assurance. Coverage limitations, though potentially desirable for the customer and insurance provider, undermine the ability to recover costs and ensure future environmental obligations. Therefore, many state programs rely on the use of boilerplate endorsements that must accompany instruments used to demonstrate coverage. These endorsements require the insurer to acknowledge the scope of coverages required by regulation and rule-out any coverage limiting exclusions.<sup>43</sup>
- Specific insurance policies called cost cap policies could help to guard the insurer against expenses that are beyond the originally estimated costs for the project. Cost cap policies can be used for a remediation project where the insured pays for a percentage of the clean up costs (called a self-insured retention) and the insurer paying the excess costs.<sup>44</sup>

### **Financial Test and Corporate Guarantee**

- EPA OIG discovered cases in which corporations that were successful in a Corporate Financial Test in one year later became financially unstable. A firm using the financial test to satisfy obligations cannot guarantee it will have funds for closure and post-closure in the event that it becomes insolvent. For conducting closure and post-closure, the public bears the risk of the firm’s insolvency.<sup>45</sup>

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<sup>39</sup> Northern Kentucky University and University of Louisville. 2005.

<sup>40</sup> U.S. EPA. 2009. Summary of EPA Webinars on Financial Responsibility for Geologic Sequestration Wells. Available online at: [http://www.epa.gov/safewater/uic/pdfs/meetings\\_uic\\_summarywebinars\\_financial\\_responsibility.pdf](http://www.epa.gov/safewater/uic/pdfs/meetings_uic_summarywebinars_financial_responsibility.pdf)

<sup>41</sup> U.S. EPA. 1988. FINANCIAL ASSURANCE. Available online at:

<http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/e4c040961571e0778525670f006bc76a!OpenDocument>.

<sup>42</sup> U.S. EPA OIG. 2005. Continued EPA Leadership Will Support State Needs for Information and Guidance on RCRA Financial Assurance. Report No. 2005-P-00026. <http://www.epa.gov/oig/reports/2005/20050926-2005-P-00026.pdf>.

<sup>43</sup> Boyd. 2001.

<sup>44</sup> Northern Kentucky University and University of Louisville. 2005.

<sup>45</sup> U.S. EPA OIG. 2001. Pages 10-11.

- During the FR webcasts, participants agreed that fully-estimated costs would not be covered by self-insurance mechanisms unless financial tests and corporate guarantees are based on highly accurate banking information about the companies, and a conservative approach to designing the tests should be followed to be sure that only the strongest companies are selected to use this mechanism.<sup>46</sup>

#### **Escrow Account**

- An escrow account, like a trust fund, would be funded with the amount of money estimated to pay for the full cost of covered events. Depending on the terms of the agreement, an escrow account could be fully funded at its inception, so coverage based on the cost estimation would be adequate. While there is some documented risk involved with the mismanagement of the escrow funds by a third-party, the investment risk would be lower than for a trust fund. Placing the funds in escrow is analogous to placing the funds in a low interest (e.g., 0.5%) savings account at a financial institution.

#### **4) What is the relative cost of the instrument? What factors drive the costs associated with the securing/maintaining the instrument?**

##### **Trust Fund**

- Trust funds are funded by the owner or operator and thus are not technically purchased,<sup>47</sup> but instead are administered by a third-party. Therefore, the total cost of the trust fund is the full cost of the environmental obligation for which financial assurance is being demonstrated plus the overhead costs associated with the instrument. Set up costs including legal fees may be high.<sup>48</sup>
- Trust fund costs may be incurred at one time, or if a pay-in period is allowed, annual costs are determined by the pay-in schedule for the fund (until the trust is fully funded).<sup>49</sup>
- Trustee's fees can be expected to vary depending on the specific institution chosen, the amount of funds held in trust, the extent to which the owner or operator uses other services of the institution, and the extent and type of investment activity and trustee involvement.<sup>50</sup>
- During the FR webcasts, participants mentioned that smaller operators benefit from trust funds with a pay-in period it gives them the opportunity to manage the financial requirement over time. Pay-in periods are limited by EPA (2-3 years in one region) and enforcement action taken if companies fail to comply.<sup>51</sup>
- After obligations are fulfilled, trust assets are returned to the firm. It is essential that regulators monitor payments into the trust.<sup>52</sup>

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<sup>46</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>47</sup> Boyd. 2001.

<sup>48</sup> Communication with Jeff Green, Wealth Management Group at Citizens Bank.

<sup>49</sup> U.S. EPA OIG. 2001.

<sup>50</sup> U.S. EPA. 1983. Service Charges on Standby Trust Funds. 530-SW-83-001J. Available online at:

[http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/AB6301907BFC7CC08525670F006BBA6A/\\$file/12147.pdf](http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/AB6301907BFC7CC08525670F006BBA6A/$file/12147.pdf)

<sup>51</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>52</sup> Boyd. 2001.

## **Standby Trust**

- Trustee's fees can be expected to vary depending on the specific institution chosen, the amount of funds held in trust, the extent to which the owner or operator uses other services of the institution, and the extent and type of investment activity and trustee involvement. The operator of a hazardous waste management facility established a letter of credit and a stand-by trust fund (containing \$1 to keep it active) and the trustee (i.e., the bank) then levied a \$1,500 per annum service charge on the stand-by trust fund.<sup>53</sup>
- Standby trust costs vary from \$900 - \$3,000 per year.<sup>54</sup>
- Standby trust costs are essentially an annual fee to keep the trust open so that it can be utilized when needed.

## **Letter of Credit**

- Banks may require collateral or deposits before providing a letter of credit, depending on the purchaser's financial health. Letters of credit are typically priced as a small fraction of their face value and are granted for annual terms. Typically, letters of credit are automatically extended after one year, subject to the purchaser's continued good credit and adherence to contract terms.<sup>55</sup>
- The premium for a letter of credit is typically 1.5 to 2 percent; if the loan is drawn on, a market interest rate, of approximately 6 to 8%, is applied to the loan.<sup>56</sup>
- Letters of credit can require \$500,000 to \$1,000,000, according to a webcast participant.<sup>57</sup>
- A letter of credit is classified as an accounting liability, and limits the holder's borrowing power.<sup>58</sup> Therefore, the relative cost may include more than the actual cost of securing the mechanism.

## **Surety Bond**

- The cost of obtaining a surety bond is a function of its credit worthiness (or financial solvency). The Surety generally places emphasis on prequalification. With either type of surety bond, the Surety retains the right to pursue reimbursement from the Company for funds paid on its behalf. Similar to a bank with a Letter of Credit, the Surety provides the Company with its financial backing. In return for the Surety's guarantee, the Surety generally receives a premium based on the face value of the bond.<sup>59</sup> The premium is typically around 2.5 percent of the contract price, and is based on a sliding scale (e.g., 2.5% is applied to the first \$500,000 of a \$1,000,000 surety bond, while 1.5% is applied to the remaining \$500,000).<sup>60</sup>

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<sup>53</sup> U.S. EPA. 1983. Service Charges on Standby Trust Funds. 530-SW-83-001J. Available online at:

[http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/AB6301907BFC7CC08525670F006BBA6A/\\$file/12147.pdf](http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/AB6301907BFC7CC08525670F006BBA6A/$file/12147.pdf).

<sup>54</sup> U.S. EPA. 2009. Notes from Webcasts on Financial Responsibility for Geologic Sequestration Wells. Unpublished notes from April 28, 2009 webcast.

<sup>55</sup> Boyd. 2001.

<sup>56</sup> Communication with Jeff Green, Wealth Management Group at Citizens Bank.

<sup>57</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>58</sup> U.S. EPA OIG. 2001. Page 22.

<sup>59</sup> U.S. EPA. 2009. United States Environmental Protection Agency RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Surety Bond. Available online at: <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/sbond-fs.pdf>.

<sup>60</sup> Communication with Paul Patalano, DeSanctis Insurance Agency.

- One participant mentioned that although surety bonds have historically been thought of as the go-to mechanisms for liability coverage, the participant offered the opinion that the availability of multiple mechanisms could help keep prices down.<sup>61</sup>
- As compared to insurance, surety bonds or letters of credit provide bonding on the basis of credit principles, and a bond's expenses are covered by a bond premium set by the underwriters. Insurance on the other hand, has premiums based on expected payments, so if the expected costs for a GS project are unpredictable, then the premiums could be insufficient to cover the potential costs, and underwriters could refuse to write the policy or else require substantial collateral. For example, hardrock mining premiums are often 1-5% of the value of the bond with smaller firms having to pay 15-20% more and large firms paying less than 1% to obtain a surety bond. TX, CA and IL allow operators to post cash, surety bonds or certificates of deposit (CDs) to cover plugging at a cost ranging from \$4000-\$15,000 per well or "blanket" bonds to cover a whole well field up to 50 wells or so. CA has surety bonds, cash or CDs worth \$17 million on 240 bonds since January 2004, and 85% used cash to cover 49,153 wells and 502 orphaned wells. Illinois used surety bonds, cash, CDs and letters of credit for 32,100 wells of which an estimated 4,000 were abandoned. Texas used letters of credit, surety bonds and cash for a total \$221 million (5% cash, 32% surety bonds, 63% letters of credit and more are shifting towards surety bonds since new state regulations came into effect). Texas has 10,547 orphaned wells which may have had to be plugged using bond funds. Each state has its own provisions for when to release a bond (i.e., prior to closure or after proof of plugging, etc.).<sup>62</sup>
- Typically, bonds are used to guarantee performance of a known, future obligation. Bond agreements typically assume that the principal bears ultimate responsibility for the loss; the bond provider pays only if the principal is unable to do so because of insolvency or abandonment. Consequently, bond pricing is primarily a function of the principal's bankruptcy risk, and bonds tend to be priced as a simple percentage of their face value.<sup>63</sup>
- When bonds are issued to satisfy regulatory obligations, the coverage mandated by the regulations defines the bond provider's obligation. In cases where the regulatory requirement and the bond's language are in conflict, courts tend to favor the regulatory definition of coverage. Courts also accord little credence to a surety's claim of misunderstanding a surety agreement.<sup>64</sup>

### **Insurance**

- The cost of an insurance policy is driven by the premiums collected by the insuring party.<sup>65</sup> Premium costs are highly site-specific and depend on the underwriter's assessment of risks. Insurance policies would be developed specifically for each project; sites that are better suited for GS would be assessed as having lower risks of failure and would be priced accordingly.<sup>66</sup>

<sup>61</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09).

<sup>62</sup> Gerard, D, E.J, Wilson. 2008. Journal of Environmental Management 90 (1097-1105). Available online at [https://www.researchgate.net/journal/0301-4797\\_Journal\\_of\\_Environmental\\_Management](https://www.researchgate.net/journal/0301-4797_Journal_of_Environmental_Management)

<sup>63</sup> Boyd. 2001.

<sup>64</sup> Boyd. 2001.

<sup>65</sup> U.S. EPA OIG. 2001.

<sup>66</sup> U.S. EPA. Unpublished. Notes from EPA Webcast on Financial Responsibility for Geologic Sequestration Wells: Insurance (May 20, 2009).

- Insurers generally require a risk assessment prior to issuing a policy. Owners or operators generally pay for the risk assessment to be conducted, which can prove to be a financial burden for some firms.<sup>67</sup>
- Insurers typically pay the claims of both solvent and insolvent clients. This means that insurance is priced to reflect a greater likelihood and range of possible claims. Consequently, insurance is usually priced with much greater sensitivity to the risks presented by the insured than other mechanisms such as bonds.<sup>68</sup>
- During the FR webcasts, a participant expressed concern that with **captive insurance** companies were more likely to use “smoke and mirror” tactics to obtain approval because they could use company data as proof for their financial stability.

#### **Financial Test and Corporate Guarantee**

- During the FR webcasts, participants tended to agree that the self-insurance option was less expensive for companies because they did not have to tie up money in expensive financial mechanisms.<sup>69</sup>

#### **Escrow Account**

- Like trust funds, escrow accounts are funded by the owner or operator and thus are not technically purchased, but instead are administered by a third-party. Therefore, the total cost of the escrow account is the full cost of the environmental obligation for which financial assurance is being demonstrated plus the overhead costs. Escrow accounts typically have a defined administrative cost (included in the escrow agreement) associated with the account that is paid to the third-party administrator on an annual basis. The costs to establish the account average around \$5,000, and some financial institutions may have a minimum threshold (e.g., \$20,000 for unmanaged, and \$1,000,000 for managed accounts).<sup>70</sup> Depending on how the account is managed, escrow accounts may accrue enough interest to cover administrative costs, but will certainly accrue less interest than a trust fund.

### **5) What is the historical use of the instrument (e.g., variance in use over time)? For environmental obligations?**

#### **Trust Fund**

- Trust funds have been used to demonstrate financial responsibility under RCRA since approximately 1982 and have been recommended in guidance for Class II wells since 1990.<sup>71</sup>

#### **Standby Trust**

- Standby trust funds are not considered stand alone instruments, but have been used as a component of financial responsibility demonstrations under RCRA since approximately 1982 and have been recommended in guidance for Class II wells since 1990.<sup>72</sup>

<sup>67</sup> Porter, Winston. 1986. Liability Regulations. EPA. Available online at: <http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/1d2a50fa09eea3148525670f006c0081!OpenDocument>

<sup>68</sup> Boyd. 2001.

<sup>69</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>70</sup> Communication with Jeff Green, Wealth Management Group at Citizens Bank.

<sup>71</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

<sup>72</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

### **Letter of Credit**

- Letters of credit have been used to demonstrate financial responsibility under RCRA since approximately 1982 and have been recommended in guidance for Class II wells since 1990.<sup>73</sup>
- Letters of credit are widely used for RCRA financial assurance.<sup>74</sup>

### **Surety Bond**

- Bonds are required under the Surface Mining Control and Reclamation Act of 1977 for coal mining projects where they are known as reclamation bonds.<sup>75</sup>
- Surety bonds have been used to demonstrate financial responsibility under RCRA since approximately 1982 and have been recommended in guidance for Class II wells since 1990.<sup>76</sup>
- In areas with many Class II wells, banks may be accustomed to issuing surety bonds. Bonds may be used often because they are easy for operators to obtain and administer. They are frequently used during permitting.<sup>77</sup>
- Surety bonds are used regularly, especially in direct implementation programs.<sup>78</sup> Widely used for RCRA financial assurance.<sup>79</sup>

### **Insurance**

- Insurance has been used to demonstrate financial responsibility under RCRA since approximately 1982. However, it was not recommended in guidance for Class II wells in 1990.<sup>80</sup>
- Insurance has been used for environmental risk management since the 1957 Price-Anderson Act, which contained financial requirements for nuclear projects. Licensees are required to obtain maximum amount of private liability insurance available on the market, currently \$300 million (or show proof of comparable resources); licensees are strictly liable for “extraordinary nuclear occurrences.”<sup>81</sup>

### **Financial Test and Corporate Guarantee**

- Financial tests have been used to demonstrate financial responsibility under RCRA since approximately 1982 and have been recommended in guidance for Class II wells since 1990.<sup>82</sup>
- Widely used for RCRA financial assurance.<sup>83</sup>

### **Escrow Account**

- Escrow accounts have not been used for UIC well financial responsibility in the past, but have been used by the courts and by states for two financial responsibility purposes: first,

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<sup>73</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

<sup>74</sup> U.S. EPA OIG. 2001. Page 57.

<sup>75</sup> Gerard, D, E.J, Wilson. 2008. Journal of Environmental Management 90 (1097-1105). Available online at [https://www.researchgate.net/journal/0301-4797\\_Journal\\_of\\_Environmental\\_Management](https://www.researchgate.net/journal/0301-4797_Journal_of_Environmental_Management)

<sup>76</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

<sup>77</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells.

<sup>78</sup> U.S. EPA. Unpublished. Notes from EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Trust Funds, Letters of Credit, and Surety Bonds with Standby Trust Agreements (April 28, 2009)

<sup>79</sup> U.S. EPA OIG. 2001. Page 59.

<sup>80</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

<sup>81</sup> U.S. EPA. 2009. Summary of EPA Webinars on Financial Responsibility for Geologic Sequestration Wells. Available online at:

[http://www.epa.gov/safewater/uic/pdfs/meetings\\_uic\\_summarywebinars\\_financial\\_responsibility.pdf](http://www.epa.gov/safewater/uic/pdfs/meetings_uic_summarywebinars_financial_responsibility.pdf)

<sup>82</sup> For example, see 1982 RCRA guidance entitled “Financial Assurance for Closure and Post Closure Guidance Manual” or U.S. EPA. 1990.

<sup>83</sup> U.S. EPA OIG. 2001.

in many environmental liability court cases, firms have been compelled to provide funds to cover remediation costs of their contaminated properties; these funds are often held in an escrow account until the remediation can be performed. However, the escrow accounts are only active during the remediation period, which would typically be much shorter and better defined than some GS phases. Second, escrow accounts have been used by a few states (e.g., Massachusetts, Kentucky, and Michigan) as a financial mechanism for environmental activities when securing some type of permit. For example, in Massachusetts (MA), for a firm to secure a ground water discharge permit, it must secure the costs for the immediate repair or replacement of its privately owned wastewater treatment facility (e.g., at a mixed use residential/commercial building) in an escrow account. The agreement remains in place as long as the firm holds the permit from the state (although it is unclear how long this may be). The MA Department of Environmental Protection used letters of credit as a financial mechanism for this permit program, however due to issues with expiring or lagging letters of credit, the MA DEP now uses escrow accounts because they are more secure, and easier to transfer and monitor. The state has not yet needed to draw on the accounts as a result of enforcement actions.<sup>84</sup>

- The firm may also use a trust agreement for a capital reserve account as an alternate financial mechanism. As a second example, in Nebraska, the Department of Environmental Quality requires that waste tire haulers provide financial assurance for the removal, closure, and abatement of waste tires and materials. The waste tire hauler may use an escrow account as the financial assurance mechanism. The escrow agreement remains in place until the termination of the account by all parties to the agreement, or until the firm is no longer required to demonstrate financial responsibility under Nebraska law. In either example, the magnitude of the dollar amount in escrow and the time period that the funds are in escrow is likely to be significantly shorter than for some GS activities.

**6) Under what scenario is the instrument best or most commonly utilized (e.g., size of firm, cost, uncertainty)?**

**Surety Bond**

- Typically, bonds are used to guarantee performance of a known, future obligation. Bond agreements typically assume that the principal bears ultimate responsibility for the loss; the bond provider pays only if the principal is unable to do so because of insolvency or abandonment. Consequently, bond pricing is primarily a function of the principal's bankruptcy risk, and bonds tend to be priced as a simple percentage of their face value.<sup>85</sup>

**Insurance**

- It is in the public interest that the use of claims-made policies (those that provide coverage for claims presented to the insured and reported to the insurer during the coverage period) be accompanied by additional safeguards to provide assurance over long timeframes. For example, regulations may require that the coverage period of a claims-made policy be extended beyond the policy's cancellation date. Occurrence

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<sup>84</sup> Communication with Alan Slater of the MA DEP.

<sup>85</sup> Boyd. 2001.



policies cover claims arising even after the policy period has ended, providing the cause of the claim occurred during the policy period. Insurers like to avoid occurrence coverage, as a way to reduce the scale and enhance the predictability of their exposures. From the standpoint of public policy, however, occurrence coverage addresses the goals of assurance better than claims-made coverage.<sup>86</sup>

- Uncertain activities (e.g., future ground water contamination) tend to be assured via insurance coverage.<sup>87</sup>

### **Financial Test and Corporate Guarantee**

- Under RCRA, firms must have a net worth greater than \$10 million.<sup>88</sup>
- During the FR webcasts, participants indicated that a \$10 million threshold seemed low relative to a GS project for coverage under self-insurance. Many agreed that third-party mechanisms provide more protection than self-insurance. Regulators who use self-insurance have found that additional time is required to regulate due to the need to follow details about the company's financial health, and there are sometimes multi-level companies who have different responsibilities within the company regarding self-insurance. Also, within days of declaring bankruptcy, funds from the company are often no longer available to take care of a site. Finally, numbers can be manipulated within a company's record to make them look more financially sound, so accuracy in evaluating actual financial strength can be difficult.<sup>89</sup>

### **Escrow Account**

- Escrow accounts are typically used for short-term transactions in real estate, mergers and acquisitions, or hard asset loans, to compel the buyer to finalize the transaction. Based on current analysis, there is little information available to characterize how an escrow account is most commonly utilized for environmental liability or if escrow accounts are commonly utilized for long-term transactions. It is expected that a firm would have a stronger incentive to use trust funds or bonds, which are likely to accrue more interest over time, and be characterized as a "better" long-term investment for the firm.

## **7) Under what conditions does the instrument totally fail (e.g., cancelation or non-renewal, breach of contract, misrepresentation)?**

### **Trust Fund**

- During the FR webcasts, a participant suggested that a trust fund must be fully funded to be acceptable.<sup>90</sup>
- EPA OIG recommends that the third party providing financial assurance be financially independent from the activity being covered.<sup>91</sup>

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<sup>86</sup> Boyd. 2001.

<sup>87</sup> Boyd. 2001.

<sup>88</sup> U.S. EPA OIG. 2001.

<sup>89</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>90</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>91</sup> U.S. EPA OIG. 2001.

### **Standby Trust**

- The standby trust may fail if it is allowed to close prior to being funded and is therefore not available when needed.

### **Letter of Credit**

- A letter of credit could fail when a bank changes ownership and the letter of credit is transferred to a trust, but as long as the rating of the new bank is good, the financial responsibility demonstration could still be acceptable.<sup>92</sup>
- If the issuing institution fails, the credit is not available to fund remediation activities. Letters of credit are not insured by the FDIC.<sup>93</sup>
- Designed properly, beneficiaries can draw on the letter of credit if its term is not extended and if a replacement form of assurance is not put in place.<sup>94</sup>
- EPA OIG recommends that the third party providing financial assurance be financially independent from the activity being covered.<sup>95</sup>
- To avoid instrument failure by cancellation or non-renewal, under RCRA for Class I hazardous wells, the letter of credit must be irrevocable and issued for a period of at least 1 year. The letter of credit must provide that the expiration date will be automatically extended for a period of at least 1 year unless, at least 120 days before the current expiration date, the issuing institution notifies both the owner or operator and the Regional Administrator by certified mail of a decision not to extend the expiration date. Under the terms of the letter of credit, the 120 days will begin on the date when both the owner or operator and the Regional Administrator have received the notice.<sup>96</sup>

### **Surety Bond**

- If a surety issues a large number of bonds to facilities in one corporation, the surety bond risk might not be adequately diversified in terms of reinsurance.<sup>97</sup> A surety bond could fail if bond ratings are wrong.<sup>98</sup>
- Many bonds are “penal bonds” that authorize the forfeiture of an entire bond amount for failure to perform as agreed. As a result, even though the performance failure may have a relatively small cost, a larger bond sum can be collected by the government. This is by design, however, and is agreed upon mutually by the parties before the fact. Accordingly, penal bond collections represent a less worrisome form of confiscation, and more a penalty used to motivate compliance with performance standards.<sup>99</sup>
- Despite regulations that typically guard against the possibility of assessor insolvency by requiring U.S. Treasury certification of bond issuers, assessor provider bankruptcies are relatively common, and there is no insurance against an assessor’s financial failure.<sup>100</sup>
- Refusal of issuing entity to honor bond requirements.<sup>101</sup>

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<sup>92</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>93</sup> U.S. EPA OIG. 2001.

<sup>94</sup> Boyd. 2001.

<sup>95</sup> U.S. EPA OIG. 2001.

<sup>96</sup> 40 CFR 144.63(5)

<sup>97</sup> U.S. EPA OIG. 2001. RCRA FA review. <http://www.epa.gov/oig/reports/2001/finalreport330.pdf>

<sup>98</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>99</sup> Boyd. 2001.

<sup>100</sup> Boyd. 2001.

<sup>101</sup> U.S. EPA OIG. 2001.

- The overall assurance risk for EPA's surety bond mechanism is a function of the assurance risk for all firms and the failure rate for Circular 570 firms. Assurance risk is extremely low for firms in any net worth category.<sup>102</sup>
- To avoid instrument failure by cancellation or non-renewal, under RCRA, the Surety is required to notify both the Company and the Regulator by certified mail of its intent to cancel the bond. Under the terms of the bond, the surety may cancel the bond by sending notice of cancellation by certified mail to the owner or operator and to the Regional Administrator. Cancellation may not occur, however, during 120 days beginning on the date of the receipt of the notice of cancellation.<sup>103</sup>
- If the Company fails to provide alternate financial assurance and receive written approval of the new mechanism by the Regulator within 90 days, the Regulator can direct the Surety to pay up to the amount guaranteed by the bond into the standby trust fund.<sup>104</sup>
- EPA OIG recommends that the third party providing financial assurance be financially independent from the activity being covered.<sup>105</sup>

### **Insurance**

- Instruments should not be easily withdrawn by providers if costly environmental problems develop. In most situations, insurers and those insured voluntarily agree on cancellation terms and coverage exclusions. For instance, nonpayment of premiums is typically grounds for cancellation.<sup>106</sup> For Class I Hazardous wells, “the insurer may not cancel, terminate, or fail to renew the policy except for failure to pay the premium.”<sup>107</sup>
- UIC Class I Hazardous Wells the policy “must contain a provision allowing assignment of the policy to a successor owner or operator” that depends on the consent of the insurer.<sup>108</sup>
- One concern associated with insurance is that the policy may feature “exclusions” that weaken coverage. For this reason, regulators must carefully verify that policies fully cover the kinds of claims subject to assurance requirements. In general, contract law offers protections against the use of exclusions that are not voluntarily agreed to by the insured or by the beneficiaries of assurance. Misrepresentations of an insurance contract by an insurer (e.g., coverage when coverage was in fact excluded) are not tolerated.<sup>109</sup> RCRA requires that insurers do not include pre-existing conditions exclusions that would invalidate the purpose of the policy and/or are based on suspected rather than known pre-existing conditions. Pre-existing conditions exclusions must be specifically based on factual information known at the time the contract was entered into.<sup>110</sup>
- During the FR webcasts, one concern was that if an insurance company feels that the owner/operator did not disclose all of the available information about the project, then the policy is void from the beginning. There is a court case involving Zurich North America

<sup>102</sup> U.S. EPA. 1996.

<sup>103</sup> 40 CFR 144.63(b)(8) or (c)(8)

<sup>104</sup> U.S. EPA. 2009. United States Environmental Protection Agency RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Surety Bond. Available online at <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/sbond-fs.pdf>

<sup>105</sup> U.S. EPA OIG. 2001.

<sup>106</sup> Boyd. 2001.

<sup>107</sup> 40 CFR 144.63(e)(8)

<sup>108</sup> U.S. EPA. 2009. Summary of EPA Webinars on Financial Responsibility for Geologic Sequestration Wells. Available online at: [http://www.epa.gov/safewater/uic/pdfs/meetings\\_uic\\_summarywebinars\\_financial\\_responsibility.pdf](http://www.epa.gov/safewater/uic/pdfs/meetings_uic_summarywebinars_financial_responsibility.pdf)

<sup>109</sup> Boyd. 2001.

<sup>110</sup> Marcia Williams. 1987. EPA Guidance On Exclusions For Pre-Existing Conditions In RCRA TSDF Insurance Policies. Available online at: <http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/bc5ce94e1913f2b88525670f006c1844!OpenDocument>

and EPA. UIC does not have a provision for cancellation with notice for fraud.<sup>111</sup>

Webinar participants indicated that insurance companies can cancel for non-payment of premiums, and non-payment would likely occur in the case of bankruptcy<sup>112</sup>.

- EPA OIG recommends that the third party providing financial assurance be financially independent from the activity being covered.<sup>113</sup>
- Increased attention should be given to the use of **captive insurance** plans. Although captives are entirely appropriate as a risk-reduction tool for firms, they are inappropriate as a demonstration of financial assurance because the captive insurer's financial strength is tied to that of the parent company. Thus, unlike a third-party insurer, a captive insurer's ability to absorb claims is weakest when its strength is most needed—upon the insolvency of the parent. Some, but not all, assurance programs prohibit the use of captives as an assurance instrument. A problem for regulators is that identification of captive policies can be difficult because policies do not necessarily specify the insurer's structure.<sup>114</sup> Captive insurance will fail if parent company becomes insolvent.<sup>115</sup> As discussed in question #3, Captive insurance is prohibited as a financial assurance mechanism under Subtitle C of RCRA in the following states: AL, NY, TX, and VA. It is allowed in CA, CT, MO, OH, and WA.<sup>116</sup>

### **Financial Test and Corporate Guarantee**

- The problem with corporate guarantees is that there exists no financial instrument dedicated to environmental obligations. The degree to which a firm's assets are obligated to other liens or creditors may not be readily apparent. From a bookkeeping standpoint alone, it is very difficult to assess all the environmental obligations attached to a single firm. Firms often operate multiple facilities with multiple obligations in multiple jurisdictions. Adding up all these obligations and accounting for them properly is crucial for assessing a firm's ability to internalize costs years in the future. Environmental assurance accounting is a problem not only for regulators untrained in its subtleties, but for accountants themselves.<sup>117</sup>
- Bankruptcy of entity that has passed a Corporate Financial Test.<sup>118</sup>
- A participant stated that bond ratings might have been a good measure a year ago, but now several AAA-rated companies are receiving TARP money, so it may not be a good measure anymore.<sup>119</sup>
- If a company is bankrupt, some alternative mechanism to pay would be necessary, and financial tests are difficult to conduct on multi-level companies because it may not be clear which level of the company is responsible. Other drawbacks cited by webcast participants included the timeframe and need for updating the test over time. Some participants were concerned that if self-insurance (financial test or corporate guarantee) was eliminated as an option, the viability of GS may be limited, but self-insurance used

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<sup>111</sup> U.S. EPA. Unpublished. Notes from EPA Webcast on Financial Responsibility for Geologic Sequestration Wells: Insurance (May 20, 2009)

<sup>112</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>113</sup> U.S. EPA OIG. 2001.

<sup>114</sup> Boyd. 2001.

<sup>115</sup> U.S. EPA OIG. 2001.

<sup>116</sup> U.S. EPA OIG. 2001.

<sup>117</sup> Boyd. 2001.

<sup>118</sup> U.S. EPA OIG. 2001.

<sup>119</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

within a framework of industry-wide pooling of resources, could work. A participant noted that self-insurance may be sufficient while a company is doing very well financially, but if economic times change then failure is a possibility. A participant cited a case where a company passed the test and then nine months later went bankrupt. Therefore, participants argued that the financial test or corporate guarantee must be designed to be very conservative in selecting companies for self-insurance so that only the strongest companies are allowed to use self-insurance.<sup>120</sup>

- If a subsidiary uses a Corporate Guarantee from its parent company to provide RCRA financial assurance and the subsidiary subsequently becomes autonomous from the parent company, the Corporate Guarantee no longer satisfies RCRA financial assurance requirements. New financial assurance must be in place at the time the subsidiary becomes independent.<sup>121</sup>

#### **Escrow Account**

- To prevent failure, the third party providing financial assurance through the escrow account should be financially independent from the activity being covered.

### *B. Considerations for GS*

#### **8) Do states prohibit the use of certain mechanisms? How accessible is the instrument in states where GS is likely to take place?**

##### **Trust Fund**

- GS is likely to continue taking place in at least 18 states (AL, AZ, CA, CO, IL, KY, MI, MS, MT, NM, ND, OH, TX, UT, VA, WA, WV, and WY).<sup>122</sup> It does not appear that any of these states will prohibit the use of trust funds to cover environmental and other risks. It seems that this form of assurance (along with other cash /cash equivalents – i.e. letter of credit) is a preferred method as it is a very secure and many times is readily available.<sup>123</sup>
- As trust funds are funded by the Firm itself, they are very accessible if the firm has the capital to contribute to cash or cash equivalents. Kuipers (2003) mentions for projects with long-term closure costs, forms of cash are the most practical way to assure financial responsibility.<sup>124</sup>

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<sup>120</sup> U.S. EPA. Unpublished. Notes from EPA Webcast on Financial Responsibility for Geologic Sequestration Wells: Self-Insurance: Financial Test and Corporate Guarantee (May 26, 2009)

<sup>121</sup> U.S. EPA. 1984. Parent Company Guarantee For Newly Independent Company. Available online at:

<http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/a78bf6cc0672f5e08525670f006bbda8!OpenDocument>

<sup>122</sup> Based on DOE Regional Carbon Sequestration Partnership (RCSP) sites and other known sites.

<sup>123</sup> Kuipers, Jim. 2003. Putting a Price on Pollution – Financial Assurance for Mine Reclamation and Closure. Mineral Policy Center. MPC Issue Paper No. 4. March 2003. <http://www.earthworksaction.org/pubs/PuttingAPriceOnPollution.pdf>

<sup>124</sup> Kuipers. 2003

### **Letter of Credit**

- GS is likely to continue taking place in at least 18 states (AL, AZ, CA, CO, IL, KY, MI, MS, MT, NM, ND, OH, TX, UT, VA, WA, WV, and WY).<sup>125</sup> It does not appear that any of these states will prohibit the use of Letters of credit.

### **Surety Bond**

- GS is likely to continue taking place in at least 18 states (AL, AZ, CA, CO, IL, KY, MI, MS, MT, NM, ND, OH, TX, UT, VA, WA, WV, and WY).<sup>126</sup> It does not appear that any of these states will prohibit the use of surety. The State of Washington specifically allows surety bonds for GS facilities.<sup>127</sup>
- Historically, surety bonds have been readily accessible for environmental obligations. However, there is a potential due to increased costs and risk of unknown environmental obligations, that surety bonds may become more difficult to secure as an assurance mechanism. An example of increased difficulty in securing surety bonds is what has occurred regarding mining reclamation and that mining reclamation and closure bonds are considered high-risk. The increased risk for mining reclamation occurred due to uncertainty about bond duration, concerns about enforcement, along with realization that cleanup and closure of modern mines is significantly more expensive than initially projected.<sup>128</sup> There is a potential that access to surety bonds may be limited in certain GS situations and may be dependent upon the site characteristics and accuracy of cost projections.

### **Insurance**

- GS is likely to continue taking place in at least 18 states (AL, AZ, CA, CO, IL, KY, MI, MS, MT, NM, ND, OH, TX, UT, VA, WA, WV, and WY).<sup>129</sup> It does not appear that any of these states will prohibit the use of insurance to cover environmental and other risks. For example, private insurance is used in 26 states to cover some of the cost of cleaning up leaking underground storage tanks.<sup>130</sup> However, not all insurance products will be available in every state.
- **Captive insurance** is prohibited as RCRA financial assurance in under Subtitle C in the following states: AL, NY, TX, and VA. It is allowed in CA, CT, MO, OH, and WA.<sup>131</sup>

### **Financial Test and Corporate Guarantee**

- GS is likely to continue taking place in at least 18 states (AL, AZ, CA, CO, IL, KY, MI, MS, MT, NM, ND, OH, TX, UT, VA, WA, WV, and WY).<sup>132</sup> It does not appear that any of these states will prohibit the use of a Corporate Guarantee to cover geologic sequestration. Some states do not allow Corporate Guarantees for mining reclamation and they are not allowed under the Bureau of Land Management 3809 regulation or on federal lands administered by the U.S. Forest Service.<sup>133</sup>

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<sup>125</sup> Based on DOE Regional Carbon Sequestration Partnership (RCSP) sites and other known sites.

<sup>126</sup> Based on DOE Regional Carbon Sequestration Partnership (RCSP) sites and other known sites.

<sup>127</sup> State of Washington. 2008. Proposed Rule (Washington Administrative Code, Chapter 173-218, Underground Injection Control Program) Available online at <http://www.leg.wa.gov/pub/billinfo/2007-08/Pdf/Bills/Senate%20Bills/6001-s.pdf>

<sup>128</sup> Kuipers. 2003

<sup>129</sup> Based on DOE Regional Carbon Sequestration Partnership (RCSP) sites and other known sites.

<sup>130</sup> Source online at: <http://www.gao.gov/new.items/d07152.pdf>

<sup>131</sup> U.S. EPA OIG. 2001.

<sup>132</sup> Based on DOE Regional Carbon Sequestration Partnership (RCSP) sites and other known sites.

<sup>133</sup> Kuipers. 2003.

- Financial test and corporate guarantee can be readily accessible as an assurance mechanism. However, in some states the financial test amounts to very little support documentation and firms have continued to meet financial tests right up to the moment of their filing for bankruptcy protection.<sup>134</sup> Even though a Corporate Guarantee is accessible it doesn't guarantee the firm will have significant financial resources in the future.<sup>135</sup>

#### **Escrow Account**

- Because of their use in transactions and for holding money, escrow accounts are not likely to be prohibited in any states. However, states have different requirements for the maximum value that a lender (for mortgages) can ask to be put in escrow.

### **9) What factors make the instrument more/less easy for the regulator to review or use?**

#### **Trust Fund**

- Trust funds are already regulated under state and federal regulatory regimes.<sup>136</sup> They are liquid assets which potentially make them more attractive to regulators from an ease of use viewpoint. Some regulations (i.e., 40 CFR 264.143) stipulate that trustees be only those regulated or regularly examined by a federal or state agency. These requirements could lessen the trust's vulnerability to the insolvency of a financial institution acting as trustee.<sup>137</sup>

#### **Standby Trust**

- Standby trust funds are not considered stand alone instruments, however, see discussion on trust funds above.

#### **Letter of Credit**

- Letters of credit require regulators to spend less time monitoring the company as compared to insurance or other options. The success of the letters of credit depends on the company's relationship with the bank and the amount of liquid assets the company has<sup>138</sup> because a letter of credit can only be altered with the agreement of the purchaser, the provider, and the beneficiary. The credit provider does not generally pay out on claims. Rather, the purchaser indemnifies the bank, making the bank liable only if the purchaser defaults.<sup>139</sup> During the initial demonstration, letters of credit are roughly equivalent in review complexity compared to bonds or insurance. However, during EPA's FR webcasts, a participant and EFAB member indicated that EPA and States do not have legal resources to use letters of credit; he noted that surety bonds are a much better choice for that reason.<sup>140</sup>

#### **Surety Bond**

- During the FR webcasts, participants noted that when bonds and activities are worth well over a million dollars for wells, they require a significant effort every year for evaluation,

<sup>134</sup> Kuipers. 2003

<sup>135</sup> Mahan, Jeff. RCRA Financial Test and Corporate Guarantee. Department of Toxic Substances Control. Sacramento, California. [http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/upload/HWMP\\_FR\\_FinanTestCorpGuarantee.pdf](http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/upload/HWMP_FR_FinanTestCorpGuarantee.pdf)

<sup>136</sup> U.S. EPA OIG. 2001.

<sup>137</sup> Boyd. 2001.

<sup>138</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>139</sup> Boyd. 2001.

<sup>140</sup> U.S. EPA. Unpublished. Notes from EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Trust Funds, Letters of Credit, and Surety Bonds with Standby Trust Agreements (April 28, 2009)

especially with a change of ownership. In this respect, the mechanism may be less attractive compared to others due to convenience or applicability. An EFAB member commented that surety bonds stand “head and shoulders” above other options, however, surety bonds are more convenient than letters of credit and trust funds.<sup>141</sup>

- Surety bonds are usually purchased from an insurance company, but they are not insurance. Within RCRA, the surety company becomes liable for closure and post-closure only when the owner or operator fails to comply with closure or post-closure requirements.<sup>142</sup> Sureties usually pay out on claims only if the purchaser defaults so sureties are less liquid than letters of credit or trusts, and the regulator may find that they are less easy to use for that reason. Surety bonds may be used often because they are easy for owners or operators to obtain and administer, and are frequently used during permitting. Under most programs, surety companies must be certified by the U.S. Treasury Department to qualify as an acceptable source of assurance. Surety bonds, like letter of credit, cannot be cancelled unless prior notice is given to the regulator, and the government is the beneficiary of the bond in the event of default by the principal.<sup>143</sup> In areas with many Class II wells, banks may be accustomed to issuing surety bonds. If the regulator wants to draw on the bond for closure and/or post-closure care (as is currently applicable to RCRA), the Regulator must send a written notification to the surety that the company has failed to perform in accordance with the requirements of the Bond.<sup>144</sup> On the other hand, the state may have to litigate to obtain the funds. For example, in one case, years of litigation took place when an insurance company refused to comply with the terms of a performance bond for facility closure.

### **Insurance**

- During the FR webcasts, participants noted that insurance companies currently go through site-specific consultation and a methodology to estimate costs. Over time, insurers gain the ability to perform rigorous cost estimations. However, participants were concerned that for GS, insurers would be estimating costs for something that has never existed. In a future paper, EFAB will analyze failures and identify what works in the field, what works in the insurance industry, and how to handle proprietary business information. EFAB intends to give a set of operating principles set forth in a paradigm so that it’s mathematically certain that it will work.<sup>145</sup>
- Insurance can be difficult to evaluate and monitor<sup>146</sup> for a regulator. Since insurance is primarily regulated by states, differences in state regulations contribute to the complexities regulators would face in evaluating insurance policies. For group insurance, states and the federal government could build from IRS criteria based on how insurance is financed for various rated and unrated organizations. Since regulators are not privy to an insurance company’s site-specific evaluation of its insurance policy objectives, regulators may have a difficult time understanding the complexities of what the policy will cover. Also, insurance companies may not always provide a transparent policy for ease of use and review by a regulator. For example, in NY, a robust insurance

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<sup>141</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells. Comments by instrument. (Version 10-21-09)

<sup>142</sup> U.S. EPA OIG. 2001.

<sup>143</sup> Boyd. 2001.

<sup>144</sup> U.S. EPA. 2009. United States Environmental Protection Agency RCRA Subtitle C Financial Assurance Instrument Fact Sheet: Surety Bond. Available online at <http://www.epa.gov/waste/hazard/tsd/td/ldu/financial/documents/sbond-fs.pdf>.

<sup>145</sup> Unpublished. 2009, Cadmus notes on EPA Environmental Financial Advisory Board Meeting, March 16-17, 2009.

<sup>146</sup> U.S. EPA OIG. 2001.



commissioner established criteria that have not prevented financial problems from occurring between the insured and insurers. There is another factor that can make insurance and other third party FR mechanisms difficult for regulators to use; GS project owners and operators will be influenced by market forces in selecting their insurance policy, rather than an insurance company's eligibility criteria, and some insurance companies will be better than others. If market forces impact the quality and eligibility of an insurance company, then it will be left to regulators to interpret policies and make difficult judgment calls on whether the insurance is adequate. This complexity for regulators is a drawback of insurance. Even if EPA made a list of qualified insurance providers, such a list may not be good for 50 years into the future.<sup>147</sup>

### **Financial Test and Corporate Guarantee**

- Financial tests and corporate guarantees are designed to determine whether a company has adequate liquid assets to demonstrate financial responsibility. Federal regulations (applicable to RCRA) allow financial test requirements to be met for the company by use of a corporate guarantee that is provided by a third party company with strong ties (corporate parent, sibling company) to the original company. After evaluating the test or guarantee, a regulator would need to conduct at least annual updates to try to predict whether a company will remain solvent, so regulators would have to take the time necessary to evaluate the tests and keep updated in order to predict future problems with the company. Self-demonstration requires the government to monitor the firm's financial condition over time. Accordingly, regulators must regularly audit these financial data to determine their accuracy and adequacy. Note, however, that corporate financial auditing is not a traditional strength of environmental regulators.<sup>148</sup> A Corporate Financial Test may be difficult to review or use because of "company mergers and acquisitions, difficulties in predicting the long-term survivability of individual firms, and evaluating financial test submissions from firms with facilities in many states. OIG suggested a future national database that could track financial status for the purpose of FR to make it easier for regulators to track and to find updated information."<sup>149</sup> Regulating corporate guarantees is a daunting task that may involve interpretation, verification, and monitoring of the financial tests over time requiring either significant in-house accounting expertise or reliance on third-party audits.<sup>150</sup>

### **Escrow Account**

- Escrow accounts are relatively secure, while remaining liquid, and would be managed by a single bank, making them easy to evaluate. However, there is less incentive for a firm to use an escrow account over a trust fund, because the interest accrued over time will be limited when compared to a trust fund. Furthermore, escrow accounts have not yet been used for environmental liability projects with a magnitude comparable to a GS project.

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<sup>147</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>148</sup> Boyd. 2001.

<sup>149</sup> U.S. EPA OIG. 2001.

<sup>150</sup> Boyd. 2001.

**10) What is the likely total administrative burden for EPA or the state regulator (e.g., initial and/or annual reviews)? What is the complexity of the review?**

**Trust Fund**

- Webcast participants indicated that trust funds may have a lower administrative burden than other instruments because they do not require that the financial health of the assuring entity be monitored constantly.<sup>151</sup>
- The total administrative burden for a FR demonstration using a trust fund is driven by (1) the initial demonstration, (2) monitoring the fund's valuation during the pay-in-period, if it is allowed, (3) ensuring that the fund's valuation matches revised cost estimates (annual valuation and periodic readjustment), and (4) the termination of the trust fund. The initial demonstration would require a review of the submitted paperwork, but no review of the trustee's financial condition, as long as the Director is confident in the respective state or federal regulator's review of the third-party. Monitoring the fund's valuation during the pay-in-period is necessary for ensuring that fund provides total coverage for estimated costs on the agreed upon schedule. A lack of monitoring would increase the risk of funding shortfalls. The burden associated with the termination of the trust fund would be a one-time occurrence, taking place either to fulfill unmet obligations, or to reimburse the owner or operator. Because funds in a trust are set aside and dedicated to a specific activity they are liquid, and the Director is unlikely to have any challenges accessing the funds.

**Standby Trust**

- Although standby trust funds are not considered stand alone instruments, when used in conjunction with a letter of credit or surety bond the total administrative burden would include (1) ensuring the fund's existence as a standby (annual valuation), and (2) the termination of the standby trust. The burden associated with the termination of the trust fund would be a one-time occurrence, taking place either to fulfill unmet obligations, or to reimburse the owner or operator.

**Letter of Credit**

- Webcast participants said that letters of credit work fairly well and are less of a burden for implementation.<sup>152</sup>
- The MA DEP noted that letters of credit have historically been difficult to review due to lags and expirations. The state has since switched to using escrow accounts.<sup>153</sup>
- The total administrative burden for a FR demonstration using a letter of credit is driven by (1) the initial demonstration, (2) ensuring that the letter of credit's valuation matches revised cost estimates (annual valuation and periodic readjustment), and (3) the return of the letter of credit. Because of the letter of credit may be issued for a period as short as one year, the creditor has the option not to renew the agreement on an annual basis. For long-term obligations associated with GS, the number of opportunities for non-renewal may be high and may result in the need for re-demonstrations by the owner or operator if their financial condition fluctuates greatly before the environmental obligation is

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<sup>151</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells. Comments by instrument. (Version 10-21-09)

<sup>152</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells. Comments by instrument. (Version 10-21-09)

<sup>153</sup> Communication with Alan Slater, MA DEP.

fulfilled. The initial demonstration would require a review of the submitted paperwork, but no review of the trustee's financial condition, as long as the Director is confident in the respective state or federal regulator's review of the third-party. The burden associated with returning the letter of credit if the owner or operator fulfills its obligations is minimal. However, if the Director needs to draw on the letter of credit, the funds come from the third-party itself (funds are not set-aside), therefore accessing the funds may require negotiation or litigation.

### **Surety Bond**

- A webcast participant suggested that surety bonds are less of a burden for implementation than other instruments. However, they may be difficult to manage over the long term if there are changes in ownership. Also, a bond for a large sum (well over a million dollars) can require significant effort every year for evaluation, also in the case of changes in ownership.<sup>154</sup>
- The total administrative burden for a FR demonstration using a surety bond is driven by (1) the initial demonstration, (2) ensuring that the bond's valuation matches revised cost estimates (periodic readjustment), and (3) the cancellation of the bond. Because the surety has the opportunity to cancel the agreement, there may be a need for re-demonstrations by the owner or operator if their financial condition fluctuates greatly before the environmental obligation is fulfilled. The initial demonstration would require a review of the submitted paperwork, but no review of the trustee's financial condition, as long as the Director is confident in the respective state or federal regulator's review of the third-party. The burden associated with the cancellation of the bond if the owner or operator fulfills its obligations is minimal. However, if the Director needs to draw on the surety bond, the funds or the completion of obligations come from the third-party itself (funds are not set-aside); accessing the funds may require negotiation or litigation.

### **Insurance**

- OSW guidance suggests EPA or authorized states conduct periodic reviews of basic policy language to ensure that only acceptable pre-existing condition exclusions are used.<sup>155</sup>
- Insurance language can be complex, and regulators may not have the necessary expertise to interpret insurance policies.<sup>156</sup>
- The total administrative burden for a FR demonstration using insurance is driven by (1) the initial demonstration, (2) ensuring that the policy's coverage is adjusted along with revised cost estimates (periodic readjustment), and (3) the cancellation or use of insurance. The insurance company can cancel the policy; therefore, there may be a need for re-demonstrations by the owner or operator if their estimated costs or financial condition fluctuates greatly before the environmental obligation is fulfilled. The initial demonstration would require a review of the submitted insurance policy, but no review of the trustee's financial condition, as long as the Director is confident in the state regulator's review of the third-party. The burden associated with reviewing the insurance policy may be substantive due to variations among policies (i.e., site specific policies,

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<sup>154</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells. Comments by instrument. (Version 10-21-09)

<sup>155</sup> Marcia Williams. 1987. EPA Guidance On Exclusions For Pre-Existing Conditions In RCRA TSDI Insurance Policies. Available online at: <http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/bc5ce94e1913f2b88525670f006c1844!OpenDocument>

<sup>156</sup> U.S. EPA OIG. 2005.

varying requirements by state). The burden associated with the cancellation of the insurance policy if the owner or operator fulfills its obligations is minimal. However, if the Director needs to draw on the insurance policy, the funds or the completion of obligations come from the third-party itself (funds are not set-aside); accessing the funds may require negotiation or litigation.

### **Financial Test and Corporate Guarantee**

- Corporate financial tests must be reevaluated and re-administered on a particular schedule, creating administration costs for regulating agencies and regulated entities.<sup>157</sup>
- The total administrative burden for a FR demonstration using a financial test is driven by (1) the initial demonstration, and (2) annual reevaluations. The initial demonstration would require a review of the submitted financial statements and calculation in a direct review of the owner or operators financial condition. Therefore, unlike third-party mechanisms, it is the Director reviewing the financial condition of the owner or operator instead of a third-party. The burden associated with reviewing the owner or operator's financial condition may be substantive to check that financial calculations (ratios) and other financial documents (bond ratings, or annual statements) are complete and accurate. There is no additional burden if the owner or operator fulfills its obligations. However, if the owner or operator fails to perform its obligations the Director can only pursue negotiations or litigation necessary to complete the required activities.

### **Escrow Account**

- The total administrative burden for a FR demonstration using an escrow account is likely to be greater than the burden for trust funds until the instrument has a longer history of being used for FR demonstration. The regulator would need to work closely with the owner or operator and the escrow agent to ensure that the instrument was established with provisions that work for the type of GS activity and timeframe required.

## **11) Which GS phase(s) is the instrument best suited for? (Considering short- or long-term application)**

### **Trust Fund**

- The strengths of trust funds are based on a fully-funded trust, which fully insulates the risk to the public of the owner or operator failing (for certain environmental activities). To the extent there is a pay-in period, these strengths are diminished because the owner or operator could fail prior to the trust becoming fully funded.
- For well-defined activities lacking “environmental risk” (i.e., certain to occur) such as well plugging, post-injection site care, and site closure, a fully-funded third-party trust minimizes the risk to the public of paying for these activities. As a result, it implies that trust funds are the most costly to the owner or operator who must deposit the funds in advance and pay for the administrative costs of the trust on an ongoing basis. Risk is limited to (1) investment risk (although one can choose the relative riskiness of the trust's investment portfolio), (2) risk from the failure of the trustee firm, and (3) risk of cost escalation.

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<sup>157</sup> U.S. EPA OIG. 2001.

- For activities with uncertain frequency and costs, such as emergency and remedial response, trust funds may perform poorly because the pool of funds in a trust does not respond to contingencies outside those embedded into the cost estimate.
- For activities that continue over the long-term (i.e. post-injection site care, site closure, and emergency and remedial responses in the post-injection site care period), trust funds are fairly reliable. During the FR webcasts, at least one state planned to use trust funds for longer-term phases of GS, and several webcast participants indicated that trust funds were less risky than insurance policies that require the owner or operator to continue paying premiums in order to continue coverage.
  - However, two webcast participants expressed concern that trust funds may not be the best instrument for longer term closure and monitoring phases.<sup>158</sup>
- For the case of uncertain long-term activities (i.e. emergency and remedial responses), the above analysis of uncertainty and timing can be combined. Funds will be available in the trust, but it is likely that there will be too little funds (in which case the public is worse off because it must pay for any environmental obligations) or too much money in trust (an inefficient use of funds that unnecessarily raises GS costs).

### **Standby Trust**

- Standby trusts are not considered stand alone instruments. They are used exclusively for the short term fulfillment of environmental obligations.

### **Letter of Credit**

- During the FR webcasts, participants discussed the appropriateness of instruments for various project phases and noted that letters of credit would apply to construction and operation, but probably are not suited for closure or the monitoring phase. It was uncertain whether the letter of credit would still be useable after 40 or 50 years.<sup>159</sup>
- Widely used for RCRA financial assurance during hazardous waste landfill closure and post-closure care.<sup>160</sup>
- For letters of credit a bank evaluates that an owner or operator is financially strong enough for the bank to pay for its obligations in the event of the failure of the owner or operator. The administrative burden of determining creditworthiness is paid for by the owner or operator (instead of being paid for by the government). Two other features of letter of credit are the credit limit (i.e. a limit to what the creditor covers), a fee paid for by the owner or operator to obtain this credit backing (a small fraction of the credit limit, as well as deposited collateral). Hence, letters of credit are also similar to surety bonds – their cost is a function of the credit limit, the financial health of the owner or operator, and risks faced by the owner or operator.
- Letters of credit perform equally well for certain and uncertain environmental activities, so long as the credit limit is not exceeded. Importantly, the risk of exceeding the limit is not pooled across owners or operators.
- For activities that continue over the long-term (i.e. post-injection site care, site closure, and emergency and remedial responses), letters of credit may be less effective than other instruments because they are granted for an annual period, upon which the creditor

<sup>158</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>159</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>160</sup> U.S. EPA OIG. 2001.

reconsiders extension (although there may be automatic renewal), and the risks of shocks to creditworthiness are not pooled across owner or operators.

### **Surety Bond**

- During the FR webcasts, participants noted that surety bonds have uncertain long-term (closure and monitoring) applicability if these instruments must be drawn upon in 40 or 50 years. Other participants suggested that a forfeiture bond would be more appropriate for long-term care than insurance.<sup>161</sup> It is worth noting that surety bonds are widely used for RCRA financial assurance when a hazardous waste landfill is active.<sup>162</sup>
- As time horizons expand, surety providers are unlikely to underwrite bonds over longer time horizons where there is considerable uncertainty. GS projects that intend to use surety bonds should be able to “clearly delineate timeframes and levels of responsibility.” Bonding for GS projects is likely to be an effective financial mechanism if transaction costs are low and with “well-defined agreements and agreed upon definitions of compliance and non-compliance, a high probability of detecting non-compliance, a limited number of contracting parties, and a well-defined time horizon for regulatory compliance.”<sup>163</sup>
- A surety company pays-out on its surety bond, up to a certain limit, in the event of failure of the owner or operator. Unlike banks offering letters of credit, surety companies are more focused on pooling the risk of failure across owners or operators – perhaps through the surety company’s purchase of insurance. There can be more investment risk with a surety bond than with a trust fund, because the surety company’s investment strategy cannot be specified by EPA (unlike for a trust fund); however, because the surety company is more risk averse than a bank, the investment risk is lower than a letter of credit.
- Surety bonds perform equally well for certain and uncertain environmental activities – as long as their limit is not exceeded. For uncertain environmental activities, surety bonds may not handle the numerous scenarios for environmental obligations as well as insurance because their structure of contingency payments is different than it is for insurance.
- For activities that continue over the long-term (i.e. post-injection site care, site closure, and emergency and remedial responses), surety bonds are as reliable as the surety company itself. As a result, surety companies may be reluctant to offer long-term surety bonds.
- Note that **blanket bonds**, where all of an owner or operator’s sites are covered under a single bond (as if it were a single site), are inferior because they do not cover the full scale of the owner or operator environmental obligations and hence present a much higher risk of the public paying for the owner or operator’s environmental obligations.<sup>164</sup>

### **Insurance**

- For activities with uncertain frequency and costs, such as emergency and remedial response, insurance is the ideal instrument for diversifying environmental risk and

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<sup>161</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>162</sup> U.S. EPA OIG. 2001.

<sup>163</sup> Gerard, D, E.J, Wilson. 2008. Journal of Environmental Management 90 (1097-1105). Available online at [https://www.researchgate.net/journal/0301-4797\\_Journal\\_of\\_Environmental\\_Management](https://www.researchgate.net/journal/0301-4797_Journal_of_Environmental_Management)

<sup>164</sup> Boyd. 2001.

handling the numerous scenarios possible in this GS phase. Moreover, insurance companies internalize much of the administrative burden of overseeing owners or operators by creating the incentive for reducing uncertain environmental risks due to improved technology and/or management.<sup>165</sup>

- However, because insurance payments cover the most contingencies, insurance policies can be complicated and have a high administrative burden.
- The biggest issue for insurance is timing. Insurers prefer to restrict the scale, timeframe, and predictability of their exposures. For instance, insurers prefer policies that cover claims made during the coverage period (preferable the period of time during which the owner or operator is paying premiums) and avoid policies that cover claims arising after the policy's coverage period has ended.<sup>166</sup>
  - Insurance can be used for either short-term or long-term applications depending on the terms of the policy. It is expected that shorter terms with finite policies will be easier to obtain, while longer-term policies that cover broader areas will be more expensive and harder to obtain.
- During the FR webcasts, participants suggested that insurance probably works best in the operational phases of a GS project because the activities and timeframe are well-defined, and hopefully, the project is fully covered by insurance thereby lowering risk. However, for long-term phases, insurance is less likely to be useful due to either a company going out of business or leaving the business at the end of the operational phase.<sup>167</sup>
- The insurance company Zurich has developed what they call the Geologic Sequestration Financial Assurance plan which covers closure and post-closure costs, and a CCS liability plan which covers pollution event liability, business interruption, control of well, transmission liability, and geomechanical liability.<sup>168</sup>
- During the FR webcasts, a participant said that insurance probably works best for the operational phases of a facility. During the injection operations, the activities are not unusual technological activities (with the exception of sequestering the carbon dioxide). According to the participant, insurance becomes problematic during site closure and post-closure care. The participant wondered how an insurer ensures financial responsibility for that period of time. He suggested that a forfeiture bond, surety bond, or trust fund would be more appropriate. Another participant agreed that insurance would be a viable option through well construction.<sup>169</sup>
- For well-defined activities lacking “environmental risk” (i.e., certain to occur) such as well plugging, post-injection site care, and site closure, insurance may be less appropriate because there is no environmental risk to diversify. In effect, insurance on certain activities is conceptually similar to a surety bond.
- Note that **captive insurance**, where the insurer is an owner or operator's parent firm. However, because the insurance company is not owned by a third party, captive insurance inherits the risks of self-insurance.

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<sup>165</sup> Boyd. 2001.

<sup>166</sup> Boyd. 2001.

<sup>167</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>168</sup> Presentation at the United States Energy Association by Lindene Patton. and Zurich. 2009. The Climate Risk Challenge: The role of insurance in pricing climate-related risks. Zurich Financial Services Group. Available online at: <http://www.zurich.com/NR/rdonlyres/E2B5B53E-11DB-47AF-91E4-01ED6A2BDCA3/0/ClimateRiskChallenge.pdf>

<sup>169</sup> U.S. EPA. 2009. Notes from Webcasts on Financial Responsibility for Geologic Sequestration Wells. Unpublished notes from May 20, 2009 Insurance webcast.

## **Financial Test and Corporate Guarantee**

- In an EPA analysis of RCRA subtitle C and D corporate financial tests, the estimated financial assurance risk to the public (of having to pay for the environmental obligations of a owner or operator) is an order of magnitude higher when self-insurance is used than when a third party instrument is used.<sup>170</sup>
- During the FR webcasts, participants stated that self-insurance is good while the company is making money, but if the economy slows, or a company fails, then the ability to pay for long-term phases may not be adequate.<sup>171</sup>
- Widely used for both short-term and long-term RCRA financial assurance.<sup>172</sup>
- Self-insurance FR demonstrations are equivalent to a waiver of third-party instruments for large and historically financially stable firms. If the firm's net worth is large enough and its risk of failure low enough, the government effectively guarantees the fulfillment of environmental activities in event of the owner or operator's failure. For this reason, self-insurance is a very controversial means for demonstrating financial responsibility.
- The financial test and corporate guarantee could be used for any or all GS activities and phases. The historical justification for self-insurance is to minimize the sum of the costs to the public and the costs to industry. Because of the comparatively higher risk, a public policy rationale should factor in to the decision to allow self-insurance demonstrations GS activities requiring financial responsibility. Therefore, the primary reason to admit self-insurance is to promote GS as a matter of public policy. When a self-insured company fails the fundamental purpose of FR—ensuring that the polluter pays—is thwarted because the public bears the risk of any unfulfilled obligations.
- Another factor to consider in allowing self-insurance demonstrations for FR is market spillover effects. Because only larger low-risk firms qualify for self-insurance, the cost of risk-pooled private FR instruments (i.e., insurance) will be much higher because the higher risk or smaller firms will be in need of third-party FR instruments. This may provide firms utilizing self-insurance with a comparative advantage and may also inhibit the development of robust third-party instrument markets, especially in the early years of commercial GS activity.

## **Escrow Account**

- Escrow accounts perform almost exactly like trust funds and hence similarly suited for GS activities.<sup>173</sup> The difference between the two FR instruments is that escrow accounts have a lower cost to set up, less oversight (trust funds cost more to set up because resources are spent on setting up stronger oversight), may not allow a pay-in period, and their funds are kept in a highly liquid form (a simple interest bearing account like a savings or money market account at a bank) which costs little to oversee but causes escrow accounts to generate minimal interest. As a result, escrow accounts are usually utilized for short-term transactions in real estate, tax payments, mergers and acquisitions, fulfillment of court orders, and for hard-asset loans to serve as a commitment device that compels the depositor to not renege on an agreement. In the case of GS, where the relative time horizon is measured in decades, a trust fund's investment strategy is likely

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<sup>170</sup> U.S. EPA. 1996.

<sup>171</sup> U.S. EPA. Unpublished. Analysis of Outcomes of EPA Webcasts on Financial Responsibility for Geologic Sequestration Wells: Comments by instrument. (Version 10-21-09)

<sup>172</sup> U.S. EPA OIG. 2001.

<sup>173</sup> Kuipers 2003, and Boyd. 2001.



to outperform an escrow account in terms of accrued interest. As a result, there may be no benefit (or actually greater costs) to using an escrow account instead of a trust fund.

Therefore, escrow accounts are likely only to be used for the shortest-term activities such as phased corrective action or for serving as a temporary account akin to standby trusts.

**12) For each GS phase, can the specific weaknesses of an instrument be minimized by combining it with another mechanism?**

**Trust Fund**

- Trust funds, letters of credit, surety bonds guaranteeing payment, and insurance can be combined for a facility if together their value is at least equal to the closure or post-closure cost estimate. Surety bonds guaranteeing performance, financial tests, and corporate guarantees cannot be combined.<sup>174</sup>
- Trust funds may work most effectively for well-defined activities and phases such as corrective action, injection well plugging, and post-injection site care and site closure. However, the uncertain frequency and costs associated with emergency and remedial response may not match the trust fund's relatively fixed value (i.e., response activities may be more or less than estimated costs) and may occur with an unknown timing. The unknown timing of response activities could create problems if the trust is not fully funded when response activities are needed. For emergency and remedial response it may be possible to combine a trust fund with another third-party mechanism to split up potential costs. That is, use the trust fund for response activities up to a pre-established value, versus the trust fund plus another third-party instrument for response activities costing more than what is available in the trust fund. By pursuing this approach the owner or operator uses the trust fund as set-aside financing to cover lower-cost activities, and purchases risk assurance (letter of credit, surety bond, insurance) to make up the difference for high cost activities. However, from the Director's perspective, the additional burden and complication from reviewing more than one instrument may be undesirable.

**Letter of Credit**

- Trust funds, letters of credit, surety bonds guaranteeing payment, and insurance can be combined for a facility if together their value is at least equal to the closure or post-closure cost estimate. Surety bonds guaranteeing performance, financial tests, and corporate guarantees cannot be combined.<sup>175</sup>
- Letters of credit may work most effectively for well-defined activities, near term activities, and phases such as corrective action or injection well plugging. However, the longer-term nature of post-injection site care and site closure and the uncertain frequency and costs associated with emergency and remedial response may not match value of the letter of credit. Changes in financial markets and changes in the owner or operator's credit rating may affect the cost and availability of letters of credit. For post-injection site care and site closure, it may be possible to combine a letter of credit with a trust fund to split up potential costs covered by the credit provider (i.e., the bank). This may provide additional stability and lower risk from the creditor's perspective. For response activities,

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<sup>174</sup> U.S. EPA OIG. 2005.

<sup>175</sup> U.S. EPA OIG. 2005.

it may be possible to utilize insurance to manage the uncertainty associated with cost. However, from the Director's perspective, the additional burden and complication from reviewing more than one instrument may be undesirable.

### **Surety Bond**

- Trust funds, letters of credit, surety bonds guaranteeing payment, and insurance can be combined for a facility if together their value is at least equal to the closure or post-closure cost estimate. Surety bonds guaranteeing performance, financial tests, and corporate guarantees cannot be combined.<sup>176</sup>
- Surety bonds may work most effectively for well-defined activities and phases such as corrective action, injection well plugging, and post-injection site care and site closure. However, the uncertain frequency and costs associated emergency and remedial response may not match the surety bond's fixed value (i.e., response activities may be more or less than estimated costs). For emergency and remedial response it may be possible to combine a surety bond with a trust fund to split up potential costs. That is, use the trust fund for response activities up to a pre-established value (that the owner or operator can afford to set aside) and then use the surety bond for response activities with more predictable costs. By pursuing this approach, the owner or operator uses the trust fund as set-aside financing to cover low-cost activities, and purchases a surety bond to make up the difference for high cost activities. However, from the Director's perspective, the additional burden and complication from reviewing more than one instrument may be undesirable.

### **Insurance**

- Trust funds, letters of credit, surety bonds guaranteeing payment, and insurance can be combined for a facility if together their value is at least equal to the closure or post-closure cost estimate. Surety bonds guaranteeing performance, financial tests, and corporate guarantees cannot be combined.<sup>177</sup>
- Insurance is likely to be most suitably matched to manage the uncertain frequency and costs associated with emergency and remedial response. However, the well-defined activities and phases such as corrective action, injection well plugging, and post-injection site care and site closure may also be managed by insurance. Owners or operators could lower their insurance premium payments by setting money aside in a trust fund or escrow account to pay for activities up to a pre-established value (that the owner or operator can afford to set aside) and then use insurance to cover remaining costs in the event the owner or operator fails to perform. This may provide additional stability and lower risk from the insurance company's perspective. However, from the Director's perspective, the additional burden and complication from reviewing more than one instrument may be undesirable.

### **Financial Test and Corporate Guarantee**

- N/A. The primary driver for utilizing the financial test and corporate guarantee is to avoid the use of the other third-party mechanisms.

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<sup>176</sup> U.S. EPA OIG. 2005.

<sup>177</sup> U.S. EPA OIG. 2005.

### **Escrow Account**

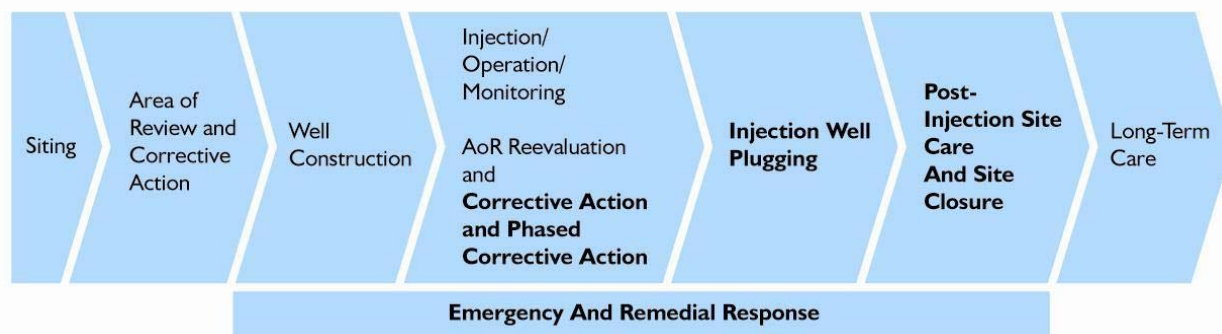
- Escrow accounts may work most effectively for near-term activities and phases such as corrective action or emergency and remedial response during injection. The longer time periods associated with all other GS phases make escrow accounts a relatively undesirable mechanism. Although any of the instruments could be combined with an escrow account over the long-term, it may be more desirable from both the perspective of the owner or operator, and the regulator, to simply utilize another instrument (or combination of third party instruments such as insurance, surety bonds or letters of credit).

## 4. Rationale for Financial Responsibility Instrument Selection

### I. Introduction

The rule “Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO<sub>2</sub>) Geologic Sequestration (GS) Wells” establishes a new Class VI well with specific requirements for the underground injection of CO<sub>2</sub> for the purpose of GS. The rule contains specific provisions for owners or operators of GS wells to demonstrate and maintain financial responsibility for corrective action on wells in the Area of Review (AoR), injection well plugging, post-injection site care and site closure, and emergency and remedial response. Figure 4.1 shows the various phases of a GS project; the activities for which financial responsibility must be demonstrated are shown in bold.

**Figure 4.1: GS Project Activities**



*\*Please note that the timeframes in this exhibit are not to scale. Activities for which financial responsibility must be demonstrated are shown in bold. Financial responsibility demonstrations will coincide with permitting (or revisions made after permitting), therefore Area of Review and Corrective Action prior to permitting (i.e., prior to well construction) are not activities for which financial responsibility must be demonstrated.*

EPA will describe the types of financial instruments that owners or operators can use to meet the requirement in GS Class VI Guidance entitled “Financial Responsibility for Class VI Wells.” This paper provides EPA’s rationale for making decisions on the financial instruments recommended for Class VI financial responsibility demonstrations. The intended audience is GS well owners or operators, EPA and state regulators, and the general public.

### A. Summary

EPA based its decision making with emphasis on USDWs protection on an analysis of (1) the potential for instrument failure, and (2) resource implications for owners or operators and Directors (see a summary of EPA’s research and preliminary analysis, including input from GWPC and EFAB in Appendix A). In its evaluation, EPA considered a broad set of instruments for financial responsibility demonstrations: trust funds, letters of credit, surety bonds, insurance policies, escrow accounts, and financial tests and corporate guarantees. Based on the analysis of these instruments, Table 4.1 indicates the relative suitability of the various financial responsibility demonstrations for each project activity.

**Table 4.1: Instruments Best Suited for GS Activities**

Corrective Action	Injection Well Plugging	Post-injection Site Care and Site Closure	Emergency and Remedial Response
<ol style="list-style-type: none"> <li>1. Trust fund</li> <li>2. Letter of credit</li> <li>3. Surety Bond</li> <li>4. Escrow Account</li> <li>5. Financial test and corporate guarantee*</li> </ol>	<ol style="list-style-type: none"> <li>1. Trust fund</li> <li>2. Letter of credit</li> <li>3. Surety Bond</li> <li>4. Insurance</li> <li>5. Financial test and corporate guarantee*</li> </ol>	<ol style="list-style-type: none"> <li>1. Trust fund</li> <li>2. Insurance</li> <li>3. Financial test and corporate guarantee*</li> </ol>	<ol style="list-style-type: none"> <li>1. Insurance</li> <li>2. Letter of Credit**</li> <li>3. Surety Bond**</li> <li>4. Financial test and corporate guarantee*</li> </ol>

\*Financial tests and corporate guarantees present the lowest direct costs to owners or operators but the highest risk to the public. Therefore, the reason to allow financial responsibility demonstrations utilizing this instrument is to enable GS as a matter of public policy.

\*\*Letters of credit and surety bonds are likely most appropriate for emergency and remedial response during operation phases.

The sections that follow address the following topics:

- The historical precedent and context for using trust funds, letters of credit, surety bonds, insurance, escrow accounts, and financial tests and corporate guarantees for financial responsibility demonstrations.
- The factors leading to instrument failure, which ultimately result in costs to the public.
- The resource implications, to the owner or operator and the Director, associated with utilizing the financial responsibility instruments.
- Additional information explaining which instruments EPA recommends for particular GS activities and why.

## *II. Historical Precedent*

All of the instruments EPA considered have been used previously for financial responsibility demonstrations. Several of the instruments have been used in the UIC program for both Class I and Class II wells. All but insurance and escrow accounts were specifically named in the guidance for Class II wells. With the exception of escrow accounts, all of the instruments have been used in the Resource Conservation and Recovery Act (RCRA) program since 1982 to provide financial assurance for hazardous waste activities, including Class I hazardous wells. Although escrow accounts do not have a history of use in the UIC program, certificates of deposit have been used by the Montana and Michigan UIC programs and were perceived by the states to have similar functionality. Although standby trusts are not considered stand-alone instruments, they have historically been combined with letters of credit and surety bonds when EPA is the Director instead of a state (i.e., for direct implementation programs) and are discussed below in this context.

## *III. Potential for Instrument Failure*

EPA understands that all financial responsibility instruments have some risk of failure and acknowledges that the purpose of requiring financial responsibility demonstrations is to

minimize the risk that costs will be transferred to the public. Although the extent of the risk varies among instruments, adverse conditions resulting from owner or operator failure, market volatility, third-party litigation, cost underestimation, and policy exclusions or limits may contribute to partial or total instrument failure. With proper implementation, oversight, and enforcement at the state and federal levels, instrument failure can be minimized along with the associated financial (e.g., clean up or enforcement costs), environmental (e.g., ground water contamination), or social (e.g., environmental justice) impacts.

The total failure of financial responsibility instruments is most likely to occur as a result of owner or operator failure and, for third party instruments, the failure of a third party. EPA defines owner or operator or third party failure as financial insolvency leading to unfulfilled requirements, or the outright abandonment of environmental obligations.

#### *A. Owner or Operator Failure*

For all instruments except financial tests and corporate guarantees, the risk of instrument failure is partially mitigated by the fact that the fund or liability is held by a third party. Therefore, for third-party instruments, both the owner or operator and the third party must fail in order for the instrument to fail. In contrast, if the owner or operator becomes financially insolvent (e.g., bankrupt), then the financial test and corporate guarantee immediately fails. If the trust fund or escrow account is not yet fully funded due to a pay-in period, financial insolvency of the owner or operator at the onset of the GS project or over time may also lead to a partial instrument failure.

#### *B. Third Party Failure*

Trust funds,<sup>178</sup> standby trusts, letters of credit, surety bonds, insurance, and escrow accounts are managed or sourced from a third party and are therefore affected by third-party failure.<sup>179</sup> This failure may occur as a result of bankruptcy of the instrument administrator or issuer, cancellation of the account or policy due to non-payment of fees or premiums, or a change in third-party ownership. However, EPA notes that third-party failure must coincide with owner or operator failure for complete instrument failure to occur. If the third party fails, but the owner or operator remains solvent, the owner or operator can secure an instrument from another third party (that is acceptable to the Director), thereby minimizing the long term financial risks to the public.

#### *C. Other Factors*

EPA is aware that accounts and policies for trust funds, standby trusts, letters of credit, insurance policies, and escrow accounts may be cancelled in the event that the owner or operator does not pay the necessary monthly or annual fees. Furthermore, the third party may terminate an account or policy based on changes to the owner or operator's financial status, or for other reasons. Therefore, in the event of cancellation or non-renewal, EPA recommends that the owner or operator have a defined period of time to secure a new financial responsibility instrument. This can help minimize the probability of cancellation or non-renewal creating breaks in coverage.

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<sup>178</sup> EPA recognizes that primacy states may have the ability to establish individual or pooled trusts, in which case there is no risk of third party failure because the state itself is the trustee.

<sup>179</sup> The failure of a third-party audit (i.e., inaccurate audit) could contribute to the collapse of the financial test and corporate guarantee instrument.

EPA also understands that surety bonds and insurance may fail when the financial health of an owner or operator has been inaccurately assessed by the third party. Similarly, financial tests and corporate guarantees may fail when the financial health of an owner or operator has been inaccurately assessed by the Director. EPA recognizes the difficulty of analyzing the complex finances of multi-level firms.

Considering these factors, EPA recognizes that a combination of financial responsibility instruments could be used to limit the risk of instrument failure and potential costs to the public. Combining instruments to minimize their weaknesses is discussed in more detail in Section V.

#### *IV. Resource Implications for the Owner or Operator and the Director*

EPA recognizes that all third-party instruments require the owner or operator to pay fees (upfront or annual fees) or monthly premiums to secure and maintain the instruments (Table 4.2, total cost to company). EPA anticipates that these overhead costs will vary by institution, the amount of coverage, and the level of investment activity for instruments like trust funds and escrow accounts. Letters of credit may also require a cash or hard asset collateral in addition to the premium. Therefore, EPA anticipates that the costs that owners or operators will incur to obtain financial assurance will vary by instrument type. For third-party instruments, the costs paid by the owner or operator include the overhead cost needed to secure and maintain these instruments with the third party. Additionally, the total cost of trust funds and escrow accounts will also include the total estimated costs of the GS activity.<sup>180</sup> In the case of financial tests and corporate guarantees, overhead costs will include only those needed to demonstrate maintained financial health.

In addition to variations in costs, there will be different logistics and processes involved if an owner or operator or the Director must access or request funds. In some cases, unused funds may be returned to the owner or operator, while in other cases the third party may seek reimbursement from the owner or operator. EPA recognizes that logistical aspects of the instruments have differing resource implications for the owner or operator and the Director.

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<sup>180</sup> Because the costs of the activity are paid for by trust funds and escrow accounts, or the owner or operator is reimbursed, estimated costs are paid (i.e., set aside) upfront. However, when demonstrations are made with surety bonds and letters of credit, activity costs are paid for by the owner or operator and the secured financial responsibility instrument is only used in the event that the owner or operator cannot complete the activity.

**Table 4.2: Regulatory Risk, Oversight Effort, and Costs to Owners or Operators**

	Total Cost to the Company*	Estimated Overhead Cost as a Percent of Total Cost	Relative Financial Risk to the Government*	Oversight and Enforcement Effort Needed*
Trust Fund	High	~2% (total)	Low	Medium Low
Letter of Credit	High	1.5 - 2% (annual)	Low	Low
Surety Bond	Medium High	0.5 - 15% (total)	Medium Low	Medium Low
Insurance	Medium**	No data available	Medium	Medium
Financial Test and Corporate Guarantee	Low	<0.5% (total)	High	High
Escrow Account	High	1 - 2% (total)	Low	Medium Low

\* Except for information on escrow accounts, relative rankings are based on U.S. GAO. 2005. Environmental Liabilities (<http://www.gao.gov/new.items/d05658.pdf>) and EPA OIG. 2005. Continued EPA Leadership Will Support State Needs for Information and Guidance of RCRA Financial Assurance (<http://www.epa.gov/oig/reports/2005/20050926-2005-P-00026.pdf>).

\*\* Includes captive insurance, which inherits the risk of self insurance.

The Director’s goal in reviewing a financial responsibility demonstration is to minimize the risk that the instrument will fail and leave the public bearing the costs (Table 4.2, relative financial risk to the government). The costs to the Director for an initial review, reevaluations, and monitoring will vary among instruments. During the initial review of the financial responsibility demonstration, For third-party instruments, the Director should consider the stability of the third-party financial institutions to minimize the risk of instrument failure. In the case of financial tests and corporate guarantees, the Director needs to evaluate the stability of the owners or operators themselves. See Chapter 6 “Director’s Examination of Third Party Stability.”

*A. Director’s Review and Monitoring*

EPA acknowledges that the initial review of the financial responsibility demonstration, reevaluations, and monitoring take time, regardless of which instrument is proposed. Trust funds, letters of credit, surety bonds, and escrow accounts require the lowest total oversight and enforcement burden for the Director. Insurance and financial tests and corporate guarantees have the highest levels of administrative burden. Insurance policies will be complex due to site-specific variations and differences within states. Financial tests and corporate guarantees are data-intensive and require frequent evaluations and re-evaluations for solvency. Financial auditing and review of financial mechanisms are resource intensive processes that require access to specific expertise or training for which additional capacity may need to be developed within the UIC program.

*V. Recommendations and Rationale*

Considering the characteristics of the instruments and the characteristics of GS project activities, some instruments may be better suited for certain GS activities than others. In general, the GS activities requiring financial responsibility demonstrations can be characterized as environmental obligations that are either relatively well-defined in terms of when they will occur and how much they will cost, or uncertain in terms of when (and if) they will occur and how much they will cost. The following descriptions characterize GS phases in terms of certainty and sequencing.



- *Corrective action* on wells in the AoR, as described at 40 CFR 146.84, presents some uncertainty in terms of when it will occur and how much it will cost. Corrective action that will occur early in a GS project during the AoR phase will be well-defined. However, the extent of future corrective action undertaken during the operational phase will depend on subsequent AoR re-evaluations. If the initial AoR delineation proves to be inaccurate, additional corrective action may be required that was not considered at the onset of the project. While the duration of the operational or injection phase of a GS project will vary by site, for the purposes of this discussion, EPA anticipates that corrective action will occur within a 20 to 30 year period.
- *Injection well plugging*, as described at 40 CFR 146.92, is relatively well-defined in terms of when it will occur and how much it will cost. Well plugging occurs later in a GS project lifecycle, following the operational phase of injection for either a particular well or the project as a whole. EPA anticipates that plugging a well will take place over a period of weeks, not years.
- *Post-injection site care and site closure*, as described at 40 CFR 146.93, is relatively well-defined in terms of when it will occur and how much it will cost. Post-injection site care and site closure occur last in the GS lifecycle. For the purpose of determining financial assurance, the post-injection site care period will be at least 50 years and site closure will occur at the Director’s discretion.
- *Emergency and remedial response* activities, as described at 40 CFR 146.94, in contrast to the three activities described above, are relatively uncertain in terms of when (and if) these activities will occur and how much they will cost. Additionally, the timeframe during which these activities may occur over is the longest (i.e., 70 years or more).

Based on the characteristics of the instruments and the characteristics of GS project activities, EPA recommends the following financial instruments as “best” or “good” for Class VI financial responsibility demonstrations (Table 4.3).

**Table 4.3: Instruments Best Suited for GS Activities**

	Corrective Action and Phased Corrective Action	Injection Well Plugging	Post-injection Site Care and Site Closure	Emergency and Remedial Response
Trust Fund	<u>Best</u>			May be too little or too much money
Letter of Credit*	<u>Best</u>		May be unreliable for longer time periods (>20 years)	Most appropriate for ERR during operation
Surety Bond*	<u>Good</u>	<u>Best</u>	May be unavailable over longer time periods (>20 years)	
Insurance	Not ideal for operational phases			<u>Best</u>
Financial Test and Corporate Guarantee	<u>Good, but provides no financial recourse if owner or operator fails</u>			
Escrow Account	<u>Good</u>	Trust funds may be preferred over the mid and long term		Likely to perform poorly for uncertain risks

\*Standby trust is needed in addition to the letter of credit or surety bond if EPA is implementing the program.

The following subsections provide a brief rationale for the recommended uses of these financial instruments based on the characteristics of GS project activities described above, and the instrument characteristics summarized in sections III and IV.

*A. Trust Funds*

Trust funds are best suited for corrective action, injection well plugging, and post-injection site care and site closure demonstrations. These activities are relatively certain both in terms of occurrence and cost. A fully-funded third-party trust represents the lowest the risk to the public of paying for these activities. Although the cost of the instrument is essentially the full cost of the activity, the owner or operator recovers this cost (in the form of reimbursement) following the fulfillment of the activity. In addition, costs to the Director are relatively low. For activities with uncertain frequency and costs, such as emergency and remedial response, the trust will likely not have the right amount of funds—too little money is a partial failure of the instrument that must be borne by the public and too much money represents an inefficient use of funds that unnecessarily raises GS costs.

*B. Letters of Credit*

Letters of credit are best suited for corrective action and injection well plugging demonstrations. Letters of credit perform equally well for certain and uncertain environmental activities, as long as the credit limits are not exceeded. The cost to the owner or operator is a function of the credit limit, the financial health of the owner or operator, and risks faced by the owner or operator. Costs to the Director are low when automatic renewals take place and no litigation is needed. For activities that continue over the long term (i.e., post-injection site care, site closure, and emergency and remedial responses), letters of credit may be unreliable because there are more opportunities for the third party to cancel the line of credit. Moreover, their application over longer time periods (i.e., greater than 20 years) is uncertain. Therefore, letters of credit may not be effective for post-injection site care and site closure.

### C. *Surety Bonds*

Surety bonds are good for corrective action and injection well plugging demonstrations. Surety bonds perform equally well for certain and uncertain environmental activities—as long as the limits are not exceeded. The cost to the owner or operator of a surety bond is greater than a letter of credit but less than a trust fund. The cost to the Director may be higher for a performance bond than for a payment bond if litigation is required to get the surety to fulfill the activity. For activities that continue over the long term (i.e., post-injection site care and site closure, and emergency and remedial responses), surety providers are unlikely to underwrite bonds over longer time periods where there is considerable uncertainty.

### D. *Insurance*

Insurance policies are best suited for emergency and remedial response demonstrations. Insurance is the ideal instrument for diversifying environmental risk and handling the numerous possible scenarios associated with emergency and remedial response.<sup>181</sup> However, because insurance policies may cover a wide range of contingencies with wide ranging costs, they can be complicated with high administrative burdens. For well-defined activities such as well plugging, post-injection site care, and site closure, insurance is less appropriate because there is no environmental risk to diversify.

### E. *Escrow Account*

Escrow accounts are good for corrective action demonstrations. Escrow accounts perform almost exactly like trust funds and hence are just as reliable. The difference between the two financial responsibility instruments is that escrow accounts have a lower cost to set up, less oversight (trust funds cost more to set up because resources are spent on establishing stronger oversight), and their funds are kept in a highly liquid form (a simple interest bearing account like a savings or money market account at a bank), which limits risk and the administrative costs but causes escrow accounts to generate minimal interest. In the case of GS, where the relative time horizon is measured in decades, a trust fund's investment strategy is likely to outperform an escrow account in terms of accrued interest. As a result, there may be greater costs from lost investment income and no benefit to using an escrow account instead of a trust fund. Therefore, escrow accounts are likely only to be used for the shortest-term activities such as phased corrective action or for serving as a temporary account, similar to standby trusts.

### F. *Financial Tests and Corporate Guarantees*

Financial tests and corporate guarantees may be useful or “good” for corrective action, injection well plugging, post-injection site care and site closure, and emergency and remedial response. While offering the lowest cost to owners or operators, self-insurance represents the highest financial risk to the public. Additionally, the Director at the state or Regional level may need a high level of financial expertise to review the demonstration with confidence. EPA recommends that the Director should only accept demonstrations when the risk to the public of the GS owner or operator failing is acceptably low. However, EPA may consider the added risk to the public

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<sup>181</sup> Captive insurance, where the insurer is an owner or operator's parent or sibling firm, inherits the risks of self-insurance because the insurance company is not owned by a third party. Captive insurance is excluded from this discussion.

worthwhile to facilitate the realization of broader anticipated public benefits from GS (i.e., climate change mitigation, economic development). Ultimately, the Director has discretion over what level of financial risk to the public is acceptable.

*G. Minimizing Instrument Weakness by Combining Instruments*

Since many of the instruments used for financial assurance are better suited to certain GS activities, EPA has stated that it is possible to combine financial instruments to obtain full coverage for all of activities requiring a demonstration. This implies utilizing different instruments for different GS activities requiring demonstrations, but it can also mean combining instruments for the demonstration for a single activity (e.g., well plugging). EPA recognizes, however, that Directors may be reluctant to allow combined demonstrations due to the likely additional burden in their review process. In general, trust funds, letters of credit, surety bonds guaranteeing payment, and insurance can be combined for *an activity* if their combined value is at least equal to the cost estimate for the respective GS activity. Surety bonds guaranteeing performance, financial tests, and corporate guarantees cannot be combined for *an activity*.<sup>182</sup>

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<sup>182</sup> U.S. EPA OIG. 2005. State support. <http://www.epa.gov/oig/reports/2005/20050926-2005-P-00026.pdf>

## 5. Presentation on Financial Responsibility to Ground Water Protection Council

On January 27, 2010, a short presentation was used to receive state input on EPA's initial analysis on Financial Responsibility (FR) instruments for Geologic Sequestration (GS) in the proposed Class VI UIC well class. A total of 48 participants representing EPA Headquarters and Regional offices, and State Underground Injection Control (UIC) programs attended the meeting.

### *I. Summary of Meeting Discussion*

- EPA stated that the proposed rule specifies a general duty for FR in four phases of a GS project.
- EPA stated that the Office of General Council has encouraged EPA to be as specific as possible about which instruments are allowable for FR demonstration and why an instrument should not be allowed for a demonstration. The benefit of being specific in the rule is that when an instrument is denied later on, the state or EPA has a lower probability of being sued for being arbitrary and capricious in its decisions.
- EPA asked for input on what might cause a FR instrument to fail?
  - A state noted that if the trust fund is administered by a state instead of a bank, it reduces the likelihood of failure. In addition to using a state administered trust fund to cover anticipated (estimated) costs, the state could collect and set aside fees during the permitting process in an emergency fund, to provide an added level of financial security for the state.
  - A participant from Montana shared an example of instrument failure: an insurance company that posted 15 or 20 surety bonds for UIC wells simply went out of business. This resulted in a period of 3 years where several operations in the state did not have a FR instrument. Ultimately, the facilities were able to secure bonds from another third-party.
  - Montana provided another example of instrument failure, which resulted from the use of Certificates of Deposits (CDs). In this case, the well owner or operator persuaded the bank to return the money held in the CD without the state's permission. The state did not have any recommendations on how to avoid this situation. Indeed, regardless of policies, rules, or regulations, human error may inevitably cause the state to bear the cost of cleanup or closure in some cases.
    - A participant recommended that the instrument language could do a better job of specifying that funds can only be released upon the Director's authorization.
    - Montana no longer accepts CDs from out-of-state banks.
  - Michigan has faced problems with CDs being returned to the bank. In one situation, the state ended up with an orphan well. Generally, the state has encountered a number of cases where financial institutions have failed. In these cases, alternative instruments were successfully identified and implemented.
  - In an effort to minimize insurance failures, Texas passed a statute allowing FR demonstrations with insurance; but since the requirements and language were so restrictive, the state has not seen any applications of insurance.
- EPA asked how suitable are existing FR instruments for GS?
  - Participants noted that some of the instruments may not be available under state law. For example, in Montana, financial test and corporate guarantee would not be allowed under state law. However, other states do allow the mechanism.
  - In Montana, an owner or operator can keep a cash reserve (CD), which is conceptually similar to an escrow account. Montana stated that a benefit of using

cash (CD or escrow account) over all other instruments, including a trust fund, is that all the state needs to do is say “release the money.” In all other cases, the state may need to prove that the obligation has not been fulfilled, and that it must be fulfilled.

- Montana stated that a benefit of a surety bond is that in the event that the state says “release the money” the surety has an incentive to pressure the owner or operator to fulfill the obligation, so that the state does not have to.
  - Montana stated that pore bonds only apply to underground activities, but not above ground cleanup; however, this is outside the scope of the GS final rule.
- In Oregon, a number of instruments will be available. Since the GS program crosses agencies, one agency will focus more on FR.
- A participant from an EPA Region asked if there are any states that can share how they administer the financial test. No examples were provided.
- A participant from Montana emphasized that FR is different for Federal and state Directors. Although FR is important for states, EPA should keep in mind that some states will be able to collect fees and establish state trusts (individual or pooled trusts), or use existing state trusts to fund cleanup when instruments fail.
- Texas assumes that the future experience with Class VI will be similar to Class I. However, the value of the instrument will be very different. The bond may have a face value of \$10k for Class I well, but that Class VI bond values may be much higher.
  - EPA added that it was asked to consider the experiences from RCRA in its decision-making.
- Montana stated that it is more concerned about the value of the instrument (i.e., value is reflective of accurate cost estimates) than the existence of various instruments.
  - EPA added that it is developing guidance to assist with the cost estimation process.
- The states recommended that flexibility be provided to encourage/promote GS projects. As many instruments (tools) as possible should be on the table.
- A participant from Montana added that the state would not object to a ranking of which instruments are recommended for which applications. Indeed, guidance specifying how to implement each instrument would be beneficial.

II. Presentation

# Geologic Sequestration Financial Responsibility

Joe Tiago

USEPA  
Office of Ground Water and Drinking Water  
UIC Program

January 27, 2010  
Ground Water Protection Council  
Austin, Texas



Geologic Sequestration Financial Responsibility

1



## Objective

- Share information on financial responsibility:
  - Preliminary analysis
  - Decision making process is ongoing
- Understand State experiences
- Ask key questions related to the potential use of financial responsibility instruments for geologic sequestration wells



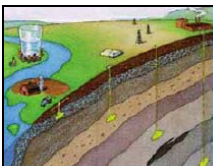
Geologic Sequestration Financial Responsibility

2

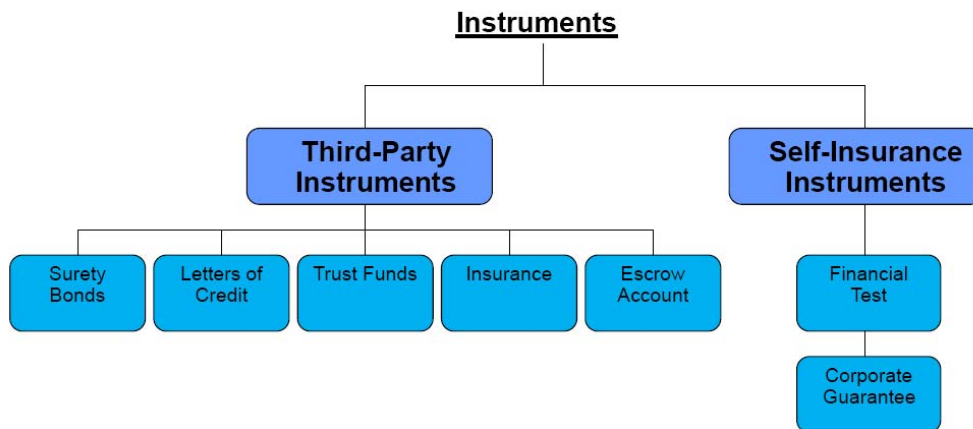


## Background

- Goal of FR
  - Ensure that owners or 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
- Proposed GS rule specifies a general duty to obtain FR at 40 CFR 146.85
- In the proposed GS rule, owners or operators must demonstrate and maintain FR for four activities/phases
  - Corrective action on wells in the AoR
  - Injection well plugging
  - Post-injection site care and site closure
  - Emergency and remedial response



## Financial Responsibility Instrument Types

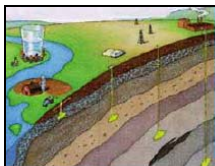






## How suitable are existing Financial Responsibility instruments for GS?

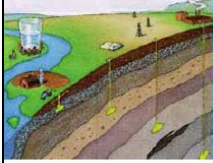
	Corrective Action and Phased Corrective Action	Injection Well Plugging	Post-injection Site Care and Site Closure	Emergency and Remedial Response
Trust Fund	Best			May be too little or too much money
Letter of Credit	Best		May be unreliable for longer time periods (>20 years)	Most appropriate for ERR during operation
Surety Bond	Good		May be unavailable over longer time periods (>20 years)	
Insurance	Likely appropriate and available in the operational phases			Best
Financial Test and Corporate Guarantee	Good, but provides no financial recourse if owner or operator fails			
Escrow Account	Good	Trust funds may be preferred over the mid and long term		Likely to perform poorly for uncertain risks



## What might cause a Financial Responsibility instrument to fail?

	Owner/operator Failure	Third Party Failure	Cancellation or Non-renewal	Inaccurate Assessment of Owner/operator Health
Trust Fund		X		
Standby Trust		X	X	
Letter of Credit		X	X	
Surety Bond		X	X	X
Insurance		X	X	X
Financial Test and Corporate Guarantee	X	N/A*		X
Escrow Account		X		





## Discussion Questions

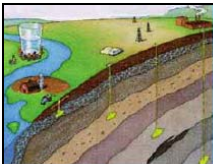
Based on your experience, please share your thoughts on the following:

1. *Potential for Instrument Failure:*
  - Under what circumstances have you experienced Financial Responsibility instrument failure?
2. *Use of Financial Responsibility Instruments for Different Phases of a Project:*
  - What are the advantages and disadvantages of using self-insurance (a financial test) for all GS phases?
  - What is your experience with the usefulness of escrow accounts vs. trust funds?
  - What is your experience with the use of insurance well plugging vs. emergency and remedial response?



Geologic Sequestration Financial Responsibility

7



## Thank You!

**For Additional Questions:**

**Joe Tiago, MS, MPH**  
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**Additional Resources:**

- EPA Geologic Sequestration of Carbon Dioxide Website:  
[http://www.epa.gov/safewater/uic/wells\\_sequestration.html](http://www.epa.gov/safewater/uic/wells_sequestration.html)
- Text of the Proposed rule for Federal Requirements Under the UIC Program for Carbon Dioxide (CO<sub>2</sub>) Geologic Sequestration (GS) Wells:  
<http://www.epa.gov/fedrgstr/EPA-WATER/2008/July/Day-25/w16626.pdf>
- Docket for the rule: [www.regulations.gov](http://www.regulations.gov), Docket ID **EPA-HQ-OW-2008-0390**



Geologic Sequestration Financial Responsibility

8

## 6. Director's Examination of Third Party Stability

This chapter describes EPA's rationale for guidance recommendations on the examination of third party stability. Because the failure of the third parties providing trust funds, standby trusts, letters of credit, insurance, and escrow accounts may increase the likelihood of instrument failure, the stability of the third party should be factored in to the Director's decision on the acceptability of the demonstration. EPA understands that in most cases financial institutions acting as third parties are regulated by a non-EPA state or federal regulator (e.g., the U.S. Department of the Treasury). For example, the strength of a surety bond provider can be inferred by whether or not it is listed on the U.S. Department of the Treasury's Department Circular No. 570 as an approved surety. Because the institutions are reviewed and listed (and unlisted) annually by the Department of the Treasury, the stability determinations for surety bond providers may require the lowest effort. Alternatively, the third party's standing may be inferred by the number (and frequency) of enforcement actions taken by the financial regulator.

EPA recommends that the third party should also be regularly evaluated by an independent rating agency. Similar to the use of bond rating tests for an owner or operator seeking to use the financial test and corporate guarantee, bond ratings and credit ratings can be used for third parties. Most financial institutions acting as third parties are likely to be evaluated by credit rating agencies and have publicly available ratings (although detailed reports explaining the rationale for the rating may not be public). Credit ratings are reviewed on a regular basis (typically annually or semiannually) and should be available at the owner or operator's request.

The GS rule at 40 CFR 146.85(a)(6)(ii) specifies that third-party providers must either

- Pass financial strength requirements based on credit ratings, or
- Meet a minimum rating, minimum capitalization, and ability to pass the bond rating when applicable.

In order to provide clear guidelines for owners or operators and the Directors, EPA can make recommendations on each component of the Rule requirements: (1) financial strength requirement based on credit ratings, (2) minimum rating, (3) minimum capitalization, and (4) bond rating. Described below are several options for interpreting each of these requirements. The selected option, and the rationale for choosing this option, is also noted for each component.

### *I. Financial strength requirement based on credit ratings*

#### *A. Credit rating requirements consistent with self-insurance requirements*

For self-insurance, the Rule *requires* a bond rating in the top four categories of either Standard & Poor's (AAA, AA, A or BBB) or Moody's (Aaa, Aa, A, Baa). These ratings categories could also be *recommended* for third-party credit ratings. This maintains a consistent method (and set of metrics) for determining *any* provider's financial strength and stability. Using the same thresholds is a logical choice since the purpose in both cases (self-insurance and third-party provider) is the same--minimizing the likelihood that the provider will be unable to meet its financial obligations.

*B. Credit rating by any Nationally Recognized Statistical Ratings Organization (NRSRO)*

EPA could recommend that third-party providers provide a credit rating of the Xth highest category (e.g., 3<sup>rd</sup> or 4<sup>th</sup> highest) as determined by any NRSRO. Credit rating thresholds would be determined based on a comprehensive analysis of failure rates of firms in each rating category offered by each NRSRO. This option provides some potential benefits and weaknesses compared to Option A. A potential benefit is that the credit ratings are not limited to just two rating agencies (Standard & Poor's and Moody's). A potential weakness is that categories may not be consistent among rating agencies (i.e., a 4<sup>th</sup> highest rating from one agency could mean "adequate" or "moderate risk" while a 4<sup>th</sup> highest rating from another agency may mean "inadequate" or "substantial risk").

*C. [SELECTED] Hybrid of Option 1 and Option 2*

In considering the strengths and weaknesses of Options A and B, a hybrid interpretation may be desirable, specifying specific rating agencies and their associated recommended ratings. For example, EPA could recommend specific rating agencies along with their associated credit ratings that correspond to those of Standard & Poor's and Moody's. This provides more flexibility than Option A and eliminates the potential weakness mentioned for Option B.

**Rationale:** Considering these factors, EPA recommends that owners or operators demonstrate that third-party providers have a credit rating in the top four categories from either Standard & Poor's or Moody's, consistent with the requirement for self-insurance. However, EPA acknowledges that greater flexibility can be used for third-party credit ratings. Therefore, at the Director's discretion, the owner or operator may alternately submit a comparable rating from any NRSRO as long as the owner or operator can demonstrate the credibility of this rating compared to the recommended ratings.

*II. Minimum Rating*

*A. [SELECTED] Minimum credit rating using the same option chosen for the credit rating requirement*

EPA may interpret minimum rating to mean minimum credit rating. The benefits of this option are that it is easy to specify in the Guidance and it lessens the number of financial measures that Directors must become familiar with. A potential weakness, however, is that this option may lead to confusion about when a third-party's financial stability should be judged based on part 1 of 40 CFR 146.85(a)(6)(ii) or part 2 (i.e., why require a credit rating or a credit rating plus).

**Rationale:** Introducing other types of ratings would require the Director to have a broader familiarity with financial metrics in order to evaluate the financial responsibility demonstration. Therefore, EPA clarifies that the minimum rating means a minimum credit rating. Furthermore, EPA clarifies that third-party providers will be required to meet the credit rating requirement at 40 CFR 146.85(a)(6)(ii), however, if the Director has concerns about the third-party provider or its credit rating, the Director can request additional information to satisfy part 2 of 40 CFR 146.85(a)(6)(ii) (i.e., minimum rating, minimum capitalization, and bond rating if applicable).

*B. Broader range of minimum rating options*

In this option, “minimum rating” could be described as an issuer, credit, securities, or financial strength rating. Using this broad definition would provide greater flexibility for the third-party provider. For example, the provider may have an “acceptable” credit rating, but have a “very strong” or “exceptional” financial strength rating and thus would submit the financial strength rating instead of the credit rating as an indication of financial stability. Furthermore, the difference between parts 1 and 2 of 40 CFR 146.85(a)(6)(ii) would be clarified. Pursuing this option would mean that an owner or operator who submits a rating for part 2 of 40 CFR 146.85(a)(6)(ii) would simply be a making different demonstration of third-party stability.

*III. Minimum Capitalization*

*A. [SELECTED] Financial ratios consistent with the financial ratio test requirements for self-insurance*

EPA could recommend that third-party providers meet the minimum thresholds for the following financial ratios: Debt-Equity, Assets-Liabilities, Cash Return on Liabilities, Liquidity, and Net Profit. Since these ratios are the required capital thresholds for self-insurance, this option is similar to Option A for credit ratings and thus has the same potential benefits and weaknesses.

**Rationale:** The rationale for choosing this option is the same as for choosing Option A for credit ratings. The Director would be familiar with these ratios because of the self-insurance financial tests. Additionally, these ratio thresholds were chosen with GS activities in mind while the thresholds in the other options may not be as applicable to GS activities.

*B. Specific dollar value capital requirements*

In choosing this option, minimum capitalization could be specified as meeting capital requirements of annual capital, surplus, and undivided profits of at least \$[X]. This option is more straightforward than Option A and may be easier for third-parties to provide. However, it would require targeted research to choose an appropriate threshold value relevant to all potential third-party providers and, furthermore, it would require additional rationale for recommending thresholds different than those required for self-insurance.

*C. Minimum capital standards prescribed by the appropriate Federal banking agency*

The Federal Deposit Insurance Act requires Federal banking agencies to establish minimum capital standards for their regulated entities. For example, the Federal Deposit Insurance Corporation (FDIC) requires institutions to maintain capital levels that meet both the leverage capital ratio requirement and the risk-based capital ratio requirement. The thresholds for these requirements are summarized in the table below.

	Leverage	Tier 1 Risk-Based	Total Risk-Based
Well Capitalized	>= 5% and	>= 6% and	>= 10%
Adequately Capitalized	>= 4% * and	>= 4% and	>= 8%
	or a Leverage ratio of = 3% if the bank is rated a composite 1 and is not experiencing or anticipating significant growth		

\* The “risk-based requirement” includes both Tier 1 Risk-Based ratio and Total Risk-Based Ratio

Institutions that do not meet the minimum thresholds are in violation of FDIC requirements because they are considered at risk of insolvency. Potential benefits of using these capital standards are that they are well-defined, easily accessible, and the rationale for choosing them is easily explained. Potential weaknesses are that although federal thresholds may have been good predictors of historical bank failure, recent legislation has been aimed at raising these standards, they may still not be as robust as the standards in Options A or B<sup>183, 184</sup>.

#### D. *Successful completion of the new comprehensive stress test for banks*

This option involves recommending that third-party providers that are banks pass the new stress tests conducted by the Department of the Treasury. These tests built upon existing regulatory capital requirements to assess whether institutions have adequate capital to see them through economic reversals, but were intended to be more transparent than existing requirements in order to restore confidence in the banking system. This option has the benefit of considering financial stability in more adverse economic conditions. However, potential weaknesses of this option include that not all third-party providers will have stress test results (it was only required of banking institutions with assets in excess of \$100 billion)<sup>185</sup>, that the stress test considers only short-term stability (one year into the future)<sup>186</sup>, that there have been concerns about political interference (by law, bank regulation is to be carried out by the independent banking agencies)<sup>187</sup>, and that the reliability of these tests is not well established (these tests are still a new procedure).

#### IV. *Ability to pass the bond rating when applicable*

##### A. *Financial ratios consistent with the bond rating test requirements for self-insurance*

For self-insurance, the Rule *requires* a bond rating in the top four categories of either Standard & Poor's (AAA, AA, A or BBB) or Moody's (Aaa, Aa, A, Baa) for bond ratings. These specific ratings could also be *recommended* for third-party providers. This option parallels Option A for

<sup>183</sup> Estrella, A., S. Park, and S. Peristiani. “Capital Ratios and Credit Ratings as Predictors of Bank Failures.” 2002. *Federal Reserve Bank of New York Working Paper*. <<http://app.ny.frb.org/research/economists/peristiani/CAPITAL-RATIOS.pdf>>.

<sup>184</sup> Enrich, D., D. Fitpatrick, and M. Eckbald. “Banks Won Concessions on Tests: Fed Cut Billions Off Some Initial Capital-Shortfall Estimates; Tempers Flare at Wells.” WSJ.com. May 9, 2009.

<<http://online.wsj.com/article/SB124182311010302297.html>>.

<sup>185</sup> Fact Sheet: Financial Stability Plan. U.S. Department of the Treasury. 2009 <<http://www.financialstability.gov/docs/fact-sheet.pdf>>.

<sup>186</sup> June Oversight Report: Stress Testing and Shoring Up Bank Capital. Congressional Oversight Panel. June 9, 2009. <<http://cop.senate.gov/documents/cop-060909-report.pdf>>.

<sup>187</sup> Bozzo, Albert. “Most Banks Well Capitalized But May Need More, Fed Says.” CNBC.com. April 24, 2009. <[http://www.cnbc.com/id/30385838/Most\\_Banks\\_Well\\_Capitalized\\_But\\_May\\_Need\\_More\\_Fed\\_Says](http://www.cnbc.com/id/30385838/Most_Banks_Well_Capitalized_But_May_Need_More_Fed_Says)>.

credit ratings. It therefore has the same potential benefits and weaknesses of Option A for credit ratings.

*B. Bond rating by any Nationally Recognized Statistical Ratings Organization ("NRSRO")*

This option is a broader interpretation of the Rule where the Guidance could recommend that the third-party provider have a bond rating of the Xth highest category (e.g., 3<sup>rd</sup> highest or 4<sup>th</sup> highest) as determined by any NRSRO. This option parallels Option B for credit ratings. It therefore has the same potential benefits and weaknesses of Option B for credit ratings.

*C. [SELECTED] Hybrid of Option 1 and Option 2*

In considering the strengths and weaknesses of Options A and B, it may be desirable to recommend a hybrid interpretation, specifying specific rating agencies and their associated recommended ratings. This option could be broader than Option A but not as broad as Option B. For example, the Guidance could recommend specific rating agencies along with their associated credit ratings that correspond to those of Standard & Poor's and Moody's. This provides more flexibility than Option A and eliminates the potential weakness mentioned for Option B.

***Rationale:*** This option was selected for the same reasons that Option C was selected for credit ratings. Again, for bond ratings, the Guidance will recommend the self-insurance ratings from Standard & Poor's or Moody's and will also mention the alternative of a comparable bond rating from any NRSRO. The appropriateness of these alternate ratings must be proven by the owners or operators and will be evaluated at the Director's discretion. Furthermore, EPA clarifies that a bond rating is only required when it exists (not all third-party providers will have bond ratings).

## 7. Rationale for the Selection of Self Insurance Requirements

This chapter describes EPA’s rationale for the selection of various self-insurance test requirements. The self-insurance requirements described at 40 CFR 146.85 are designed to ensure that owners or 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 and to ensure that the private costs of GS are not passed along to the public. These self-insurance requirements are based on the historical precedent established by the detailed guidance “Federal Financial Responsibility Demonstrations for Owners and Operators of Class II Oil- and Gas-Related Injection Wells” (EPA 570/9-90-003) as well as rule requirements described at 40 CFR 144.63 for Class I hazardous waste injection wells.

EPA chose to follow precedents by selecting of self-insurance requirements for Class VI wells so that they closely follow Class I hazardous waste well requirements. Additionally, EPA has included financial tests from the Guidance for Class II wells that are substantially different from the financial tests described at 40 CFR 144.63. For owners or operators selecting the financial ratios test option, EPA is requiring owners or operators to exceed all five ratio thresholds to ensure the demonstration of their financial health and stability in as many ways as possible.

EPA’s approach for the selection of self insurance test requirements is also consistent with the approach recommended by the Environmental Financial Advisory Board (EFAB). When charged with the task of recommending financial assurance mechanisms for the new Class VI wells, EFAB “recommended use of Class I financial assurance mechanisms [based on their] familiarity with, and belief in, the effectiveness of these mechanisms.”<sup>188</sup> EPA’s approach with regard to the bond rating test is specifically supported by EFABs primary recommendation that “the use of independent credit analysis, i.e. credit ratings, is a cost-effective mechanism for demonstrating financial assurance and should continue to be an alternative for those companies that have investment-grade ratings on their debt.”<sup>189</sup>

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<sup>188</sup> Report on Financial Assurance. EFAB. March 2010. Page 6.

<sup>189</sup> Report on Financial Assurance. EFAB. March 2010. Page 2.



I. Financial Coverage Criteria

**Table 6.1: Definitions of Financial Coverage Criteria**

Financial Indicators	Requirement	Rationale
Net Working Capital (NWC)	NWC must be at least six times the sum of the current cost estimates for all required GS activities.	Consistency with <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(B) and 40CFR144.63(f)(ii)(B)</li> </ul>
Total Assets	Assets in the United States must amount to at least 90 percent of total assets, <i>or</i> at least six times the sum of the current cost estimates for all required GS activities.	Consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(D) and 40CFR144.63(f)(ii)(D)</li> </ul>
Tangible Net Worth (TNW)	TNW must be at least six times the sum of the current cost estimates for all required GS activities.	Six times threshold is established for consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(B) and 40CFR144.63(f)(ii)(B)</li> </ul>

II. Bond Rating Test

**Table 6.2: Explanation of Bond Rating Test**

Requirement	Rationale
For an owner or operator to pass the financial test, EPA recommends that the bond's rating be one of the four highest categories (i.e., AAA, AA, A, or BBB for Standard & Poor's or Aaa, Aa, A, or Baa for Moody's). The owner or operator should also submit an annual report of its bond rating.	Consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(ii)(A)</li> <li>Class II Guidance</li> </ul>

III. Financial Ratio Test

**Table 6.3: List of Financial Ratios**

Type of Ratio	Financial Ratios	Threshold	Rationale
Debt-Equity	$\frac{\text{Total Liabilities}}{\text{Net Worth}}$	< 2.0	Consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(A)</li> </ul> This diverges from: <ul style="list-style-type: none"> <li><u>Long term liabilities</u> to net worth threshold recommended in Class II Guidance. The total liabilities threshold is used so that only one debt-equity ratio is needed and EPA is not specifying the ideal distribution of current vs. long term liabilities.</li> </ul>
Assets-Liabilities	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	> 1.5	Consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(A)</li> </ul> This diverges from: <ul style="list-style-type: none"> <li><u>Current liabilities to net worth &lt; 1.0</u> recommended in Class II Guidance. Both the Class I and Class II ratios include current liabilities (one on the numerator, one on the denominator, therefore leading to the sign change). The current assets to current liabilities is used so that a “current” picture is created (net worth includes all assets e.g., current, long term, etc.).</li> </ul>
Cash Return on Liabilities	$\frac{(\text{Net Income} + \text{Depreciation} + \text{Depletion} + \text{Amortization})}{\text{Total Liabilities}}$	> 0.10	Consistency with: <ul style="list-style-type: none"> <li>Class I Haz Regs at 40CFR144.63(f)(i)(A)</li> <li>Class II Guidance</li> </ul>
Liquidity	$\frac{(\text{Current Assets} - \text{Current Liabilities})}{\text{Total Assets}}$	> -0.10	Consistency with: <ul style="list-style-type: none"> <li>Class II Guidance</li> </ul>
Net Profit	Net Profit	> 0	Consistency with: <ul style="list-style-type: none"> <li>Class II Guidance</li> </ul>

IV. Corporate Guarantee

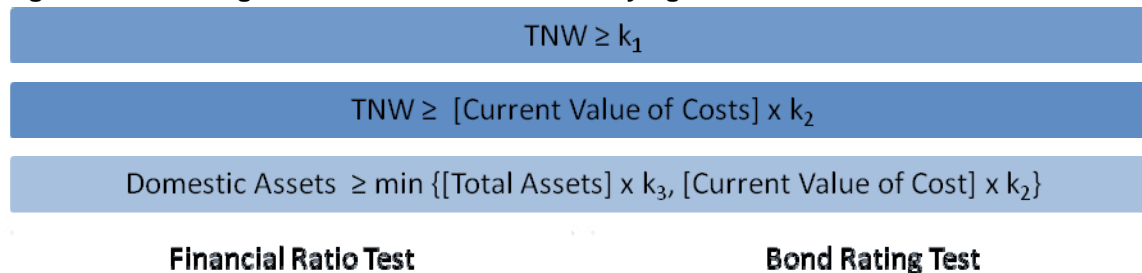
**Table 6.4: Explanation of Corporate Guarantee**

Guidance Text	Rationale
<p>The Director might allow the corporate guarantee if it is issued by a parent corporation that owns at least 50 percent of the subsidiary's voting stock, has been in business for at least 5 years, and has a net worth of at least \$100 million.</p>	<p>Consistency with:</p> <ul style="list-style-type: none"> <li>• Class II Guidance, which states:               <ul style="list-style-type: none"> <li>○ A parent corporation must own at least 50 percent of the subsidiary's voting stock</li> <li>○ Companies in business less than five years or whose net worth is less than \$1 million may be ineligible for use of financial statements or blanket coverage</li> </ul> </li> </ul>

## 8. Evaluation of Minimum Tangible Net Worth

EPA's final rule creates a new Class VI well for the geologic sequestration (GS) of carbon dioxide. If an owner or operator fails during the life cycle of a GS project, then the project's environmental liabilities could fall to the public. Liabilities could include corrective action on wells in the Area of Review (AoR), injection well plugging, post-injection site care, site closure, and any emergency and remedial responses. To protect the public from the risk of paying for these financial liabilities, the proposed rule contains specific provisions requiring an owner or operator to demonstrate and maintain financial responsibility by either securing an instrument from an independent third-party or by utilizing self-insurance. Self-insure is available to owners or operators who assure the regulator (and the public) that they are unlikely to fail. To demonstrate adequate financial responsibility, EPA requires that the self-insuring owner or operator meet specific financial coverage criteria and pass either a bond rating test or a financial ratio test. The coverage criteria and tests should ensure that owners or operators are unlikely to fail and leave the public with a large financial liability. The Director has the discretion to approve (or deny) an owner or operator's bid to use self-insurance as a demonstration of financial responsibility. The three coverage criteria and two test options are depicted in Figure 8.1:

**Figure 8.1: Coverage Criteria and Tests for Qualifying for Self-Insurance**



Under 40 CFR 144.63, the coverage criteria parameters for Class I Hazardous wells were set at:

$$\begin{aligned}k_1 &= \$10\text{M} \\k_2 &= 6 \\k_3 &= 90\%\end{aligned}$$

Although these parameters have applied to Class I Hazardous wells for 30 years, Class VI GS wells may require more stringent parameters based on the long time periods and large costs associated with GS. The purpose of this analysis is to reevaluate the  $k_1$  parameter for the minimum tangible net worth (TNW) threshold, explore alternative TNW thresholds, and recommend a TNW threshold for Class VI GS Wells.

### Options

In theory, the TNW threshold can be any (non-negative) number, which would yield a continuum of policy options. The evaluation of a continuum of policy options would require a proposed regulation and it is beyond the scope of this evaluation; therefore we evaluated 3 discrete options for the TNW threshold:

- A.  $k_1 = \$0$ : Drop the TNW criterion
- B.  $k_1 = \$10M$ : Preserve the status quo (i.e., utilize the Class I Hazardous threshold for Class VI wells)
- C.  $k_1 = \$100M$ : Increase the status quo by a factor of 10

### *Objective for Setting TNW*

By definition, for any particular owner or operator, **independent third-party instruments always pose a lower risk of failure than self-insurance.** This is because when an independent third-party instrument is in place, *both* the independent third party and the owner or operator must fail in order for the financial liabilities to be passed onto the public. In contrast, with self-insurance, *only* the owner or operator must fail for the financial liabilities to become the public's responsibility. Self-insurance is always riskier to the public, but it remains desirable to owners and operators because it is their lowest cost option. Self-insurance can also be desirable to the public because it encourages growth of the GS industry by lowering the cost of doing business.

The TNW criterion, like the other criteria and tests, should not hinder the growth of the GS industry by excluding prospective owners or operators for entry and it should not expose the public to excessive risk. Therefore, **this analysis identifies a TNW value that assures that the risk born by the public from a self-insured owner or operator is no greater than the riskiest scenario under independent third-party instruments.**<sup>190</sup> To determine the appropriate TNW value, this report evaluates results from an economic model calibrated to data on GS activities and the owners or operators expected to participate.<sup>191</sup>

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<sup>190</sup> This is a departure from the assumption made by other programs.

<sup>191</sup> This analysis excludes other criteria for qualifying for self-insurance; these additional criteria would further control the risk of instrument failure.

## *Calibrated Model*

Our quantitative model examines the risks to the public under self-insurance against a baseline level of acceptable risk. The baseline is the risk to public when the riskiest owner or operator (i.e. an undercapitalized owner or operator that can barely afford to enter the industry) uses an independent third-party instrument to demonstrate its financial responsibility. A parsimonious model was designed to capture the following details:

- the timing, structure, overhead costs, and failure of independent third-party instruments
- the magnitude, timing, and uncertainty of environmental liabilities
- the hazard of financial insolvency and how this changes with the owner or operator's size
- the role of tangible net worth in driving an owner or operator into insolvency
- the effects of environmental liabilities, as well as other leveraging liabilities, on tangible net worth and hence on insolvency
- the stochastic growth of tangible net worth due to the owner or operator's activities both inside and outside of the GS industry
- the timing and structure of GS operations, as well as the risk and return on GS activities
- the characteristics of owners or operators (chiefly the distribution of their size and hence risk) that will participate in the GS industry

The model divides time into 91 periods corresponding to 1 year of the pre-operation phase during which the owner or operator secures a financial responsibility mechanism, 40 years of the operation phase, and 50 years of the post-operation phase during which the owner or operator continues monitoring the site and tending to any stochastic GS events (e.g. emergency and remedial responses and corrective action). The unit of analysis is the owner or operator.<sup>192</sup> The return on the owner or operator's investment in GS is accrued only during the operating phase. Stochastic GS events can occur in either of the later periods, certain costs (operational and post-operational) occur in both of the later periods, and the costs of independent third-party financial responsibility instruments are paid for in the first period alongside other initial costs.<sup>193</sup> During each period, there is some risk that stochastic GS events or external shocks (i.e. losses/windfalls from the owner or operator's activities in other markets) will decrease the GS owner or operator's TNW to the point that the owner or operator becomes insolvent.

To evaluate the model's chief outputs, an Excel workbook performed hundreds of Monte Carlo realizations (scenarios) on every uncertain variable for every year. The model can simulate the distribution of its variables, including risk to the public, for each possible TNW. The model parameters were empirically calibrated to "realistic" values found during careful research. The greatest sources of uncertainty in these model parameters are the stochastic GS events, the magnitude of the resulting damages, and the price paid to the owner or operator for each ton sequestered.<sup>194</sup>

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<sup>192</sup> For simplicity, all decisions in the model (e.g. participation in the market, the riskiness of the other profit-making investments in the owner or operator's portfolio of activities, the amount of dividends to offer to shareholders, etc...) are treated as exogenous – occurring outside of the model and hence independent of what occurs inside the model.

<sup>193</sup> By forcing the owner or operator to pay upfront( in-full) for the 91 years, we circumvent the problem of owners or operators evading liabilities falling in the post-operation phase. Like several other assumptions, this simplifying assumption is made to keep the model tractable. In reality, the financial assurance of owner or operator owners or operators will be reviewed periodically, owners or operators may be somewhat allowed to pay as they go, and financial conditions may dictate a change in instruments or even a complete shutdown in the middle of the operations phase.

<sup>194</sup> The risk of leakage into the atmosphere is not explicitly set aside in this model; it is subsumed in the damages from a stochastic GS event.

## Results

Over the course of the 91 year span of the model, no more than 1 emergency and remedial response events are expected for any single owner or operator. However, based on industry failure rate data, only 61% of insurance owners or operators are expected to survive the 91 years due to their other liabilities (a compounding of the 0.6% failure rate of insurance companies, a hazard which is presumably constant over time). In contrast, just over 97% of trust funds are expected to survive the entire 91 years modeled. However, the upfront cost of using trust funds as a form of financial responsibility are so high that it is very unlikely that an owner or operator would choose to use a trust fund over insurance.<sup>195</sup> Consequently, both certain and uncertain costs get coverage from third-party insurance providers in this model. The owners or operators that survive this 91 year stretch tend to exhibit exponential growth in their tangible net worth and their risk steadily falls, along with their expected returns (i.e., their expected growth rate).

### **A. $k_1 = \$0$ : Drop the TNW criterion**

If the GS activity costs for which the owner or operator must demonstrate financial responsibility are sufficiently high, then the criterion requiring TNW to exceed 6 times that current cost ( $k_2 = 6$ ) makes the TNW threshold of \$10M used for Class I Hazardous wells irrelevant. For example, the current value of costs in our baseline scenario when using independent third-party instruments is \$48M rendering both the \$10M and \$100M candidate thresholds irrelevant because both are smaller than  $6 \times \$48M = \$288M$ . Moreover, all of the owners or operators actively involved in demonstration projects have TNW values that are orders of magnitude above these candidate thresholds (the smallest has a TNW of just over \$2,800M or 28 times the size of the larger threshold). However, there are two good reasons for keeping the TNW criterion. First, the owners or operators involved in the demonstration projects are the heavily capitalized firms that can afford to take a risk on these experimental demonstration projects as part of their research and development. But in the future, there may be lightly capitalized owners or operators entering the GS market, and such higher-risk firms should not be allowed to self-insure. Second, the \$48M figure in our baseline scenario is a central estimate, but there is considerable uncertainty around that figure. Real costs could vary by orders of magnitude. Hence, depending on the actual cost estimates, a \$100M or even \$10M TNW threshold could separate out lightly capitalized owners or operators.

### **B. $k_1 = \$10M$ : Preserve the status quo threshold used by Class I Hazardous wells**

A TNW threshold of \$10M results in the public bearing a risk from self-insured owners or operators that can be nearly 14 times higher than the risk from owners or operators that have just enough capital to afford the independent third-party financial responsibility instruments (which cost \$2.6M, up-front). Therefore, the threshold of \$10M clearly fails to accomplish the purpose of financial responsibility because it exposes the public to excess risk in the baseline scenario.<sup>196</sup>

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<sup>195</sup> For a trust fund, the owner or operator would be required to pay the current value (i.e. undiscounted) of all liabilities plus administrative overhead into a trust. For an insurance contract, the owner or operator could pay only the present value (i.e. discounted) plus the insurer's mark-up over actuarial fair cost.

<sup>196</sup> Allowing an owner or operator with \$10M in TNW to self-insure would obviously be riskier if that same owner or operator couldn't even afford the independent third-party FR instruments.

Again, this baseline risk is determined from the riskiest owner or operator that can afford independent third-party instruments and is heavily dependent on uncertain cost estimates. Likewise, the risk of allowing an owner or operator with \$10M in TNW to self-insure also depends on this uncertain cost estimate.

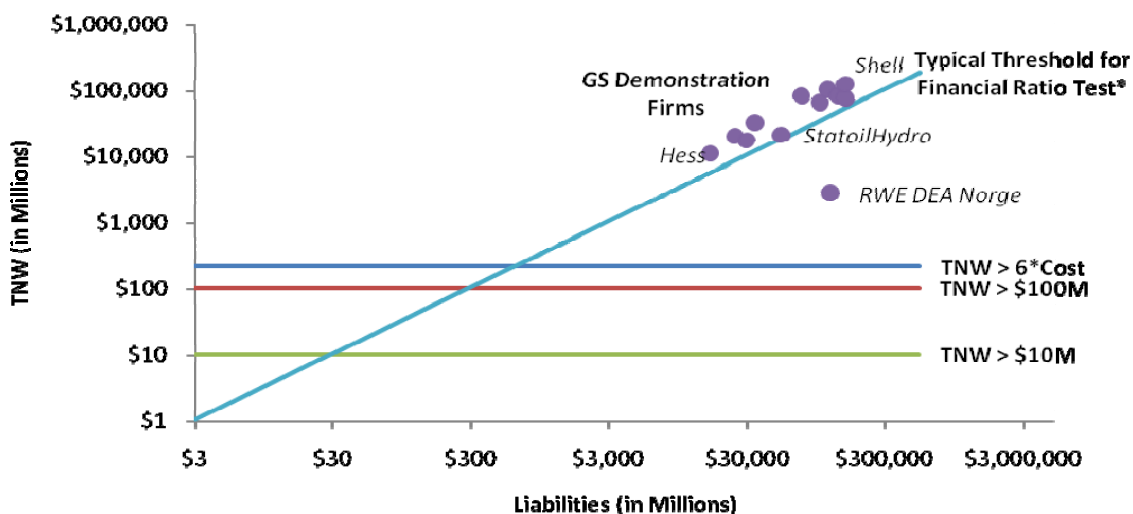
### C. $k_1 = \$100M$ : Increase the status quo by a factor of 10

A TNW threshold for self-insured owners or operators of \$100M results in a risk to the public from a self-insured owner or operator that is roughly equal to the baseline risk from an owner or operator which is barely able to afford the independent third-party financial responsibility instruments (which cost \$2.6M, up-front).<sup>197</sup> Therefore, the threshold of \$100M should assure that the risk born by the public from a self-insured owner or operator is no greater than the riskiest scenario where independent third-party instruments are used. As mentioned above, this finding is highly sensitive to the cost estimates and should not be taken as a certainty.

#### Context

Although a ten-fold increase in the TNW criterion could be seen as a dramatic increase, it should be put in context. The scale of GS operations (as well as the owners or operators likely to run them) dwarf the smaller-scale projects for which the \$10M TNW criterion was originally set by the UIC program 30 years ago. The TNW criterion should be judged by the scale of the cost estimate. A TNW criterion of \$100M is small in comparison to \$288M, which is the TNW value equal to six times the cost estimate for covered activities ( $6 \times \$48M$ ). Figure 8.2 places the scale of \$100M in context by comparing the TNW criteria in the space of tangible assets versus total liabilities, as well the participants in demonstration projects.

**Figure 8.2: Chart of Criteria Thresholds for Self-Insurance**



\*Typical Threshold for Financial Ratio Test – To plot this threshold in this space, we have assumed that 90% of total assets are tangible (and the fraction of total assets that are current equals the fraction of total liabilities that are current). The plotted points are the actual (Liabilities, TNW) of the GS demonstration owners or operators; their tangible assets range from 88% of their total assets (for RWE DEA Norge and StatoilHydro, both headquartered in northern Europe) to 99% of their total assets (for Sonatrach headquartered in Algeria).

<sup>197</sup> The limited simulation produces a flat risk profile between \$75M and \$165M as a result of a finite number of realizations. With a larger simulation, that flat interval would narrow, presumably around \$100M.



## **Appendix A: Costs to the Owner or Operator for each Mechanism**

*Trust fund:* Funds must be paid into the trust to cover the total estimated costs of the GS activity. Additionally, the owner or operator pays a fee for the administrative services provided by the trustee. Overhead costs will be case specific, but are estimated at 2 percent of the total cost of the activity. Annual costs will be determined by the trust fund's pay-in schedule if a pay-in period is allowed.

*Letter of credit:* The owner or operator pays fees to obtain letters of credit and may be required to set aside substantial collateral to secure the instrument. The annual fee for a standby letter of credit is estimated at 1.5 to 2 percent of the total cost of the GS activity. If letter of credit is utilized, the interest rate is typically at the market rate (prime plus a percentage determined by the bank), estimated at 4 to 8 percent. The financial health of the purchaser will determine the interest rates, and whether collateral or deposits are required. Letters of credit are also classified as an accounting liability, and their relative costs may include limits to borrowing power. Additional overhead costs may be incurred to maintain a standby trust, if required.

*Surety bond:* The owner or operator pays annual premiums to a surety company and generally is required to provide substantial cash collateral. Premiums average 2.5 percent, although the costs could range from 0.5 percent to 15 percent of the total cost of the GS activity, depending on the financial solvency of the owner or operator and the risk associated with the project's activities. Financial institutions emphasize prequalification. Typically, the premium would be paid based on the face value of the bond; premiums are often based on a sliding scale rate and need to be paid up front.

*Insurance:* Costs for the owner or operator can vary based on the type of insurance.<sup>198</sup> Finite or fully-funded policies (which resemble trust funds and therefore limit risk to the insurer) present higher costs to the owner or operator than do conventional insurance policies. The cost of insurance is a premium established by the policy underwriter's assessment of site-specific risks. The price reflects the likelihood of a range of possible claims. Insurance may also have a fee for an initial risk assessment.

*Financial Test and Corporate Guarantee:* The financial test and the corporate guarantee are the lowest-cost options for companies because they do not have to set aside funds for future payments or pay fees or premiums to third parties. Therefore, total costs are estimated at less than 0.5 percent of the GS activity cost. These instruments are based on an assessment of company worth and do not require backing by a third party or the company to set funds aside.

*Escrow account:* Funds must be paid into the escrow account to cover the total estimated costs of the GS activity. Additionally, the owner or operator pays a fee for the administrative services provided by the escrow agent. Fees are estimated at less than 2 percent of the total cost of the activity, depending on the amount of money held in escrow. Fees are paid to a third-party administrator annually, and depending on how the account is managed (entirely liquid, or some

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<sup>198</sup> Captive insurance, where the insurer is an owner or operator's parent or sibling firm, inherits the risks of self-insurance because the insurance company is not owned by a third party. Captive insurance is excluded from this discussion.

low-risk investments) it may accrue interest to cover the administrative costs defined in the escrow agreement.

## Appendix B. Technical Description of Geologic Sequestration (GS) Financial Responsibility (FR) Model

### Core Model

The model divides time into 91 periods corresponding to 1 year of the pre-operation phase during which the owner or operator secures a financial responsibility mechanism, 40 years of the operation phase during which the firm earns profits from injecting CO<sub>2</sub>, and 50 years of the post-operation phase during which the owner or operator continues monitoring for an tending to any emergency and remedial response (ERR) events. The following table illustrates the timeline:

Year	Phase	GS Activities
Period 0	Pre-operation	Securing Financial Assurance Instrument(s)
Period 1	Operation	GS injections, monitoring, responding to ERR events
.		
Period 40		
Period 41	Well Plugging (year 41 only) Post-operation	Site-care (monitoring and responding to ERR events)
.		
Period 90		

At each point in time  $t$ , the owner or operator inherits an initial tangible net worth (TNW) of  $A_t$  from its past activities, in the form of  $A_t$  assets and no liabilities.<sup>199</sup> To leverage these assets, the owner or operator then borrows additional capital, which shows up as liabilities in the firm's balance sheet:

$$L_t = b_0 A_t^{b_1}$$

The owner or operator invests its assets and its borrowed capital,  $A_t + L_t$ , in productive activities that consume the capital in the process. The investment in the productive activity returns stochastic revenue:

$$R_t = P_t \times [A_t + L_t]$$

<sup>199</sup> Although we do not explicitly introduce optimization decisions made by firms in this model in order to remain parsimonious, the model is consistent with the standard sort of investment model sketched by Hubbard (1998) and presented in corporate finance textbooks (e.g. Tirole (2006) or Ross, Westerfield, and Jaffe (2008)).

Where  $P_t$  is the productivity of the capital. The owner or operator will survive only if it remains solvent.<sup>200</sup> Let  $S_t$  be a binary variable indicating if the owner or operator is solvent at the end of period  $t$ . The solvency condition is given by:

$$S_t = 1\{P_t \times [A_t + L_t] > [1 + r_D]L_t\}$$

Where  $1\{\}$  is an indicator function equal to 1 when its argument is true and  $r_D$  is the interest rate that lenders charge the owner or operator (which will be made a function of the firm's credit risk below). If the owner or operator's revenue is sufficient to pay off the principal and interest on its liabilities, then the remainder of the firm's revenue is reinvested as next period's initial net worth:

$$A_{t+1} = S_t \times [P_t \times [A_t + L_t] - [1 + r_D]L_t]$$

Survival is uncertain because the productivity of the owner or operator's working capital,  $P_t$ , is stochastic. The distribution of productivity is log-Cauchy, yielding a closed-form for the probability of failure:<sup>201</sup>

$$Pr(S_t = 0) = Pr\left(\ln P_t < \ln\left(\frac{[1 + r_D]L_t}{[A_t + L_t]}\right)\right) = \frac{1}{2} + \frac{1}{\pi} \tan^{-1}\left(\frac{\ln\left(\frac{[1 + r_D]L_t}{[A_t + L_t]}\right) - \delta}{\gamma}\right)$$

Where  $\delta$  is the median productivity and  $\gamma$  is  $1/2$  of productivity's interquartile range.<sup>202</sup> A critical stylized fact for this model to capture is that smaller owners or operators experience productivity shocks with a higher median and greater volatility than larger firms.<sup>203</sup> In order to make the model sufficiently flexible to capture this stylized fact, we let the median and volatility of productivity shocks vary with the firm's size:<sup>204</sup>

$$\delta = \ln(1 + r_D)$$

$$r_D = r_F + \beta_D(A_t) \times [r_m - r_F]$$

$$\gamma = \sqrt{[\beta_D(A_t)]^2 \theta_1}$$

<sup>200</sup> This solvency condition should be interpreted as a level of tangible net worth below which the firm is unwilling, or unable, to finance a continuation of its operations. Instead, bankruptcy is either the better option or the only option. In general, the solvency threshold would depend on the transactions costs of bankruptcy, as well as short-term options for financing the cash flow shortage (and these financing options depend on a variety of financial variables).

<sup>201</sup> Because a normal distribution is convenient for many models of investment returns, e.g. the classic option-pricing model of Black and Scholes (1973), it is often used in models of investment returns and even in models of credit risk, e.g. Hillegeist et al. (2004). However, it is well known that the normal's kurtosis is inadequate for modeling investment returns. In the context of this sort of dynamic model, a sufficiently large probability of failure is only possible by giving the normal such a large variance that most firms grow at an implausibly high rate. Following the suggestion of Mandelbrot and Hudson (2004), we employ the Cauchy distribution which has much fatter tails while concentrating more probability mass around the median.

<sup>202</sup> Note that the central tendency (median) and variability (volatility = IRQ/2) are measured in different units from the normal distribution, for which practitioners usually refer to mean and variance. For the Cauchy distribution, the tails are so fat that the mean and variance do not actually exist. Although they may appear quite different on the surface, the Cauchy and Normal distributions are closely related. Both the Cauchy and the Normal are particular members of a broader parametric class of distributions known as Stable Distributions for which the distributional family is closed under convolution. See Nolan (2009) for more on Stable Distributions.

<sup>203</sup> In addition to being a presupposition of there being a TNW requirement for self-insurance, documented empirical evidence of this stylized fact dates back at least as far as Hall and Weiss (1967).

<sup>204</sup> Without allowing  $\delta$  and  $\gamma$  to vary by firm size, the empirical relationship between  $A_t$  and  $L_t$  (coupled with the observed survival probabilities and growth rates) would rigidly box this model into a corner where it would fail to allow sufficient variation in productivity shocks by firm size.

$$\beta_p(A_p) = \left[ \frac{\mu}{\ln(1 + A_p)} \right]^{\theta_2}$$

Where the second equation comes directly from the Capital Asset Pricing Model (CAPM),  $r_F$  is the long-run rate of return on a “risk-free” asset,  $r_m$  is the long-run average (across the market) rate of return on private capital, and  $\beta$  is the mark-up in the owner or operator’s interest rate due to its riskiness relative to the market.<sup>205</sup> Describing the relationship between  $\beta$ ,  $\gamma$ , and  $A$  introduces three additional parameters:  $\theta_1$  describes how volatility changes with the owner or operator’s risk factor (its  $\beta$ ),  $\theta_2$  describes the elasticity of  $\beta$  with respect to the firm’s size, and  $\theta_3$  determines the firm size at which  $\beta$  is 1.<sup>206</sup>

### Self-Insurance

At time 0, the owner or operator must make a financial responsibility demonstration. If its TNW exceeds the minimum threshold, then the owner or operator can use self-insurance to make a financial responsibility demonstration that is good enough to cover the lifetime of the site.<sup>207</sup> We assume that a self-insurance demonstration is (virtually) costless for the firm.<sup>208</sup> From period 1 to period 40, the owner or operator can inject  $Q$  tons per year at a certain cost of  $C_{t < 41}$  with a high enough price for the firm to net a “fair rate of return” on that cost outlay at the end of the year (i.e.,  $1 + r_m$ , akin to an electric power utility).

During these first 40 years, as well as for the next 50 years after that, the owner or operator is also responsible for any uncertain costs due to Emergency and Remedial Response (ERR) events and Corrective Action (CA) events. We model the uncertain costs due to an ERR event as the simple product of the occurrence of an ERR event in that year,  $M_{tERR}$ , the scale of damages from that event,  $D_{ERR}$ , relative to expected total discounted costs of the project ( $C_{NPV}$ ):

$$U_{tERR} = D_{ERR} M_{tERR} C_{NPV}$$

Let the probability of an ERR event be constant:

$$\Pr(M_{tERR} = 1) = \lambda_{ERR}$$

Let the damages of an ERR event be Beta distributed with mean equal to 80 percent of the owner or operator’s estimated total costs and a maximum of 6 times that total cost:

$$\Pr(D_{ERR} = d) = 1\{d \in [0,6]\} \times \frac{d^{\alpha-1} (6-d)^{\beta-1}}{6^{\alpha+\beta-1} B(\alpha, \beta)}$$

<sup>205</sup> See French (2003) for the development of a basic variant of the CAPM and the model’s place in the history of economic thought. Campbell, Hilscher, and Szilagyi (2008) demonstrate a connection between the stock’s risk, captured by  $\beta$  in the CAPM, and its failure risk.

<sup>206</sup> In practice, we will calibrate  $\theta_3$  so that it is the mean of the logged distribution of firm size across the GS industry, with the assumption that the distribution is log normal with mean  $\mu$  and standard deviation  $\sigma$ . This assumption is standard in the literature on the distribution of firm sizes within an industry – see Cabral and Mata (2003).

<sup>207</sup> The TNW requirement is a necessary condition for using self-insurance but not a sufficient condition. There are more conditions, referred to as financial tests, which further control the public’s risk exposure due to self-insurance. Likewise, the director has some discretion in allowing third-party assurance mechanisms and that is also not included in this simple model. Moreover, these requirements are revisited periodically. However, the model becomes increasingly complicated if these details are included.

<sup>208</sup> EPA recognizes that self-insurance is not without cost. Self-insurers may utilize captive insurers or seek other means of diversifying risk that are costly. However, the demonstration of self-insurance itself is assumed to be a minor cost.

Where the parameters ( $\alpha$ ,  $\beta$ ) produce a skewedness in-line with expert judgment, while satisfying:

$$E(d) = \frac{6\alpha}{(\alpha + \beta)} = 0.8$$

We model the uncertain costs of CA events as the simple product of the occurrence of a CA event that year,  $M_{tCA}$ , and a constant cost for that event,  $\Delta_{CA}$ :

$$U_{tCA} = \Delta_{CA} M_{tCA}$$

For years 41 through 90, the owner or operator does not earn any revenue from injection but is still obligated to pay for certain costs at the site,  $C_{t>40}$ , as well as any costs from ERR events.

If the owner or operator fails for whatever reason, be it from an exogenous productivity shock or an ERR event, then the public must pay for the dissolved firm's environmental obligations. We assume that if an owner or operator fails during years 1 through 40, another operator or owner will continue to operate the plant for the remaining operable years.<sup>209</sup> The public will not pay for post-operation expenses until year 41. The expected discounted risk to the public of a self-insured owner or operator is given by:

$$E(D | Self) = \sum_{t=0}^{90} \left( \frac{1}{1+r^*} \right)^t [E(D_{ERR} M_{tERR}) C_{NPV} + \Delta_{CA} E(M_{tCA}) + C_t 1\{t > 40\}] \Pr(S_t = 0 | A_t)$$

Where D on the left hand side is the expected damages (risks to the public) and  $r^*$  is the socially optimal discount rate, which is necessary in order to sum liabilities that are spaced over time.

### Third-Party Instruments

If the owner or operator's TNW is beneath the minimum threshold, then it cannot use self-insurance to make its financial responsibility demonstration. Instead, in period 0, it must purchase third-party instruments for demonstrating financial responsibility over the course of the lifetime of the site. The simplest third-party instruments to model are those that pay out so long as the third-party is solvent, regardless of whether the owner or operator has failed. Hence, we use insurance for the uncertain costs due to ERR and CA events as well as for the certain costs in the post-operation phase. The cost of these instruments is actuarially fair, plus a percentage markup over that actuarial fair cost:<sup>210</sup>

$$K_{IN} = (1+k) \sum_{t=0}^{90} \left( \frac{1}{1+r_{IN}} \right)^t [E(D_{ERR} M_{tERR}) C_{NPV} + \Delta_{CA} E(M_{tCA}) + C_t 1\{t > 40\}]$$

These third-party instrument providers can, themselves, fail. We have modeled the failure of third-party instrument providers as a (statistically independent) constant hazard rate over the

<sup>209</sup> This assumption lowers the financial risk to the public substantially. Without this assumption the TNW would need to be increased by a factor of 10 to equate risk.

<sup>210</sup> This model of insurance is extremely simplified. For instance, the model has no caps on claims, no annual premiums, no copay, no deductible, no exceptional clauses, etc.

horizon of the model. In order for the public to bear the risk, both the third-party instrument provider and the owner or operator must fail. Once again, we assume that the public will not pay for post-operation expenses until year 41. Hence, the expected discounted risk to the public of an owner or operator with a third-party instrument is given by:

$$E(D | 3^{rd}) = \sum_{t=0}^{90} \left( \frac{1}{1+r^*} \right)^t \left( (1-q)^t [E(D_{ERR} M_{tERR}) C_{NPV} + \Delta_{CA} E(M_{tCA}) + C_t 1\{t > 40\}] \right) \Pr(S_t = 0 | A_t) W$$

here  $q$  is the probability of an insurance provider surviving the year. As can be seen from these two equations for risk, third-party instruments pose a lower risk than self-insurance for any given owner or operator. However, because risk is decreasing in the owner or operator's size, there exists a level of TNW above which the risk to the public is lower than the riskiest firm that can afford the cost of third-party instruments.<sup>211</sup>

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<sup>211</sup> We should note that this model is quite simplified, by necessity. What it fails to address could potentially alter the recommended TNW requirement. For instance, the model does not explicitly model the optimizing decisions made by firms, including the decision to participate in GS. Also, many heterogeneous aspects of both GS activities and GS firms have been neglected entirely here. Importantly, the probability of a third party's failure is not likely to be independent of all other shocks. Finally, this model neglects the effect of allowing self-insurance on markets: it exacerbates the competitive advantage of larger firms and it skims the third party insurance market's risk pool of the least risky firms.

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## Appendix C. Calibration of GS FR Model Parameters

The set of parameters to be calibrated appear in the following table:

<b>Description</b>	<b>Parameter</b>
Quantity of CO2 sequestered by GS Operation	Q
Certain Costs of GS During Operation (all costs other than ERR)	$C_{t<41}$
Average cost of an ERR event	$\Delta$
Expected number of ERR events per site	$\lambda$
Certain Costs of GS After Operation	$C_{t>40}$
Price paid per ton of CO2 sequestered by a GS Operation	P
Overhead cost for trust fund	$\kappa_{TF}$
Overhead cost for insurance	$\kappa_{IN}$
Average rate of return in private capital markets	$r_m$
Average rate of return on risk free asset	$r_F$
Interest rate on trust fund investments	$r_{TF}$
Interest rate used by insurance investments	$r_{IN}$
Socially optimal discount rate	$r^*$
Liabilities as a fraction of Assets, given unitary elasticity	$b_0$
Leveraging Elasticity Parameter	$b_1$
Insolvency rate for insurance	$1-q_{IN}$
Insolvency rate for trust funds	$1-q_{TF}$
Baseline Average Insolvency rate for Owners/Operators	$1-q_{OO}$
Elasticity of Beta to TNW	$\theta_1$
Beta Risk Factor	$\theta_2$
TNW level with unitary Beta Risk Factor	$\theta_3$
Mean ln(Assets) of owners or operators in Industry	$\mu$
Standard Deviation of ln(Assets) of owners or operators in Industry	$\sigma$
Parameter on the stability distribution (2 = normal, 1 = Cauchy)	$\alpha$

To describe how these parameters are calibrated, we take them one block at a time.

1. Of the first block of parameters,  $Q$ ,  $C_{t<41}$ , and  $C_{t>40}$  are taken from the cost model that EPA is developing to estimate to impact of the GS rule.

Description of certain costs:

Cost	Annual Amount (M\$)	Description
Certain Costs of GS Before Operation ( $C_{t=0}$ )	45.8	One-time costs incurred in the pre-orientation phase (year 0).
Certain Costs of GS During Operation (all costs other than ERR/CA) ( $C_{t<41}$ )	4.2	Average annual costs incurred in the operation phase (years 1 through 40).
Certain Costs at Well Plugging ( $C_{t=40}$ )	0.8	One-time costs incurred in the well plugging phase (year 40).
Certain Costs of GS After Operation ( $C_{t>40}$ )	0.8	Average annual costs incurred in the post-operation phase (years 41 through 90)

*Source: All certain cost estimates are from the EPA's "Cost Analysis for the Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells" (816-R-10-013).*

Our estimate for  $P$  (the price paid per ton of  $CO_2$  sequestered during the life of a GS operation) is based on a rate of return equal to 7 percent of total capital costs. The rate of return is set so that owners or operators get a fair return (equal to  $r_m$ ) on their cost outlays. Given that  $Q$  (quantity of  $CO_2$  sequestered by a GS operation) is equal to 1.8 million tons,  $P$  is equal to the quotient of total revenue and sequestered tons of  $CO_2$ :

$$P = (1 + r_m)K/Q$$

Where  $K$  is equal to total capital costs. The estimate for  $Q$  is taken from the EPA's cost model.

Both  $\Delta$  and  $\lambda$  were increased to reflect our best professional judgment of the full range of damages.

2. The overhead costs of trust funds were taken from the Fall 2009 Tangible Net Worth Issue Paper. The overhead costs of insurance were assumed to be the same.

3. The long-run interest rates come from OMB's standardized instructions for conducting economic analyses. Roughly half are 3%, reflecting the long-run average rate of return on treasury bills and the other are 7%, reflecting the long-run average rate of return on private capital.

4. The leveraging parameters ( $b_0, b_1$ ) get their values from rounding off an estimation of those parameter values for liabilities regressed on assets using the 4 largest firms involved in GS demonstration projects (Shell, BP, ExxonMobil, and Chevron) using the data that appears in the Fall 2009 Tangible Net Worth Issue Paper.

5. The survival probabilities  $[q_{IN}, q_{TF}, q_{OO}]$  were taken (respectively) from A.M. Best Financial Strength Rated Insurance Company Impairments, a RCRA issue paper, and from The Dun and Bradstreet Corporation's Annual Business Failure Record using the oil and gas industry as a proxy for the GS industry. This third probably is not a direct input to the model but gets used in the estimation of other model parameters.

6. Because inspection of publicly available estimates of  $\beta$  for oil firms hovered around 1 (with the largest firms being below 1), we set  $\theta_3$  to  $\mu$ , the mean of the log of the distribution of firm sizes. Both  $\theta_1$  and  $\theta_2$  were estimated in a multi-step procedure that also involved estimating  $\mu$  and  $\sigma$ . The first step involved centering the prior distribution on the beliefs of the  $\mu$  and  $\sigma$  parameters using a method of moments (GMM) matching to the moments for firm failure conditional on TNW reported in a RCRA issue paper. In the second step, the prior number of firms in the GS industry was centered on the MLE of the number of firms in the industry using the 4 largest firms listed in the Fall 2009 TNW Issue Paper as the top 4 order statistics (of draws from the log normal distribution using the  $\mu$  and  $\sigma$  estimates from the initial GMM procedure). With flat priors around these center points, Bayesian updating was performed on these prior distributions using the 4 order statistic data points. This resulted in our final estimates of  $\mu$  and  $\sigma$ . Given those estimates, we then fitted  $\theta_1$  and  $\theta_2$  using a GMM procedure to fit the mean failure rate for owners and operators.