Regulating the operational and long-term liabilities associated with Carbon Capture and Storage (CCS): Approaches and lessons from Europe, Australia and Canada

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Abstract

Several jurisdictions globally have now adopted detailed legislative regimes for regulating and facilitating the development of Carbon Capture and Storage (CCS) activities. While many aspects of these regulatory regimes vary between countries, states and territories, the twin issues of operational and long-term liability have received considerable attention from governments, industry and the wider public. This paper, which is based upon a broader Global CCS Institute study completed in 2014, compares the approach adopted by legislators in jurisdictions in Australia, Europe and Canada in the design of their regulatory rules for CCS liability. In doing so, the paper considers how those rules will fit within the wider liability regimes which prevail in each jurisdiction, including those found under civil and administrative law.

Keywords: Regulation; regulatory frameworks; liability.

1. Introduction

The development of Carbon Capture and Storage (CCS) specific legislation in recent years, has resulted in closer scrutiny of the wider liability regimes associated with existing industrial activities, as well as the emergence of new...
regulatory approaches to tackling novel aspects of the technology. While several different countries, states and territories have addressed the challenges posed, the topic of liability has remained a contentious one for a wide group of stakeholders, including those seeking to develop the technology and the broader public. To this end, the design and implementation of legal liability regimes for CCS activities continues to be of profound interest to project proponents, policymakers and regulators globally.

The Global CCS Institute commissioned a study in early 2014 [1], drafted by the authors of this paper, to examine the approaches adopted by some of these early legislators. While the study is not intended to provide an exhaustive review of each liability regime, it examines the development of these models and considers in particular, how regulatory rules for CCS have been incorporated within the broader liability regimes that prevail in each jurisdiction.

This paper examines the key findings from the Institute’s study, contrasting how particular types of legal liability have been handled within these early regimes and highlighting important themes that will likely need to be addressed in the design of future legal and regulatory models for CCS.

1.1. Context – legal regimes examined

Three jurisdictions were selected as the basis for the comparative assessment; the State of Victoria, Australia; the Province of Alberta, Canada; and the United Kingdom. These particular jurisdictions were chosen because each have developed CCS-specific regulatory frameworks in recent years including, in some instances, primary and secondary legislation. The legal systems in each of these jurisdictions also share a common law tradition which, save for some notable variations, largely supports the making of direct comparisons between the various regulatory methods employed. The government and regulators in each of these jurisdictions, have also played a significant role in promoting their regulatory activities to the wider, global CCS community.

In Alberta, the provincial government enacted primary and secondary legislation in 2010 and 2011, which amends several energy statutes to clarify the basis for CCS regulation in the province. The Act and subsequent Regulation address a number of important issues including, among others; pore-space ownership, the management of long-term liabilities and the post-closure transfer of liability for stored CO₂ to the Province. In addition to these legislative developments, the government has undertaken a Regulatory Framework Assessment (RFA) with a view to further refining the Province’s regulatory model. This exercise, which engaged both domestic and international experts, resulted in the submission of seventy-one individual recommendations to government in late 2012.

The State of Victoria enacted one of the world’s first CCS-specific regulatory models in 2008, in the form of its onshore storage Act. A further Act, governing offshore storage operations in the State’s territorial waters, was enacted in 2010. Both Acts draw heavily from the State’s existing petroleum legislation, with the offshore Act amending the existing petroleum legislation to include provision for geological storage. The onshore Act, however, establishes a stand-alone model. These Acts, together with their subsequent Regulations, provide a comprehensive model for the State-wide regulation of CO₂ storage.

The United Kingdom’s regulatory framework largely reflects the requirements of the European Union’s 2009 Directive on geological storage. In anticipation of the Directive being agreed, the UK government enacted licensing legislation in the form of the Energy Act 2008. In a similar manner to the UK’s pre-existing model for oil and gas activities, the Act and its accompanying Regulations, provide a detailed model of regulation for offshore storage operations.

1.2. Types of liability

This paper, as does the Institute report, focuses upon three types of liability presented by CCS operations. The first, civil liability, exists where third parties, who have suffered harm as a result of particular activities, seek redress in the form of compensation or an order from a court. In many jurisdictions, this type of liability is also known as tort.
liability. In the jurisdictions examined, the principles of civil liability have largely been developed by national courts through case-law, though legislation still has a significant role to play, especially when it comes to limitation of actions.

The second type of liability considered here, is what we term *administrative liability*. These liabilities are to be found in the powers afforded to public authorities, which may require an operator to undertake specific remediation activities in the event of leakage. Comparable powers have previously been afforded to government bodies under the auspices of environmental legislation where, for example, prompt action is required to address a pollution incident. It should be noted that these powers are to be considered separate and distinct from any enforceable obligations owed under a permit or a license, which are likely to be addressed through the imposition of criminal sanctions or administrative penalties. Administrative liability powers derive exclusively from legislation.

A further category of liability addressed in this paper is an *emissions trading liability*, which may be owed by an operator under an emissions trading scheme. In jurisdictions, such as the European Union, where a trading scheme is in operation and operators secure credit for CO₂ that has been successfully stored, liability will likely be imposed where there are instances of subsequent leakage. While in reality, this category may be classified as a form of administrative liability, its purpose is sufficiently distinct, from the clean-up provisions characterized above, to merit a separate category.

2. Civil Liability

Civil liability principles may prove an important mechanism for compensating those who have suffered harm as a result of others’ actions. However, while comprehensive in scope, these principles do not always provide an automatic right to compensation in the event of damage, despite the clear involvement of fault on the behalf of one party. Beyond the provision of compensation, civil liability principles may also afford other remedies to a victim of damage. One example are injunctions, which may be available to a claimant where there is evidence of continuing damage caused by an activity.

2.1. *Torts relevant to CCS*

All three jurisdictions have adopted a largely similar approach to addressing the torts of trespass to land; private nuisance; public nuisance and negligence. The Institute study confirms that in many instances, existing and agreed principles of civil liability, developed under these torts, would likely be available to claimants seeking compensation for damage caused by CCS-related activities. Agreed principles, which apply to pollution incidents and land contamination, for example, are likely to be applicable by analogy in instances of damage caused by leakage of CO₂ from a storage site.

As noted previously, the jurisdictions considered here share a common law background and their approach to civil liability principles has therefore been largely developed by their courts, in the form of case law. While many of these legal principles are of common application, by virtue of this shared legal tradition, their development and interpretation in national courts has meant that they are not always applied in a uniform manner. One example of these divergent approaches is found in relation to the recognition of a right of action, defined in the case of *Rylands v Fletcher* [2]. This case, concerning the escape of dangerous substances that are brought onto land, imposes strict liability upon the operator whose actions give rise to an escape, with no requirement to demonstrate fault or negligence on behalf of the operator. Case law in the UK continues to view this rule as a subset of nuisance actions, but in recent years the Australian courts have effectively got rid of it as a separate cause of action in favour of the existing rules applicable to negligence actions [3].
2.2. Regulatory compliance

The position in each of these jurisdictions is perhaps less clear, however, when considering some of the novel aspects of the CCS process and their regulation under national frameworks. One issue highlighted in the wider Institute study, is the relationship between regulatory compliance and the potential liability in tort in each of the individual jurisdictions. The Courts in all three jurisdictions have addressed this issue in relation to other activities, and these experiences may provide useful analogues.

Courts in the UK, Canada and Australia have all found that some nuisance claims may be dismissed, where legislation expressly authorises an activity be undertaken. The absence of negligence on behalf of the respondent and analysis of the authorising legislation’s construction has nevertheless proven crucial in decisions relating to statutory authority. Whether these principles apply in the case of actions brought under the tort of trespass is less clear. While there are examples of defences to trespass actions, where actions and activities are justified by licence or legislation, it is unlikely that a licence or consent awarded to a CCS operator would afford a defence in instances where CO₂ has been allowed to leak onto another’s property.

As an activity which is likely to be highly regulated, however, it is notable from the analysis of the civil liability regimes in each of the three jurisdictions, that none offer an absolute defence to a claim, even where there had been compliance with a permit. This issue will likely prove of keen interest to regulators and CCS proponents.

2.3. Limitation periods

Limitation periods, which define the time periods for bringing civil claims, are an issue which will likely be of particular importance in the case of the leakage of CO₂ from a storage site. Difficulties associated with identifying latent damage and the significant time frames associated with storage operations, means that national legislation defining limitation periods will inevitably prove a key factor in bringing a claim. Table 1 below, which is extracted from the wider Institute study, details the limitation periods for tort actions in each of the three jurisdictions examined.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>General Rule</th>
<th>Exceptions</th>
<th>Overall Time Limit to Bring a Claim</th>
<th>Court Power to Override?</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wales</td>
<td>Six years from when the damage occurs</td>
<td>Three years from when the claimant discovered the damage, or from when the damage was reasonably discoverable, in cases of negligence or nuisance involving personal injury, and in negligence cases concerning property damage</td>
<td>Negligence involving property damage are subject to a fifteen year overall time limit</td>
<td>Yes, in negligence and nuisance actions involving personal injuries where the court considers it equitable to do so (section 33 of the Limitation Act 1980)</td>
</tr>
<tr>
<td>Alberta</td>
<td>Two years from when the claimant knew, or should have known, about the damage</td>
<td>None</td>
<td>Ten years</td>
<td>Yes, under the Environmental Protection and Enhancement Act 2000 for claims based on releases into the environment</td>
</tr>
<tr>
<td>Victoria</td>
<td>Six years from when the damage occurs</td>
<td>Three years from when the damage was discovered, or from</td>
<td>Negligence and nuisance actions causing personal injury are</td>
<td>Yes, in cases involving negligence and nuisance involving personal</td>
</tr>
</tbody>
</table>
The significant differences in limitation periods observed in each of the three jurisdictions, is clearly evident from the table above. Two broad models have emerged – a limitation period based on when the damage occurred, but with some exceptions which allow for that period to start when it was reasonably deliverable, and perhaps the more modern approach (see in Alberta) based on the date when the damage was reasonably discoverable, but with a shorter period to bring actions and an overall time-limit. While limitation periods are defined in national legislation, it is inevitable that judicial interpretation and the assessment of their application to the facts of a particular case, will lead to further variation across each of the individual jurisdictions.

3. Administrative Liability

All three of the jurisdictions considered, have extensive bodies of law and regulation that govern administrative liability. In addition to those found in the CCS-specific frameworks detailed in section 1.1 above, provisions governing administrative liability may also be identified in national regimes addressing environmental protection, oil and gas activities, marine management and water protection. Many of these models provide a public body, or a number of different bodies, with wide-ranging powers to require an operator to undertake specific activities. In some instances, an authority itself, is empowered by legislation to carry out works to remedy a particular situation.

3.1. Existing law and regulation

Environmental protection legislation found in each of the jurisdictions, provides just one example of where administrative liability powers may impact upon CCS operations. Acts and Regulations in all three jurisdictions afford various administrative liability powers to competent authorities in instances of environmental pollution, including where there is an imminent threat of damage or where it is necessary to prevent further environmental damage from occurring. In some occasions, for example the UK Regulations governing the prevention and remediation of environmental damage [4], the authority has a duty to take action, rather than a discretionary power.

Powers exercised by the competent authorities are, in many instances, initially in the form of notices or orders, which require an operator to undertake a specified activity or cease a particular operation. These orders and notices are usually binding upon the operator and failure to satisfy their requirements will often be deemed an offence and subject to further sanction in the form of financial penalties. Beyond the power to issue a notice or order, some legislation also empowers a public body to take whatever action they deem necessary to remedy a particular situation. These far-reaching and in some instances ambiguous powers, are often further reinforced by the ability to then recover the costs of any action from an operator or person served with the original notice or order.

When comparing the regimes, however, it is clear that there are a number of areas where there are variations in the approaches taken by legislators. One particular example, is the ability of an operator to review or challenge the public body’s exercise of these administrative powers. The study has revealed that these rights vary considerably, with some legislation offering operators the right of a full merits appeal, while other legislation only allow a review based upon limited grounds of appeal. While likely to be familiar with the administrative powers found within these existing regulatory models, their subsequent application to CCS activities may prove of greater concern to prospective operators.
3.2. CCS-specific legislation

Similar administrative liability powers have also been expressly included within the CCS-specific frameworks in each of the jurisdictions considered. In the UK, the Energy Act 2008 includes provisions which enable the licencing authority to issue an operator with ‘directions’, where the operator has failed to comply with the terms of a licence issued under the Act. Where an unexpected leakage is detected, the Act also provides the authority with the power to direct an operator to undertake ‘corrective measures’ and any measure necessary for protecting human health. In both instances, where an operator fails to undertake the necessary actions, the authority may carry out any necessary works themselves and recover the associated costs.

In Alberta, the Energy Regulatory is afforded a general power under the Oil and Gas Conservation Act to act in instances where a facility is not being operated in accordance with an order, direction or requirement of the regulator. The regulator may authorise any person to carry out ‘whatever the regulator considers necessary’, to comply with its requirements. The costs associated with this action may then be allocated to the licensee and are subsequently recoverable as a civil debt.

Similar concerns to those expressed in relation to the existing laws and regulations, may be raised with regard to the administrative liability powers found in these CCS-specific models. The broad scope of the regulators’ powers in some instances, together with potentially limited rights to review or appeal a decision, may concern future operators. These issues are perhaps further complicated in relation to these CCS-specific models, however, because their provisions remain untested by both operators and regulators. The nature of the obligations imposed by specific orders or directions, as well as the likely cost of compliance, will not become apparent until a CCS-specific incident occurs.

4. Emissions Trading Liability

Greenhouse gas trading schemes, which incentivise CO₂ storage through the provision of economic benefits, will also be required to address the issue of accounting liability in instances where leakage is subsequently identified. Analysis of the EU’s Emission Trading Scheme’s (EU ETS) management of CCS activities reveals that there remain a number of uncertainties, which may prove of concern to both regulators and operators.

Under the amended EU ETS Directive, a registered emitter is not obliged to surrender allowances in respect of emissions which are verified as successfully captured and stored, in accordance with the EU’s storage Directive. While no allowances are allocated to a storage operator, the operator is subsequently obliged to account for any emissions from the storage site, both during the operational phase and beyond into the post-closure period of the project. The operator will therefore be liable for any leakages, until the point of surrender and transfer of responsibility to the Member State.

The significant timescales associated with storage activities, the technical challenges of determining exact leakage to the atmosphere and uncertainties surrounding the future price of allowances, will all likely prove important factors in determining the extent of these liabilities. In the EU, operators will be obliged to provide financial security to cover these potential liabilities prior to the commencement of injection. Notwithstanding the Guidance on financial security issued by the European Commission in 2011, the challenge of predicting a future allowance price over the lifetime of a project will likely prove challenging for operators, and the insurance industry.

5. The transfer of liability

In designing regulatory models for the technology, many governments have recognised that CCS is a mitigation technology designed to offer a permanent solution and, as such, liabilities attaching to these operations will extend far beyond the traditional lifespan of a commercial or corporate entity. Transferring responsibility for a storage site from the operator to the State, at some point following the cessation of injection activities, has therefore proven a popular yet contentious method of addressing this issue in early regulatory frameworks for CCS. Victoria, Alberta and the
United Kingdom have all included provisions to enable the transfer of liability in their CCS-specific frameworks. There are some notable differences in the approach adopted in each of the three jurisdictions.

Three particular issues have emerged, when assessing the scope of the transfer regimes introduced in each of the jurisdictions. The first is the conditions which will have to be fulfilled by an operator before a transfer can be effected. A second is the nature of the transfer and which liabilities are in fact transferred to the State. Equally important to consider in this instance, are the liabilities which are by implication excluded from the transfer provisions. The potential for re-assigning liability to an operator, post-transfer, is a further important factor to be considered. One of the models considered here includes explicit provision for ‘clawing back’ costs from an operator, should fault be discovered at a later stage.

5.1. Conditions for transfer

Each of the jurisdictions considered, have legislation which contemplates the ultimate transfer of responsibilities for the storage site to the State. Table 2 below, which is taken from the broader study, provides a high-level synthesis of the requirements for the transfer in the three jurisdictions. This includes both the ‘core conditions’ which must be fulfilled to allow a transfer to take place, as well as any minimum period that has to elapse after the injection of CO₂ has ceased and the site has been closed (‘Post-Closure Time Limit’).

<table>
<thead>
<tr>
<th></th>
<th>Core Conditions</th>
<th>Post-Closure Time Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The EU Directive</strong></td>
<td>‘all available evidence’ indicates that the stored CO₂ will be completely and permanently contained</td>
<td>Minimum period of twenty years unless the competent authority is satisfied that the core condition is met at an earlier date</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td>‘all available evidence’ indicates that the stored CO₂ will be completely and permanently contained</td>
<td>Minimum period of twenty years unless the competent authority is satisfied that the core condition is met at an earlier date</td>
</tr>
<tr>
<td><strong>Alberta</strong></td>
<td>The Minister is satisfied that the captured CO₂ is behaving in a stable and predictable manner, with no significant risk of future leakage</td>
<td>Not yet specified in the Regulations. The RFA recommends a minimum period of ten years, with no discretion for the authority to reduce this period</td>
</tr>
<tr>
<td><strong>Victoria</strong></td>
<td>The Minister is satisfied that: (i) the injected CO₂ is behaving in a predictable manner, (ii) the licence holder has reduced risks to as low as reasonably practicable and (iii) the stored CO₂ will not present a risk to public health or the environment</td>
<td>None specified in the legislation</td>
</tr>
</tbody>
</table>

A cursory analysis of the table reveals that there are significant variations in the approach adopted by legislators in each instance. The ‘core’ transfer conditions reveal that the requirements of the European and UK model afford a far more stringent test than those observed in the Alberta and Victorian regimes. The Alberta Mines and Minerals Act, for example, adopts less rigorous language and requires that the Minister is ‘satisfied’ that the closure requirements have been met. The Alberta legislation’s use of the term ‘no significant risk’, with regard to future leakage, also suggests that some form of risk will be acceptable – in contrast to the ‘complete and permanent containment’ requirement of the UK model.
5.2. Scope of the transfer

The responsibilities and liabilities that are transferred to the State, also vary between the different regimes that are examined here. Table 3 below, provides a high-level comparison of the approach taken to transfer in each of the jurisdictions. Most notable are significant differences between the more expansive provisions found in the UK and Alberta regimes, and the less specific nature of the Victorian model. It may be presumed that the ‘silence’ of the Victorian model, sees the holder of an authority relieved of any administrative liabilities – borne under the various relevant Acts - following the surrender of an authority. It is clear, however, that civil liabilities are not contemplated within this transfer, leaving an operator potentially liable to a civil claim following the surrender of an authority.

Both the UK and Alberta models offer greater detail as to exactly which liabilities are transferred to the relevant authorities. In Alberta, future liability for the stored CO₂ will be transferred to the Crown, however, this does not include any existing liabilities. Under the Mines and Minerals Act an indemnification is offered, subject to conditions, to the lessee in respect of any liability in damages in an action in tort. The UK’s Regulations [5] offer perhaps the most comprehensive transfer provisions, with a broad range of liabilities being transferred to the Secretary of State. In addition to the transfer of liabilities relating to the EU ETS, the Environmental Liability Directive and monitoring and corrective measures obligations under the storage Directive; the Regulations also enable the transfer of ‘leakage liabilities’ incurred prior to the termination of the licence. The expansive definition of these type of liabilities, could potentially encompass any sort of potential civil claim or administrative liability arising from a leakage – whether the leakage occurred before or after the transfer to the Secretary of State. This apparently generous transfer, however, is subject to the ‘claw-back’ provisions described below.

<table>
<thead>
<tr>
<th>Body the Liabilities Transferred to</th>
<th>Liabilities Transferred</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The EU Directive</td>
<td>The competent authority</td>
<td>Obligations under the CCS Directive relating to monitoring and corrective measures, obligations relating to the surrender of EUAs under the ETS Directive in the event of leakage and obligations relating to preventative and remedial action under the ELD</td>
</tr>
<tr>
<td>England and Wales</td>
<td>The competent authority (the Secretary of State)</td>
<td>Obligations under the CCS Directive relating to monitoring and corrective measures, obligations relating to the surrender of EUAs under the ETS Directive in the event of leakage and obligations relating to preventative and remedial action under the ELD. Also, any liabilities, whether present or future, actual or contingent, arising from leakage from the site</td>
</tr>
<tr>
<td>Alberta</td>
<td>The Crown</td>
<td>Future responsibilities under various environmental legislation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The former lessee is indemnified from any liabilities in damages in torts. The RFA recommends that liabilities under the greenhouse gas</td>
</tr>
</tbody>
</table>
emissions regime should also be transferred

| Victoria | The Crown | Future responsibilities under environmental laws are presumed to be transferred, although are not specified | There is no transfer or indemnification in respect of liabilities for torts |

5.3. ‘Claw-back’ provisions

The EU’s storage Directive includes a distinct provision, in Article 18(6), which enables the authority to recover costs from the operator following the transfer of liability. This ‘claw-back’ provision may be used by an authority where it is demonstrated there has been fault on the part of the operator, ‘including cases of deficient data, concealment of relevant information, negligence, willful deceit or a failure to exercise due diligence’. The provisions found in Article 18(6) have been fully transposed into the UK’s regulatory model, with the Regulations enabling the competent authority to recover costs ‘to the extent that such costs arise due to fault on the part of the operator’. These provisions would enable an authority to recover costs for several obligations and liabilities, including those arising out of tort.

Similar ‘claw-back’ provisions do not appear to have been expressly included within the Alberta and Victorian regimes. While there are no explicit provisions within these models, it would be unlikely that an operator would be able to gain a benefit from a statutory transfer provision, where they have committed a deliberate fraud or misled a competent authority during a decision-making process.

6. Financial security

Financial security requirements have also been imposed in each of the three jurisdictions, reflecting once again the need to ensure that the long-term risks associated with storage operations are directed away from the public purse. These provisions are clearly designed to ensure that the State is not overly-burdened by the inability of an operator to meet their obligations, particularly in the post-closure period or in instances where an operator has gone into liquidation. The Institute’s study revealed some important similarities and differences in the three models, two of which are discussed below.

6.1. Precedent and experience

The approach to designing financial security provisions has varied in each of the jurisdictions surveyed, however it is evident that national legislators have drawn heavily upon existing models designed to address the oil and gas, and landfill waste disposal sectors. In Victoria, the holder of an authority under the Greenhouse Gas Sequestration Act, is required to obtain a rehabilitation bond, prior to the commencement of operations. The bond mechanism, which is defined as an ‘instrument acceptable to the Minister securing the payment of a specified amount of money for any rehabilitation work, clean-up work or pollution prevention work that may be necessary as a result of a greenhouse gas sequestration operation’, is similarly found within the state’s petroleum legislation.

In Alberta, operators are required to pay into the Post-closure Stewardship Fund, rather than establish their own financial mechanisms. This model again draws heavily from an existing model, in particular the province’s ‘Orphan Fund’ established under the Oil and Gas Conservation Act. Now extended to include facilities used for the disposal of carbon dioxide, the fund pays for the abandonment and rehabilitation costs of orphan wells and other facilities by levying funds from operators.

In Europe, and consequently the UK, the CCS Directive has adopted a model similar to the one developed under the existing EU Landfill Directive, which requires that a landfill permit may only be granted in instances where an
operator has made adequate financial security provision. In a similar regard, the EU’s CCS legislation, which introduces two forms of security, requires an applicant for a storage permit to provide evidence of financial security to ensure that all obligations under a permit can be met. Financial security in this instance, will include those obligations relating to closure and post-closure.

6.2. **Long-term monitoring and verification costs**

Contrasting approaches to the payment and management of long-term monitoring and verification costs, are to be found in each of the individual regimes. The financial mechanism found within the EU and UK model, requires an operator to make a financial contribution just prior to the transfer of responsibility, where liability is assigned to the competent authority. This financial contribution, which will cover ‘at least the anticipated cost of monitoring for a period of 30 years’, is to be used by the competent authority to ensure that the stored CO₂ is ‘completely and permanently contained in geological storage sites after the transfer of responsibility’. The UK’s implementing Regulations afford broad discretion to the Secretary of State in determining the amount of contribution and, while the operator is afforded an opportunity to make representations on any proposal, no right of administrative appeal against the ultimate decision is provided.

In Victoria, a holder of an authority is required to pay an annual fee to the relevant Minister to cover the costs associated with the long-term monitoring and verification of the stored CO₂. As a condition of the grant of a monitoring and injection licence, the amount to be paid is calculated by the Minister as a percentage of the total estimated costs associated monitoring and verification. In Alberta the Post-closure Stewardship Fund, which is to be administered by the relevant Minister, provides the mechanism for monitoring injected CO₂ in the post-closure period. Holders of carbon sequestration leases will be required to pay into the Fund, based upon a fee-per-tonne of CO₂ injected. The fee to be levied has yet to be set by the relevant Minister.

The contrasting approaches observed in each of the jurisdictions offer several benefits and potential disadvantages. The Victorian and Alberta models, which require an operator to make payments during the operational phase of the project, may prove more desirable from the operator’s perspective. In clear contrast to the UK model, this approach will allow them to make contributions while there is an income stream for the project, rather than at the point of transfer. Under the UK model, there is potential for an operator to be faced with charges which exceed the sums they have calculated or reserved during their operations. The EU and UK’s approach does however, offer a benefit in this regard, because authorities will be potentially less reliant upon predictions when determining the costs of long-term monitoring and verification.

7. **Conclusions**

The overview provided here, together with the Institute’s broader and more comprehensive study, reveals the complex and occasionally contrasting nature of legal liability for CCS operations, which have been developed in the UK, Alberta and Victoria. All three jurisdictions with their shared common law tradition, detailed existing regulatory systems and CCS-specific frameworks, demonstrate that there is potential for a number of approaches to addressing the key areas of legal liability for CCS. For those jurisdictions currently considering or developing legal and regulatory models for the technology, it is apparent there are a range of policy, legal and regulatory options available for addressing legal liabilities.

Several significant messages may be derived from this brief analysis and the wider study. Perhaps the most important of which is that, despite the legal and regulatory development undertaken in each jurisdiction, the absence of significant regulatory experience means that much of the current commentary must remain speculative. As CCS moves beyond the demonstration phase and greater technical and operational experience is garnered, further refinement of these legal and regulatory regimes will likely be required.
The deployment of the technology will also likely afford greater experience from a technological perspective, this in turn will help to address questions as to the technical feasibility of projects to meet the criteria specified in the current legal and regulatory models. The stringent requirements currently placed upon operators ‘up-front’, for example with regard to site selection and in the provision of financial security, may provide one example of legislators attempting to reduce the current level of uncertainty surrounding some aspects of the technology.

Another important consideration in the design and development of models to address legal liabilities, is the need to ensure flexibility in the regulatory approach adopted. The ability of a regulator and operator to review and adjust requirements, throughout the lifetime of the project, will likely prove an important feature of an effective legal and regulatory model. While not addressed in this particular paper, it may also be important to consider the application of these provisions against the host of commercial arrangements for sharing risks and costs, which will no doubt be developed in forthcoming years.

References