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Liability for sequestered CO₂: the path forward for Alberta

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Abstract

This paper presents the approach being taken by the Province of Alberta (Canada) to assess the site specific risks of carbon dioxide (CO₂) sequestration and how the long-term liability associated with such activities will be managed. This paper highlights the benefits Alberta has obtained from the passage of carbon capture and storage (CCS) legislation and summarizes some of the work taking place via the Regulatory Framework Assessment (RFA) to review the specific processes, requirements and performance criteria necessary for the Government of Alberta to manage long-term liability for sequestered CO₂ into the future.

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1. The province of Alberta

Located in Western Canada, Alberta is a province rich with a beautiful environment, abundant natural resources, a strong economy and a stable political system. Alberta is a global energy leader with a diverse resource portfolio which includes coal, electricity, minerals, natural gas, conventional oil, petrochemicals, renewables and Alberta's oil sands. In 2009, Alberta released its Provincial Energy Strategy with a vision of being a responsible world-class energy supplier, an energy technology champion, a sophisticated energy consumer and a solid global environmental citizen [1].

1.1 Alberta's resource base

As the engine of Alberta's economy, energy revenues account for nearly a third of the revenue comprising Alberta's provincial budget and just over half of the value of the province's total exports. Alberta has proven oil reserves of 170.8 billion barrels, consisting of bitumen (169.3 billion barrels) and conventional oil (1.5 billion barrels) [2]. These reserves make up the third-largest proven crude oil reserve in the world, next to Saudi Arabia and Venezuela. Alberta's reserves contain enough oil to meet Canada's current oil demand for almost 400 years.

Albertans own 81 per cent of the province's oil, natural gas and other mineral resources. The remaining 19 per cent are 'freehold' mineral rights owned by the federal government on behalf of First Nations or in National Parks, and by individuals and companies. Many Albertans contribute every day to an energy sector that yields benefits year after year to all who live in the province. The energy sector employs - directly or indirectly - nearly one in every six workers in Alberta.

As global markets transition toward low-carbon energy sources, Alberta, like many other jurisdictions, is looking for opportunities to continue to grow its economy, while at the same time ensuring that growth is occurring in a responsible manner.

1.2 Alberta's Climate Change Strategy

Alberta's Climate Change Strategy outlines the importance of carbon capture and storage (CCS) to the province. Using three main approaches, the Government of Alberta is planning to reduce the province's emissions profile by 200 million tonnes (Mt) per year below the projected 'business as usual' scenario (see Figure 1, below):

- To reduce greenhouse gas emissions by transforming how energy is used, applying energy efficient solutions, and conserving energy. (24 Mt per year by 2050)
- To transform the way we produce energy and to introduce cleaner, more sustainable approaches to energy production. (37 Mt per year by 2050)
- To store quantities of carbon dioxide in Alberta's geological formations rather than releasing it into the atmosphere. (139 Mt per year by 2050)

By 2050, CCS is expected to reduce emissions by 139 Mt a year, which will represent 70 per cent of all emission reductions in the province. As the world transitions to a clean energy economy, CCS will help Alberta remain competitive. Those jurisdictions that lead in this transition will be best positioned to be the new leaders of the global economy.

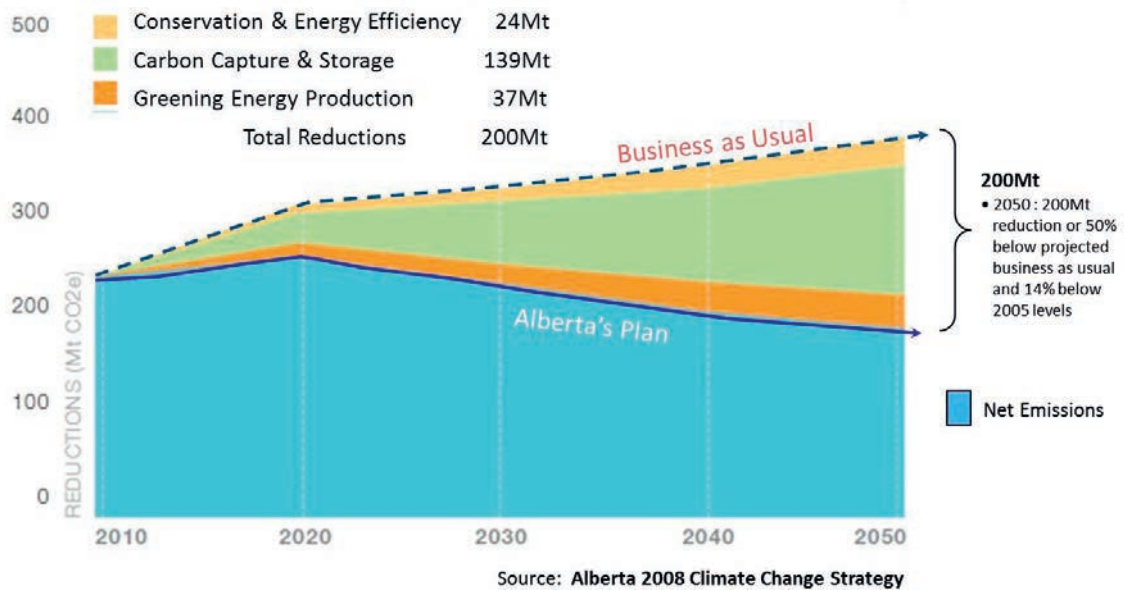


Figure 1 – Alberta's Climate Change Strategy [3]

1.3 Why CCS?

CCS is an excellent fit for the Province of Alberta for several reasons. It aligns with Alberta's experience and knowledge of energy based technology, it fits Alberta's emissions profile that is primarily made up of large point source industrial emitters, and it allows the province to make use of the tremendous geological formations found in the Western Canadian Sedimentary Basin.

CCS is one part of the potential solution for large industrial emissions in many sectors, including: thermal fired power, upgrading, refining, petrochemicals, manufacturing, steel and cement. CCS has broad application wherever fossil fuel energy is used and is one of the only ways to manage greenhouse gas emissions growth in coal-fired power generation and in the rapidly expanding oil sands sector.

Albertans have been in the energy business for 60 years and over those decades have developed an amazing amount of technical expertise. Alberta is known as an energy technology champion and some of the world's best practices around hydrocarbon exploration and production were developed and perfected in Alberta. This allows Alberta the opportunity to tap into some of the best geologists and reservoir engineers in the world when it comes to assessing which formations will be best suited for storing CO₂ indefinitely, and for predicting and monitoring CO₂ behaviour once injected. Additionally, the infrastructure and services needed to aggressively deploy CCS are all found in the province.

The majority of Alberta's emissions come from large industrial facilities that are appropriate for commercial-scale CCS, including coal-fired power plants and oil and gas facilities. In the future, Alberta's emissions profile will continue to be made up of large industrial emitters, just as it is today. Many of these emission streams are amenable to capture with today's technology, although the costs associated with capturing CO₂ is one of the key barriers facing CCS at the moment.

Perhaps the most important reason for Alberta's strong commitment to CCS is that Alberta sits on some of the greatest geological formations on the planet. The Western Canadian Sedimentary Basin is a stable sedimentary rock formation that has provided Alberta with the third largest resource base in the world and it is these same formations that provide the province with world class sequestration sites. The porous rock formations found beneath impermeable rock layers in the basin offers Alberta tremendous capacity to safely and securely store CO₂.

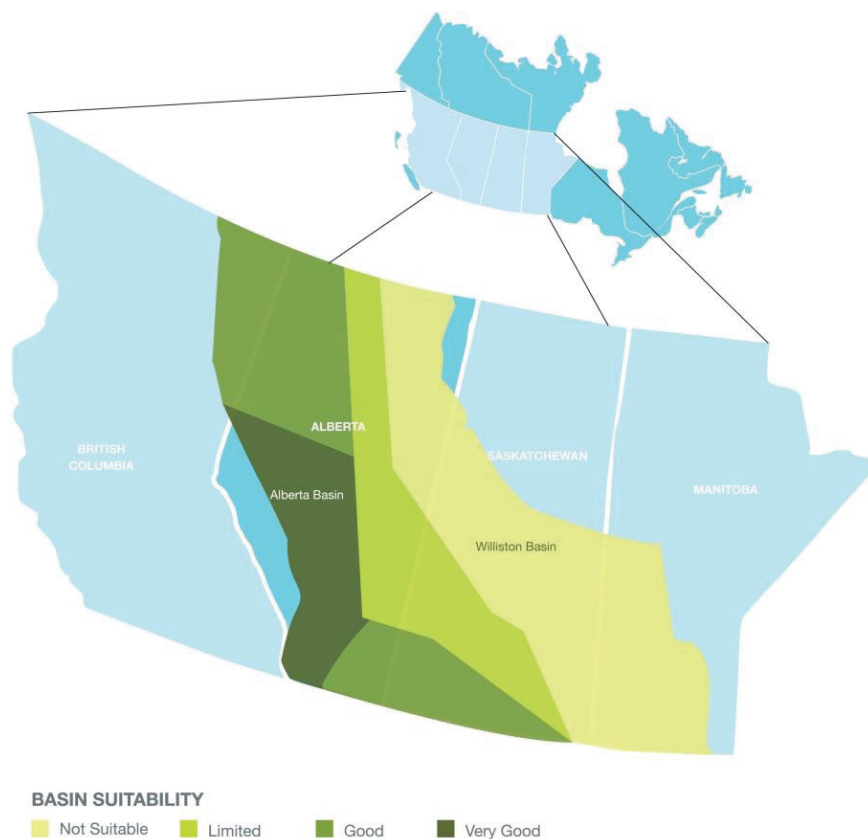


Figure 2 – CO₂ Sequestration Suitability in the Western Canada Sedimentary Basin (Adapted from: Bachu and Stewart, 2002) [4]

2. Regulatory framework for CCS

The current regulatory regime for CCS projects in Alberta is governed by several pieces of provincial legislation (federal legislation primarily applies to CCS if there are interprovincial or international components of a project). Alberta has established legal authorizations (approvals, permits, etc.) and a regulatory process for the capture and transportation phases of CCS activities and recently passed the *Carbon Capture and Storage Statutes Amendment Act, 2010* and *Carbon Sequestration Tenure Regulation* to address CO₂ sequestration and other issues, including liability.

In general, approval for the operation of a CCS scheme in Alberta is the responsibility of the Energy Resources Conservation Board (ERCB) under the *Oil and Gas Conservation Act*. Currently, applicants for a CO₂ sequestration project use the ERCB acid gas disposal scheme requirements, which require approval for both surface and subsurface development.

Prior to ERCB approval, a tenure agreement is required with the Government of Alberta under the *Mines and Minerals Act* in order to inject CO₂ into Crown-owned pore space. CCS project proponents can obtain an evaluation permit to evaluate a sequestration site and a carbon sequestration lease to secure pore space tenure for long term sequestration from the Alberta Department of Energy. At the end of a project, a closure certificate is required to close a site and transfer long-term liability to the Government of Alberta.

Proponents may also require various authorizations from other government departments, including Alberta Environment and Sustainable Resource Development (ESRD), depending on the scope, location and scale of the CO₂ sequestration project.

2.1. *Mines and Minerals Act*

Under the *Carbon Capture and Storage Statutes Amendment Act, 2010* the Government of Alberta assumes long-term liability for a CCS sequestration site once a closure certificate is issued. CCS projects are long-term projects, and CO₂ sequestered during a project will remain trapped underground for hundreds, and likely thousands, of years. Due to these long timeframes, it is conceivable that sequestered CO₂ will remain in place much longer than any corporation operating a project would be expected to exist. Therefore, the Government of Alberta made a policy decision to assume long-term responsibility for sequestered CO₂ to ensure that it will be monitored and, if necessary, managed in the future. This assumption of liability for sequestered CO₂ differs from the perpetual liability that operators hold for other upstream petroleum operations. Government of Alberta policy to assume long-term liability for CCS was also designed to incent CCS development, and to ensure long-term stewardship of sequestered CO₂. The requirements for closure, outlined in both closure and MMV plans, have been designed to minimize the risks to the province and Albertans in accepting long-term liability for sequestered CO₂.

The *Mines and Minerals Act* sets out the liabilities and obligations the Government of Alberta will assume when it issues a closure certificate. When a closure certificate is issued, the Government of Alberta becomes owner of all injected CO₂, and assumes all obligations as lessee and operator, including responsibilities related to wells and facilities, the environment and land. The Government of Alberta also indemnifies the former lessee against damages in tort action.

The *Mines and Minerals Act* also established the Post-closure Stewardship Fund (PCSF) to ensure that liabilities for sequestered CO₂ assumed by the Government of Alberta will not become a burden to Albertans by protecting the public from bearing the costs of post-closure liabilities. Funds are collected from the CCS operator during the injection period of a project to cover potential costs for some of the liabilities assumed by the Government of Alberta that could arise during the post-closure period. The Act sets out the allowable uses for the PCSF, which are:

- Monitoring injected CO₂
- Fulfilling obligations assumed as operator and lessee
- Paying for suspension, abandonment, reclamation and remediation of orphaned facilities
- Other purposes prescribed in the regulations.

2.2. Carbon Sequestration Tenure Regulation

The *Carbon Sequestration Tenure Regulation* was passed in spring of 2011 to lay out some of the administrative details for the two tenure types allowed by the *Mines and Minerals Act*. The Regulation establishes five-year evaluation permits and 15-year renewable carbon sequestration leases. Tenure applicants are also required to submit an MMV plan as part of the application for either form of tenure and a closure plan as part of the application for a carbon sequestration lease. MMV and closure plans must also be re-submitted for review and approval every three years.

2.3. Regulatory Framework Assessment

The Government of Alberta is taking action to deploy CCS by committing over \$1.5 billion (CDN) to three large-scale CCS projects. These projects will reduce Alberta's greenhouse gas emissions by over four Mt per year starting in 2015, and will provide momentum towards reaching the province's long-term greenhouse gas reduction targets. To address regulatory barriers to the deployment of CCS, several legislative changes have been made including, clarification of pore space ownership and disposition, and enabling future transfer of long-term liability from industry to the Government of Alberta.

In undertaking CCS at a large scale, the Government of Alberta must assure itself and all Albertans that sequestration of CO₂ is comprehensively and transparently addressed in Alberta's regulatory framework. In order to identify and address any potential regulatory gaps, the Government of Alberta initiated the Regulatory Framework Assessment (RFA) in March 2011. The RFA is a multi-stakeholder process that is reviewing and recommending technical, environmental, safety and monitoring requirements for CCS, and identifying regulatory efficiencies to enable the deployment of CCS in a safe, responsible and efficient manner.

This multi-stakeholder process is guided by a Steering Committee, includes an Expert Panel of world-renowned scientists, and four highly specialized Working Groups that are examining various CCS related issues in detail. The organizational structure of the RFA is illustrated in Figure 3 below.

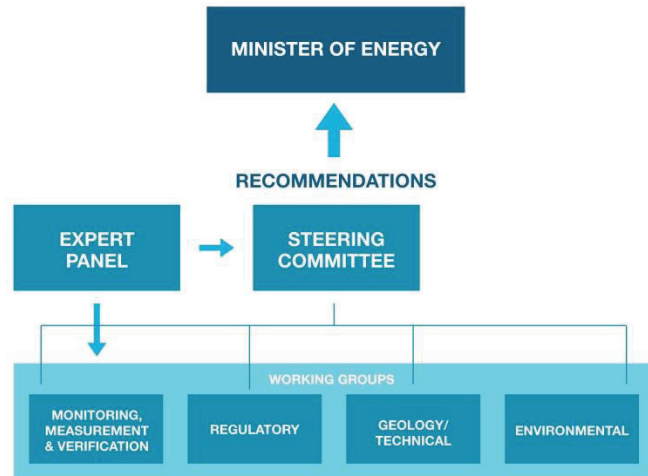


Figure 3 - Organizational chart of the Regulatory Framework Assessment

The Steering Committee includes members from senior positions in government, industry, academia and non-governmental organizations. The Committee defines the scope of the assessment, guides the work of the Working Groups, consults with the Expert Panel and approves Working Group recommendations to be provided to the Minister of Energy for decision.

The Expert Panel includes internationally recognized experts in CCS and related fields from Australia, Canada, the United Kingdom and the United States of America. The Panel is accountable for advising the Steering Committee and Working Groups on the scope and content of the review and the resulting recommendations.

The Working Groups include members from government, industry, academia and non-governmental organizations. Four Working Groups (regulatory, environmental, geology/technical, and measurement, monitoring and verification) are organized to address specific issues and topics related to the large-scale deployment of CCS in Alberta. The primary role of the Working Groups is to review technical, environmental, safety and monitoring requirements and provide recommendations to address requirements for large-scale CCS and opportunities for regulatory efficiencies.

Over the course of the RFA, high-level outcomes, or guiding principles, have been identified that will enable CCS to be deployed in a safe, responsible and efficient manner. These principles are:

- CCS activities must be conducted in a manner that ensures public safety.
- The regulatory framework must provide a high level of protection for the environment.
- Underground sources of potable water must be afforded a high level of protection within the regulatory framework.
- The long-term liability for sequestered CO₂ must not become a financial burden to Albertans.
- Regulations must be robust, enable science based assessment and adaptive management of CCS projects.
- The regulatory framework must be transparent and must be openly and clearly communicated to all stakeholders.
- The Government of Alberta and CCS project operators must make use of site-specific risk management for CCS activities.
- Subsurface resource developments, including CO₂ sequestration, must consider potential resource interactions.
- The Government of Alberta must seek to gain and share knowledge internationally with regard to CCS.
- CCS expertise and analogous experience in the oil and gas industry must be leveraged to successfully deploy CCS.

These principles are guiding the RFA recommendations for enhancing Alberta's regulatory framework.

3. Path Forward

The long-term liability for geologically sequestered CO₂ is one of the main regulatory barriers that CCS project proponents face. The Government of Alberta's decision to assume long-term liability once a closure certificate has been issued provides regulatory clarity for CCS project proponents that they will not be perpetually liable for sequestered CO₂. This is different from how liability is handled in the oil and natural gas sector, where operators are perpetually responsible for the liabilities associated with their project activities. However, by absolving proponents from perpetual liabilities, the Government of Alberta will assume ownership and responsibility for injected CO₂, and any of the associated risks. The Government of Alberta is developing a number of policy tools and regulatory requirements and processes to manage these liabilities.

The RFA process is examining the broad requirements that were established through the *Carbon Capture and Storage Statutes Amendment Act, 2010* and the *Carbon Sequestration Tenure Regulation* in significant detail, and aims to provide expert recommendations on the specific processes, requirements and performance criteria necessary to ensure that long-term liability for sequestered CO₂ will not become a burden to Albertans in the future. The following sections will outline some of the regulatory requirements and processes for managing liability that are currently being considered by the RFA. The following sections will step through four phases of a typical CCS project lifecycle, and will discuss some of the RFA's key learnings and considerations for liability management at each project phase. Figure 4 below illustrates a potential timeline for the closure process for a CCS project.

Tenure Application	Injection Period	Closure Period	Closure Point
Initial closure and MMV plans	Interim closure and MMV plans	Minimum Closure Period	Transfer of Liability
Submitted with Tenure application	Submitted every three years and PCSF payments		

Figure 4 - Potential phases and timeline for the closure process

3.1. Tenure Application Phase

The Government of Alberta's ability to manage long-term liability for sequestered CO₂ begins during the site selection and tenure application period. When applying for a carbon sequestration lease under the *Carbon Sequestration Tenure Regulation*, applicants are required to submit an initial closure plan and a monitoring, measurement and verification (MMV) plan.

Closure plans describe the activities that a lessee will undertake to close down sequestration operations, and contain specific informational requirements that a project operator is required to track and report on from the time of the pore space tenure application until a closure certificate is issued. Project proponents are required to submit an initial closure plan with their tenure application. In addition, lessees are required to submit a revised interim closure plan to the Government of Alberta every three years for renewal. This three year renewal offers the Government of Alberta and the operator the opportunity to continually assess and monitor the state of the project and any risks that have been identified. The purpose of the closure plan is to minimize the risks associated with liabilities assumed by the Government of Alberta in the post-closure period by facilitating an ongoing and open dialogue between an operator and the Government of Alberta about project activities and performance.

MMV plans are an early and important requirement for future liability management. A project's initial MMV plan sets out the monitoring, measurement and verification activities that a project proponent will undertake for the term of their permit or carbon sequestration lease. The purpose of MMV is to address health, safety and environmental risks, evaluate sequestration performance and provide evidence required for closure and transfer of liability to the Government of Alberta. In Alberta, MMV plans are developed by the project operator to meet regulatory requirements and conditions specified by the provincial regulator in project approvals. Sufficient data must be collected by a project proponent regarding the behaviour of the sequestered CO₂ for several purposes. Measurement and monitoring data from the injection facilities, geologic sequestration site and surrounding environment provides assurance that CO₂ is confined to the sequestration complex (containment). Moreover, measured data is compared to predicted performance to ensure that sites are operating as predicted and permitted (conformance), a process known as verification. MMV is central to sequestration project risk management, and is therefore a key component of long-term liability management.

Alberta's current legislative framework for CCS stipulates that MMV and closure plans are required for carbon sequestration tenure applications. However, current legislation does not provide guidance on how these plans should be developed. These details are currently being considered by the RFA. When considering guidance on how MMV and closure plans should be developed, the RFA has discussed the

value of adopting an iterative, risk-based approach for the development of both MMV and closure plans. A key component of this approach involves site-specific risk assessments. Undertaking risk assessments is common practice within industry. However, there are currently no explicit requirements for submission of a risk assessment in Alberta legislation for carbon sequestration or other projects. The RFA believes that the submission of a risk assessment would enhance the regulatory process for CO₂ sequestration projects as the site-specific risks, and how they are being managed, could be more thoroughly considered and communicated throughout the life of the project.

MMV and closure plans are developed in response to identified risks, and requiring the inclusion of a risk assessment as part of the regulatory process would enable the project proponent to communicate to the regulator and stakeholders the basis for the MMV and closure plans. The RFA believes that the ongoing development of the risk assessment over the life of the project could be used as a tool to communicate sequestration performance and permanence of greenhouse gas reductions when applying for transfer of liability to the Government of Alberta. This early and iterative approach to CO₂ sequestration risk management is intended to provide certainty to both the operator and Government of Alberta during the closure period.

3.2. Injection Period

During the operational phase of a CCS project, the Government of Alberta has developed two important regulatory requirements to manage long-term liability. First, as summarized above, CCS operators are required to update and renew MMV and closure plans every three years. Monitoring data obtained throughout the operational phase of a CCS project will be used to inform and update the project risk assessments. Monitoring technologies and strategies selected in the initial MMV plan are continually evaluated in the injection period to ensure effectiveness. Results will also be incorporated into simulations and models so that actual and predicted behaviour can be compared and the MMV and closure plan can be updated as necessary. This iterative approach to risk management will provide the Government of Alberta with confidence that the sequestered CO₂ is contained and behaving predictably. It will also provide the Government of Alberta with sufficient data about a project that will enable it to act as the site operator after transfer of liability.

Another key liability management tool that the Government of Alberta has created is the Post-closure Stewardship Fund (PCSF). In 2010, the Government of Alberta legislated that it will assume certain liabilities and obligations of the lessee upon the issuance of a closure certificate. To ensure that costs associated with those liabilities and obligations will not become a burden to Albertans, the PCSF was created with passage of the *Carbon Capture and Storage Statutes Amendment Act, 2010*. The PCSF was established to cover the costs associated with some of those assumed liabilities and obligations in the post-closure period, and to protect the Alberta public from bearing those costs.

Currently, Alberta's *Mines and Minerals Act* requires holders of carbon sequestration lease to make payments into the PCSF for every tonne of CO₂ injected, but does not provide details about what the rate should be, or how it should be calculated. The RFA is currently considering these details related to the PCSF rate, and has come up with a number of ideas about how it could best be calculated, and what could be included in the rate.

When considering the PCSF rate, the RFA has identified some high-level principles that could inform how the rate could be calculated. A key question that has been considered is whether the rate for the PCSF should be the same for all operators (uniform rate) or if it should be different depending on the

specifics of individual projects (project-specific rate). Through discussion on this issue, the RFA has identified key considerations for each of these rate setting options.

One potential concern with a project-specific rate may be the administrative burden associated with the necessity for calculating and negotiating a number of site-specific rates for individual CCS projects. From this perspective, a uniform rate could be preferential if it simplifies the rate setting process. However, the RFA also recognized that, in the early stages of CCS development when there will be a limited number of projects, a thorough examination of project-specific risk assessments would be needed in order to determine an appropriate uniform rate. Therefore, for the time being, the administrative burden of undertaking and evaluating risk assessments will be similar for setting a uniform rate or project-specific rates, as a uniform rate calculation would still likely be based on the risk assessments from all initial projects. Moreover, the RFA has identified potential incentives from project-specific rates, whereby operators could have a financial incentive to adopt best practices for site selection, MMV and operations to secure a lower per tonne rate.

Adopting a risk-based calculation methodology for the PCSF rate is consistent with the overall liability management approach that the Government of Alberta has adopted for MMV and closure plans. Therefore, the RFA is also considering the merits of periodic rate reviews to ensure that PCSF rates are appropriate and reasonable throughout the life of a CCS project. Since the CCS industry is relatively new, there is still uncertainty about the potential costs the Government of Alberta will be required to bear after a closure certificate is issued. Therefore, requirements for a periodic review of a project's rate may be desirable as it is unlikely that the rate set at the beginning of a long-term CCS project to cover potential future costs will be accurate, given the evolving risk profile over a project's life, technology improvements and the cost of inflation. These rate reviews could provide an opportunity to make adjustments to the rate based on new data and increased knowledge of the project, including any changes to MMV and closure plans.

Another key consideration for the PCSF rate that the RFA has been considering is what should be included in the PCSF rate. Determination of the precise calculation methodology for calculating the PCSF rates is out of the scope of the RFA. However, the RFA is currently considering the broad components of what should be included in the PCSF rate. Through its analysis and deliberation, the RFA has identified the importance of basing the rate (fee-per-tonne) that commercial operators will pay on the allowable uses of the PCSF. As outlined above, section 122 of the *Mines and Minerals Act* establishes the allowable uses of the PCSF. Three general rate components have been identified and discussed by the RFA: monitoring and maintenance, unforeseen events and administrative costs associated with management of the PCSF.

A monitoring and maintenance component would collect money to pay for MMV activities carried out by the Government of Alberta after a closure certificate has been issued. An unforeseen events component would collect money to pay for reabandonment, reclamation and remediation costs that the Government of Alberta may incur because of unforeseen events (e.g., release of injected CO₂). An administrative costs component would collect funds to manage the PCSF and to fund administrative tasks the Government of Alberta must undertake for CCS projects, such as management of data transferred to the Crown throughout the life of a project.

The regulatory requirements for iterative MMV and closure plans, and requirements for payments into the PCSF, will enable the Government of Alberta to effectively manage the long-term liability that it will assume when it issues a closure certificate. Discussions throughout the RFA process have identified a number of important considerations for how these broad regulatory requirements could be operationalized

to effectively and efficiently manage liability for sequestered CO₂ throughout the operational phase of a CCS project.

3.3. Closure Period

The closure period for a CCS project in Alberta will begin at the time when no more CO₂ will be injected into a site. This marks the period of time between permanent cessation of injection and the issuance of a closure certificate, which formalizes the transfer of liability from an operator to the Government of Alberta. During the closure period, the operator continues to be the owner of the sequestered CO₂ and remains responsible for MMV activities and all liabilities related to the project. The RFA is currently discussing the criteria that could determine the duration of the closure period.

A key consideration of the RFA is whether a CCS operator should only be able to receive a closure certificate after a minimum period has passed and whether a decision to issue a closure certificate should be performance based. Most jurisdictions (e.g., European Union and individual EU states, US EPA and Australia) have considered a purely performance based regulation for closure before deciding to include some form of minimum closure period. Most jurisdictions that allow for a transfer of liability require a minimum time period to pass.

The RFA is currently considering the merit of requiring a minimum closure period and performance based requirements for a closure certificate. The RFA has identified a number of important reasons why a minimum closure period may be desirable. One reason is that a minimum closure period may be important to allow the Government of Alberta to be confident of a site's compliance with performance criteria. For example, performance criteria to be demonstrated may include that the sequestered CO₂ is behaving in a predictable manner as demonstrated by defensible models and that the project specific risk profile is decreasing. Another key reason that the RFA has identified for a minimum closure period is to enhance public confidence in the closure and transfer of liability process. CCS is a new industry where no projects have gone through the closure process, and, with the transfer of liability to the Crown, the public will be taking on long-term risks for sequestered CO₂. Therefore, requirements for minimum periods may be important to build confidence that the risks are well understood and manageable before liability is assumed by the Government of Alberta.

Because CCS is new as a holistic activity, and minimum closure periods vary widely among other jurisdictions, the RFA has found it difficult to determine what the optimal minimum time period should be. After considering the recommendations of the Alberta CCS Development Council, the RFA is currently considering a ten year minimum closure period. Ten years is shorter than in most other jurisdictions, but is being considered as a non-discretionary minimum backed by the sustained performance criteria. This approach means that if there are any issues with performance, a longer period of time may be necessary to demonstrate sustained compliance. The regulator would determine how sustained compliance should be interpreted and implemented based on risk analysis on a case-by-case basis.

Closure and transfer of liability is a new regulatory process for Alberta. The RFA is currently considering criteria and process for issuance of a closure certificate. The criteria and processes being considered would require operators to demonstrate that sequestered CO₂, in all likelihood, is permanently sequestered, thereby ensuring public safety, environmental protection, and that the Alberta public will be protected against costs in the post-closure period.

3.4. Closure Point

To apply for a closure certificate in Alberta, a project proponent will be required to demonstrate that they have complied with closure requirements and fulfilled the closure plan requirements. The issuance of a closure certificate to a project operator signifies that a project has successfully reached the closure point. At this point responsibility and long-term liability for the sequestered CO₂ will be transferred from the project operator to the Government of Alberta.

Upon issuance of a closure certificate, the Government of Alberta will assume liabilities of sequestered CO₂ at a CCS site. The *Mines and Minerals Act* sets out the liabilities and obligations the Government of Alberta will assume when it issues a closure certificate. When issuing a closure certificate, the Government of Alberta becomes owner of all injected CO₂, and assumes all obligations of the lessee, including responsibilities related to wells and facilities, the environment and land.

In addition to those liabilities and obligations already included in the *Mines and Minerals Act*, the RFA has identified liability for CO₂ offset credits as another liability that could be assumed by the Government of Alberta following the issuance of a closure certificate. In the future, if there is loss of containment of CO₂ from a sequestration site in the post-closure period, it will be necessary to accurately account for the quantities of CO₂ released in order to ensure accurate greenhouse gas accounting and reporting in the province. As owner of the CO₂ in the post-closure period, the Government of Alberta may need to accept liability for any true-up of CO₂ offset credits or other climate change obligations that may be required. The RFA is considering whether this climate liability should be assumed by the Government of Alberta. Through its analysis, the RFA has identified a number of potential reasons why assumption of climate liability may be desirable. First, assumption of climate liability would be consistent with the treatment of other CCS liabilities. Second, after site closure, the project proponent will likely lose the ability to take action in the event of loss of CO₂ containment. Finally, failure to accept climate liability may signal a lack of confidence on the part of the Government of Alberta in the permanence and safety of CCS.

Assumption of these liabilities may be important for building additional confidence in Alberta's climate change accounting and reduction program. The closure requirements outlined in the MMV and closure plans are important tools that the Government of Alberta will be able to use to ensure that these liabilities will not become a financial burden to Albertans. By issuing a closure certificate for a sequestration project, the Government of Alberta will signal that it is confident that the CO₂ has been permanently and safely sequestered at the site, and that the likelihood of loss of CO₂ containment is low.

4. Conclusion

With passage of the *Carbon Capture and Storage Statutes Amendment Act, 2010* the Government of Alberta has signalled that it will assume long-term liability for sequestered CO₂ at a CCS site once a closure certificate is issued. These legislative amendments have addressed some of the key regulatory challenges facing CCS deployment, and have developed a high-level framework for long-term liability

management for sequestered CO₂. The RFA is examining this regulatory framework in detail, and is preparing recommendations to ensure that the Government of Alberta will be well-equipped to manage long-term liability for sequestered CO₂ into the future. Alberta is committed to the global implementation of CCS, and will continue to share its knowledge and experience around CCS with the world.

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References

- [1] Government of Alberta. *Launching Alberta's Energy Future: Provincial Energy Strategy*. December 2008. Accessible at: <http://www.energy.alberta.ca/Initiatives/3082.asp>
- [2] Alberta Energy website. Accessible at: <http://www.energy.alberta.ca/oilsands/791.asp> [accessed October 9, 2012]
- [3] Government of Alberta. *Alberta's 2008 Climate Change Strategy*. January 2008. Accessible at: <http://environment.alberta.ca/0909.html>
- [4] Bachu, S. and Stewart, S., 2002, Geologic sequestration of anthropogenic carbon dioxide in the Western Canadian Sedimentary Basin. *Journal of Canadian Petroleum Technology*, 41(2).