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Alberta's Energy Future in Carbon Capture and Storage: A Comparative Analysis of CCS Legislation

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THE SCHOOL
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Alberta's Energy Future in Carbon Capture and Storage: A Comparative Analysis of CCS Legislation

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Submitted in fulfillment of the requirements of PPOL 623 and completion of the requirements for the Master of Public Policy degree

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I. Executive Summary

The interest in climate change policy by governments is greater than it has ever been before. With two Carbon Capture and Storage (CCS) projects set to be in operation in Alberta by 2015, it is a good time to examine and evaluate the legislation that these projects will be operating under. By undertaking a qualitative cross-jurisdictional analysis, this report determines the best practices that exist within the written CCS legislation of other states when compared to Alberta's law. By examining CCS legislation passed in Wyoming, Kansas, Montana and the States of Victoria and Queensland in Australia an understanding of the positive and negative elements of the written CCS legislation in Alberta is formed. In order to understand where the Albertan legislation fails, the report address three policy problems that currently sit within *The Carbon Capture and Storage Amendments Act*. These are:

1. Payments into the Post Closure Stewardship Fund
2. Monitoring Measurement and Verification (MMV) Plans
3. Time frames for the transfer of liability

The report concludes that Kansas' coverage of fees is preferable to look at for CCS in Alberta, the State of Victoria has the most comprehensive MMV plans to learn from and, that Montana's time frames for the transfer of liability will ensure a smoother transition once liability is taken over by the government. Knowledge sharing from other jurisdictions is vital to determine where Alberta's laws fall flat. In order to ensure that legal coverage for the sequestration of CO₂ in Alberta is undertaken properly it is important that the Government of Alberta correct these policy issues in order to ensure a well-functioning legal environment is in place.

II. Introduction

The twofold challenge of reducing carbon dioxide (CO₂) emissions while meeting a growing energy demand is attracting policy makers around the world.¹ Alberta's economy is largely driven by fossil fuel production and, as a result, greenhouse gas (GHG) emissions have been increasing throughout the province.² CO₂ is one of the primary GHG's within the atmosphere and, as climate change and global warming have been at the forefront of environmental concerns during recent years, the growing amount of emissions coming from Alberta has become an area of national, and even international interest. Limiting GHG emissions in an Alberta context is not an easy thing to do, as the desire to keep the "engine" of the economy going, (oil and gas production) must be

¹ Klaas van Alphen, Marko P. Hekkert and Wim C. Turkenburg, "Comparing the Development and Deployment of Carbon Capture and Storage Technologies in Norway, the Netherlands, Australia, Canada and the United States –An Innovation System Perspective," *Energy Procedia*, no.1 (2009): 4591.

² Environment Canada, *Greenhouse Gas Emissions Data*, September 2012, <https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=BFB1B398-1>

traded off against environmental concerns. Carbon Capture and Storage (CCS) has emerged as a possible way to “strike this balance,”³ between allowing oil and gas production to continue at current rates, while simultaneously committing to a reduction in GHG emissions. Through CCS, CO₂ emissions are diverted away from the earth’s atmosphere and are instead captured at the point of emission and stored within secure rock formations to prevent it from escaping.

Project risk plays an important part in CCS, especially for private companies who will be operating the injection wells. A key issue that must be addressed if CCS is to be implemented on a commercial scale is the assignment of liability for the stored CO₂. The liability issue is complicated because it involves indefinite spans of time and large amounts of mitigated CO₂. As several academics have noted,⁴ a government can choose to take the step of the “polluter pays” principle and have a well operator assume liability for the whole storage process in CCS from injection to closure or, at some point in time an operator can be cleared of any liabilities and instead place the responsibility in the hands of the government where tax-payers become liable for any CO₂ leakage.

Alberta has indicated that it intends to implement policies that establish it as a global leader in CCS technology.⁵ It is anticipated that emissions reduction from CCS will account for 139 Mt of mitigated CO₂ by the year 2050.⁶ If Alberta is going to play a leadership role in the implementation of CCS technology an important part of the policy landscape involves the implementation of sensible liability schemes for the long-term storage of CO₂.

This paper will focus upon the onshore long-term liability legislation during the closure and post-closure stages of CCS projects within Alberta. By analyzing the current

³ Drew Thomson and Anshuman Khare, “Carbon Capture and Storage (CCS) Deployment -- Can Canada Capitalize on Experience?” *Journal of Technology Management and Innovation* 3, no. 4, (2008): 112.

⁴ The polluter pays principle is mentioned in: Aldrich and Koerner’s, “Assessment of Carbon Capture and Sequestration and Liability Regimes,” and Ingleson, Kleffner and Nielson’s, “Long-Term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs –A Comparative Analysis.”

⁵ Milenka Mitrović and Alexandra Malone, “Carbon Capture and Storage (CCS) Demonstration Projects in Canada,” *Energy Procedia* 4, (2011): 5685.

⁶ Government of Alberta, Environment and Sustainable Resource Development, *Alberta’s 2008 Climate Change Strategy: Responsibility, Leadership, Action*, (January 2008): 18: <http://environment.alberta.ca/01757.html>18

structure outlined by the *Carbon Capture and Storage Amendments Act, 2010*, the paper will evaluate the legality of the document and identify current policy gaps. Using CCS regulations from other jurisdictions as a comparison, it will be determined what the best practices are to take care of policy risks. A clear and stable regulatory framework will provide companies, citizens and stakeholders with the certainty needed to move forward with these projects.

II.2 Carbon Capture and Storage: The Basics

In 2008, the Government of Alberta released their policy framework for climate change. The backbone of the strategy was the implementation of CCS in order to reduce the provinces emissions and “store quantities of CO₂ in Alberta’s geological formations rather than releasing it into the atmosphere.”⁷ The demand for fossil fuels remains the foundation of the Albertan economy and, the policy framework introduces CCS as a way to address concerns over climate change. The federal government is also keen to invest in clean energy, and in 2009, announced a \$2 billion dollar commitment to fund CCS development.⁸ Qualified projects are to be developed through the ecoENERGY Technology Initiative, a component of the Federal Government’s ecoACTION policy that was designed to develop actions toward clear air and GHG emissions reduction.⁹ Currently, the Shell Quest and Alberta Carbon Trunk Line projects are two government-funded projects moving forward in Alberta to help reduce 2.76 million tonnes of CO₂ from oil sands refining projects by 2016.¹⁰

The process of CCS can be divided into three steps: capture, transportation and storage. Each process is important, but for this paper we will focus specifically on the final stage when the CO₂ is stored. This is the most important step in the process and also the most controversial. In order to store CO₂ it must be injected into secure rock formations where it cannot escape back into the atmosphere. CO₂ is injected at high pressure into the ground and will consequently need extensive monitoring to ensure that

⁷ Ibid., 7.

⁸ Albert Koehl, “Carbon Capture and Storage,” *Canadian Dimension* 45, no. 5 (2009), 16.

⁹ Natural Resources Canada, *EcoENERGY Technology Initiative*, February 11, 2011, <http://www.nrcan.gc.ca/energy/science/1335>

¹⁰ Carbon Capture and Storage: Solutions Start Here, *Alberta’s CCS Projects*, 2011: <http://www.solutionsstarthere.ca/24.asp>

leakage does not occur. Storage can take place in depleted oil and gas reserves, coal seams, deep saline formations or offshore in the ocean floor.¹¹ If a storage facility does leak, the potential hazard is that the CO₂ will be released back into the air. It is therefore important that a sound geological formation is used during the injection phase, and that proper liability laws are in place in order to determine who holds responsibility if storage reservoirs fail.

The injection of gases into geological formations is already a common practice in many countries for usage in enhanced oil recovery (EOR), and for the disposal of sour gas from the natural gas industry.¹² EOR involves injecting CO₂ at high pressure into a virtually depleted oil or gas reserve allowing any remaining supplies to be recovered from the reserve while at the same time trapping CO₂ within the formation. In Western Canada, CO₂ has been used for the purpose of EOR since the 1970s,¹³ and Alberta already operates fifty acid gas injection storage sites.¹⁴ EOR is therefore commonly used for CCS research. An example is the large Weyburn-Midale project in Saskatchewan, which has been in operation since 2000. In this project, a pipeline transports captured CO₂ from a coal plant in North Dakota to depleted oil fields in Saskatchewan.

The principle regulations governing EOR in Alberta are the *Oil and Gas Conservation Act* (OGCA) and the *Oil and Gas Conservation Regulations*. The OGCA does not deal with geological storage aside from some generic references, and most details can be found in the *OGCA Regulations* and within various Alberta Energy Regulator directives.¹⁵ While EOR is a useful starting point for the consideration of CCS projects it is important to note that the primary objective of EOR is hydrocarbon recovery,

¹¹ S.J. Freidman, "Carbon Capture and Storage," *Lawrence Livermore National Laboratory*, (2007), 3.

¹² Barry Barton, "Carbon Capture and Storage Law for New Zealand: A Comparative Study," *New Zealand Journal of Environmental Law* 13, (2009): 2.

¹³ *Ibid.*, 9.

¹⁴ Mark Jaccard and Jacqueline Sharp, "CCS in Canada," in *Caching the Carbon: The Politics and Policy of Carbon Capture and Storage*, eds. James Meadowcroft and Oluf Langhelle (Cheltenham, UK: Edward Elgar Publishing Limited, 2009), 93.

¹⁵ Nigel Bankes, Jenette Poschwatta and E. Mitchell Shier, "The Legal Framework for Carbon Capture and Storage in Alberta," *Alberta Law Review* 45, no. 3(2008), 611.

not the long-term disposal of CO₂.¹⁶ Within EOR the injection of CO₂ is a means with which to recover the remaining supply of any hydrocarbons still within the rock formation. Therefore, basing CCS regulations on existing rules for EOR projects would be inappropriate because they both have different end objectives; CO₂ sequestration for EOR projects is simply a means to an end.¹⁷ For example, EOR experience tells us nothing about storing CO₂ within deep saline formations. Moreover, a CCS project within a saline aquifer can be ten to one hundred times the size of an EOR operation.¹⁸

Saline aquifers provide the greatest storage potential for CO₂ and are the formations that the Alberta government will be using for their sponsored CCS projects. As Teresa Meadows and Tony Crossman have noted,

The same geological endowment that makes Alberta an energy powerhouse means that it is also ideally situated for the implementation of large-scale CCS due to the close proximity of concentrated carbon dioxide (CO₂) sources and underground geological formations in the Western Canadian Sedimentary Basin suitable for deep storage.¹⁹

Within the sequestration phase for deep saline aquifers there are also three separate stages: operation, closure and post-closure.²⁰ Each stage comes with its own associated risks. Proper liability schemes are important to protect against storage risks in both the short term and the long-term.²¹ Short-term liability coverage can be capped at any number of years, however once injection has stopped and the site is closed it is harder to consider where long-term liability will fall. Long-term storage of CO₂ needs special attention in regards to the amount of CO₂ being stored and the indefinite span of time in which it will be kept in storage. The closure and post-closure stages of sequestration are the primary focus of this paper.

¹⁶ Ibid., 613

¹⁷ Ibid.

¹⁸ Barton, "Carbon Capture and Storage Law," 27.

¹⁹ Teresa Meadows and Tony Crossman, "A Tale of Two Provinces: Imposing Greenhouse Gas Emissions Constraints Through Law and Policy in Alberta and British Columbia," *Alberta Law Review* 47, no. 2 (2010): 434.

²⁰ Elizabeth Lokey Aldrich and Cassandra Koerner, "Assessment of Carbon Capture and Sequestration Liability Regimes," *The Electricity Journal* 27, no. 7 (2011): 36.

²¹ Ibid., 36.

II.3 The *Carbon Capture and Storage Amendments Act, 2010*

One of the biggest obstacles that needed to be addressed if projects were to be up and running by 2015 was the legal matter of who would assume long-term liability of the stored CO₂. In order to have functional legislation and encourage the adoption of CCS in Alberta, it is essential to clarify who is liable for the CO₂ in storage in order to ensure the safe outcome of these projects and also gain the certainty required for investor support. On December 2, 2010 *Bill 24: the Carbon Capture and Storage Amendments Act S.A. 2010* received Royal Assent, making Alberta the first jurisdiction in Canada to have comprehensive CCS legislation.²² The passage of the Act led to amendments within five existing provincial laws most notably, the *Mines and Minerals Act* (MMA). Changes were also made to the *Energy Resources Act*, *Oil and Gas Conservation Act*, *Public Lands Act* and the *Surface Rights Act*.

The MMA was amended to incorporate important issues surrounding CCS such as, the definition of pore space, the liabilities that the Government of Alberta will assume for injected CO₂ and, the development of a Post Closure Stewardship Fund (PCSF). Changes made to the MMA were CCS specific and within section 121 (1) of the MMA the assumption of liability will be transferred to the Crown once the issuing of a closure certificate from the Minister has been completed. This means that after this point the Government of Alberta “becomes the owner of the captured carbon dioxide injected pursuant to the agreement,” and “assumes all obligations of the lessee.”²³ At some point when the movement from the closure phase into the post-closure phase has taken place a shift in liability will occur from the private operator to the public.²⁴ The long-term liability issue and the Government of Alberta’s decision to assume all responsibility once a closure certificate has been issued provides clarity for CCS projects in the province. Due to the long time periods associated with sequestering CO₂, the Alberta government

²² Michael G. Massicotte, Alan L. Ross and Chidinma B Thompson, “The Changing Legislation and Regulation of Carbon Capture and Storage: Impacts on Purpose, Policy and Projects,” *Alberta Law Review* 49, no. 2 (2011):305.

²³ *Mines and Minerals Act, RSA 2000, c M-17*, The Law of Society of Alberta, Canadian Legal Information Institute: <http://www.canlii.org/en/ab/laws/stat/rsa-2000-c-m-17/latest/rsa-2000-c-m-17.html>

²⁴ Bankes, Poschwatta and Shier, “The Legal Framework,” 623.

has made a policy decision to assume long-term responsibility for sequestered CO₂ to ensure that it will be safely monitored and managed.

Further, section 122(1) of the MMA established the development of the PCSF. The PCSF was created to ensure that the liabilities assumed by the government will not become a burden to Albertans, and that they will not have to bear any of the costs associated with post closure liability. Funds will be collected from CCS operators during the injection period to cover any potential costs that may arise after a closure certificate has been issued to an operator. The funds will be used for the purpose of monitoring the captured CO₂'s behavior once it has been injected into the saline aquifers.²⁵ Moreover, if any obligation did arise that the Crown must take care of the costs would be taken from the fund. These costs are addressed within section 122(2) of the MMA.

The passing of Bill 24 shows the commitment that Alberta has made to make CCS a priority in their climate change policy. The bill was enacted to clarify the role that the Government of Alberta will play in terms of CCS liability and, to also provide a framework for the regulatory mechanisms needed before CCS projects can be undertaken. It is important to be clear that certain gaps still exist within the current legislation. As will be discussed below, the framework of Bill 24 needs to be further tightened in order to address potential problems that could arise when CCS projects are put in place. With two large-scale CCS projects set to be operational in Alberta by 2015, it is important to tie up the loose ends within the legislative.

The problems that need to be addressed within the framework are threefold. First, there is currently no dollar amount set for payments into the PCSF. This is a key problem. The fund is intended to ensure that liabilities assumed by the Government of Alberta will not become a burden to the public. A dollar amount must be set so that during the operation, closure and post-closure periods operators pay enough into the fund to cover potential liabilities that could be assumed by the government after the transfer of

²⁵ *Mines and Minerals Act, RSA 2000*

liability.²⁶ Secondly, Alberta's current CCS framework sets out that monitoring, measurement and verification (MMV) plans are required along with closure plans for anyone applying for a carbon sequestration lease. However, current legislation does not provide guidance on how these plans should be developed or what they should include.²⁷ Risk assessment is a major component of MMV plans, which should be incorporated to provide further certainty for the government and, for operators. If both, the first and second issues are remedied then it will allow the government to better manage the long-term liability they will assume once a closure certificate is administered.²⁸ Finally, the new legislation states that there will be a transfer of liability from the operator to the government. However, there is currently no criteria outlined to determine the proper amount of time that will be needed to pass before a closure certificate can be issued. The Government of Alberta will need to address these three problems if they wish to not only become a global leader of CCS knowledge and experience, but to also have confidence and backing from the citizens of the province for these projects.

II.4 Setbacks: The Economics of CCS Technology

Another problem that also needs to be addressed is the costs of putting CCS technology in place. Alberta originally planned to have four private sector CCS projects now under construction in the province. However, two of these projects were recently cancelled when the companies decided that even with a "government-infusion of dollars," the projects did not make economic sense.²⁹ On April 26, 2012 one of the projects better known as the Pioneer project was cancelled.³⁰ The project, which was to be run by the TransAlta Corporation was tied to one of their coal-fired power plants, and was too account for close to twenty percent of the emissions reductions target Alberta was set to

²⁶ Mike Fernandez, Chad Leask and Chris Arnot, "Liability for Sequestered CO₂: The Path Forward for Alberta," *Energy Procedia*, no. 1 (2013): 10.

²⁷ *Ibid.*, 9.

²⁸ *Ibid.*, 10.

²⁹ Kelly Cryderman "Stonger Rules on Carbon Capture Urged," *The Globe and Mail*, Toronto, ON, August 20, 2013: <https://secure.globeadvisor.com/servlet/ArticleNews/story/gam/20130820/RBCARBONCAPTURE0819ATL#>

³⁰ Carrie Tait, "Alberta's Carbon Capture Efforts Set Back," *The Globe and Mail*, Toronto, ON, April 26, 2012: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/albertas-carbon-capture-efforts-set-back/article4103684/>

reach by 2015.³¹ Further, in February of this year the Swan Hills Synfuels CCS project outside of Edmonton was also cancelled due to lower than expected natural gas prices.³² The cancellation of these projects highlights two key problems being faced in getting CCS off the ground. The first problem is that it is cheaper for companies simply to pay the Alberta carbon tax, which is currently set at \$15. In addition, is the more cost effective option of using a cleaner fossil fuel such as natural gas within company's burners as a way to lower emissions.

In Alberta when companies emit over 50,000 tonnes of CO₂ a year they must pay the penalty of a carbon tax to the government. In the case of the Pioneer project's cancellation, TransAlta opted to pay the \$15 per tonne overage fee when they exceeded the limit, instead of installing CCS technology at their facility. TransAlta prefers to pay the \$15 fee, instead of investing in CCS technology where the price per tonne of CO₂ runs between \$100- \$125.³³ The Pioneer cancellation highlights the ineffectiveness of carbon pricing within Alberta, emphasizing the importance of appropriate carbon pricing to put a significant value upon CO₂ emissions.³⁴ Therefore, the market that already exists that is supposed to help reduce emissions has actually created an obstacle for CCS implementation in Alberta. The tax, which took effect in 2007, now stands in the way of further CCS projects moving forward due to the large cost differentials.³⁵

In the case of the Swan Hills project, the government cut funding due to lower than expected natural gas prices throughout the province.³⁶ The government deferred the project as the economics of producing synthetic gas have been hurt due to low natural gas prices, meaning that the company would not get government funding if they were to

³¹ Wendy Gillis, "Carbon Capture and Storage: An Uncertain Future in Canada," *The Toronto Star*, Toronto, ON, June 8, 2012: http://www.thestar.com/news/canada/2012/06/08/carbon_capture_and_storage_an_uncertain_future_in_canada.html

³² Richard Blackwell, "Alberta Cancels Funding for Carbon Capture and Storage Project," *The Globe and Mail*, Toronto, ON, February 27, 2013: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/alberta-cancels-funding-for-carbon-capture-project/article9024237/>

³³ Gillis, "Carbon Capture and Storage: An Uncertain Future in Canada."

³⁴ Tait, "Alberta's Carbon Capture Efforts Set Back."

³⁵ The Calgary Herald, "Go Figure – A Carbon Tax Crafted Right Here at Home," Calgary, AB, March 9, 2007: <http://www.canada.com/calgaryherald/columnists/story.html?id=8c3c9760-7cbe-4fab-b00c-1c77243903b6>

³⁶ Huffpost Alberta, "Swan Hills Synfuels, Alberta Government Cancel Carbon Capture and Storage Project," Calgary, AB, February 25, 2013: http://www.huffingtonpost.ca/2013/02/25/swan-hills-synfuels-alberta-carbon-capture_n_2759771.html

include CCS at the facility.³⁷ The cost of CCS has become a controversial issue. Arguments have developed over whether or not the province should continue to put money into CCS projects or instead work on more cost effective policy measures that companies, and the Alberta Government will find more appealing.

The CCS process is complicated and costly, and while not a legal issue *per se* carbon pricing is affected by legislative measures, which are proving to make the economic viability of CCS within Alberta uncertain.³⁸

III. Methodology

In order to address the shortcomings of Alberta's legislation, it is useful to look at other jurisdictions, which have implemented similar standards throughout their own state legislation. CCS is region specific and is more beneficial to jurisdictions with large emissions makeups.³⁹ Specific attention is paid to Montana, Wyoming, Kansas and the states of Queensland and Victoria in Australia. These five states are selected because they have passed specific CCS legislation that deals with onshore long-term liability within deep saline aquifers. A qualitative cross-jurisdictional analysis is done in order to identify best practices that exist within currently written CCS legislation.

While it may have been useful to look at already operational projects such as Weyburn-Midale in Saskatchewan and the Sleipner and Snøhvit projects in Norway, these are not the same sort of projects that are covered by the *Carbon Capture and Storage Amendments Act*. Weyburn–Midale is an EOR project⁴⁰ while, the two projects running in Norway are offshore CCS storage projects, which fall under completely different liability regimes. In fact, offshore storage would never be possible within

³⁷ Blackwell, "Alberta Cancels Funding for Carbon Capture Project."

³⁸ Lanette Wilkinson, "CCS: Identified Challenges to Implementation," *Stikeman Elliot*, March 29, 2010: <http://www.stikeman.com/cps/rde/xchg/se-en/hs.xsl/13690.htm#.UgkBZjAhsZ8.email>

³⁹ Barton, "Carbon Capture and Storage," 4.

⁴⁰ EOR while not covered extensively in this paper is important to help offset many of the costs related to the capture and storage of CO₂. By recovering the last ten to fifteen percent of oil or gas left within reservoirs the costs of implementing the technology are more beneficial. Refer to Bankes et. al (2008) for more information on just how EOR legislation can be a framework for CCS within saline formations. Directives 065 and 060 within the *OCGA Regulations* are EOR scheme specific and also deal with entirely different goals and objectives than a CCS project, namely how EOR be an economic booster for a company.

Alberta because it is a land-locked province and any Albertan CCS projects will not exhibit the same characteristics as the Norwegian ones.

CCS projects vary according to the type of activity and the project,⁴¹ and it is therefore important to consider legislation from states, which are similar to Alberta and have comprehensive frameworks already written into law. As is seen from Appendix. 1 several other U.S. states have implemented CCS legislation however they differ where liability will be assumed in the long run.

We begin by accessing academic papers that have been written about the topic, specifically those that give explicit comparisons of the jurisdictions mentioned. Also, by accessing current house and senate bills from Montana, Kansas and Wyoming it is possible to compare and contrast the difference between the bills and to compare them to Bill 24 in Alberta. Specific attention is paid to Sections 27 and 28 within the *Queensland Greenhouse Gas Storage Act 2009* (GGSA) as they are very similar to Alberta's section 15.1 of the MMA,⁴² which addresses state ownership of GHG storage reservoirs.⁴³ Part five of the *Greenhouse Gas Geological Sequestration Act (GGGSA)* passed in the state of Victoria addresses monitoring and injection plans that are to be completed for approval by the Minister.⁴⁴ This comprehensive outline for MMV operations is crucial to the space within Bill 24 that addresses MMV plans but in a very vague nature.

While, the literature and legislation reviewed provides some insight into how the gaps within the *Carbon Capture and Storage Amendments Act* may be addressed, a difficulty with the analysis is that no projects are currently up and running for long-term storage in saline aquifers. Therefore, there is no direct experience with this type of legislation as of yet. Nonetheless, we are able to ascertain where better coverage exists in terms of detailed attention to different areas within the written laws. In the province of Alberta much is already known about the storage of substances within geological formations and it was therefore important to build from the strengths of this written

⁴¹ Bankes, Poschwatta and Shier, "The Legal Framework," 598.

⁴² Massicotte, Ross and Thompson, "The Changing Legislation," 331.

⁴³ Government of Queensland, *Greenhouse Gas Storage Act 2009*, <http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/G/GreenGasSA09.pdf>

⁴⁴ Government of Victoria, *Greenhouse Gas Geological Sequestration Act 2008*, [http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubStatbook.nsf/51dea49770555ea6ca256da4001b90cd/7E4801FE0E8E3A55CA2574F80019A141/\\$FILE/08-61a.pdf](http://www.legislation.vic.gov.au/Domino/Web_Notes/LDMS/PubStatbook.nsf/51dea49770555ea6ca256da4001b90cd/7E4801FE0E8E3A55CA2574F80019A141/$FILE/08-61a.pdf)

legislation and also the strengths of the other jurisdictions. One law may be superior to another in terms of MMV coverage while another may cover monetary funds more precisely. The approach followed here is to assess the strengths of each piece of legislation, with the intention of creating Albertan legislation that reflects best practices across all the relevant area.

IV. Literature Review

One of the foremost experts in CCS in Alberta is Nigel Bankes, a law professor at the University of Calgary. He has written several pieces about CCS implementation in Alberta. Bankes, Poschwatta, and Shier (2008) offer an analysis of what CCS legislation could look like by building on existing laws in Alberta for natural gas storage, enhanced oil recovery and acid gas disposal. Written before Bill 24 was passed in 2010, this paper is often cited as the leading paper for understanding the legality of CCS within Alberta. The paper provides an in depth examination of what CCS is, the issues that will need to be covered in order to ensure clean legislation is put forth and, how Alberta is prepared to introduce CCS into the province and has been able to learn from similar processes taking place such as EOR.

Bankes' other works cover an assortment of legal and regulatory questions in relation to CCS in Alberta. Using a well developed legal knowledge of storage regimes that already exist throughout implemented provincial legislation, Bankes is able to draw comparisons through several pieces of work (*Developing a Legal Regime for Carbon Capture and Storage in Canada, The Legal and Regulatory Issues Associated with Carbon Capture and Storage in Arctic States*), and determine how the Albertan management of CCS could be shaped.

Fernandez, Leask and Arnot (2013) have one of the most up to date pieces addressing CCS legislation in Alberta. Their work assesses the regulatory framework that was put in place in 2010 and clarifies where work still needs to be done before 2015. The paper highlights the benefits that will be realized through CCS implementation in the province, but also reviews the current criteria that must be clarified for the Government of Alberta

to properly manage sequestered CO₂.⁴⁵ Aldrich and Koerner's (2011) work suggests that the best long-term liability scheme is one, like Alberta, which transfers liability from operator to a state but, unlike Alberta, does so after a prescribed amount of time has passed. They believe this time period should be long enough to allow the operator to bear a significant portion of the responsibility, but not so long as to make coverage by a private company impossible.⁴⁶

Massicotte, Ross and Thompson (2011) offer another comprehensive comparison of Alberta's legislation with other jurisdictions. They look at Wyoming and Montana as well as Queensland and Victoria in Australia and evaluate how each piece of legislation is similar to or different from Alberta. The author's note: "when compared to the CCS regimes in other jurisdictions, Alberta's legislative changes appear to be more certain, have lower compliance costs and be more attractive to CCS investors."⁴⁷

Ingleson, Kleffner and Nielson (2010) provide another comparative analysis that looks specifically at the positive and negative outcomes associated with the transfer of liability from the operator to another party. They start with an analysis of the potential risks associated with long-term storage of CO₂ and critique the legislation in Wyoming, Kansas and Montana. They agree with Bankes, Poschwatta and Shier in recommending that, any long-term CO₂ liability system should build upon the existing oil and gas regulatory system in order to minimize any long-term risk.⁴⁸

Finally, Barton (2009) undertakes a comparative study of CCS laws and looks at how CCS could potentially fit into New Zealand's climate change policies to lower GHG emissions. The starting point he argues in the laws of most countries "is that rights deriving from the ownership or possession of an estate in land are presumed to be capable of exercise on all parts of the land, including upwards and downwards."⁴⁹ In Alberta the Crown owns all mineral rights, which will make any onshore storage legislation run smoother. Therefore clear CCS legislation will address ownership so that no one else may

⁴⁵ Fernandez, Leask and Arnot, "Liability for Sequestered CO₂," 1.

⁴⁶ Aldrich and Koerner, "Assessment of Carbon Capture and Sequestration," 47.

⁴⁷ Massicotte, Ross and Thompson, "The Changing Legislation," 337.

⁴⁸ Allan Ingleson, Anne Kleffner and Norma Nielson, "Long-Term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs – A Comparative Analysis," *Energy Law Journal* 31, no. 43 (2010): 468.

⁴⁹ Barton, "Carbon Capture and Storage Law for New Zealand," 17.

interfere with the operations. Barton also points out that a CCS regulation scheme must properly deal with the difference between EOR and CCS within saline aquifers.

The literature reviewed here mainly touches upon how other jurisdictions deal with the long-term liability issue and the debate surrounding whether or not a transfer should take place after a reasonable amount of time has passed. In order to get a broader understanding a more detailed review of the legislation passed in each jurisdiction is necessary. This is the focus of the next section.

V. Legislation Review

The relationship between law and policy is important. Every jurisdiction has its own set of laws, which help to shape the relationship between individuals and the state.

Each state examined here has chosen a different way to incorporate CSS into their legislation. Australia and the US are the two most comparable countries to Canada in terms of population and economic growth.⁵⁰ House and Senate bills were passed within American states that stood alone, whereas in Alberta Bill 24 incorporated CCS measures to make operations valid within several currently existing laws. The Australia Acts are much “meatier,” with the Queensland Act running three hundred and twenty one pages in length and in Victoria, two hundred and seventeen.

As is the case in all legislation, “the devil is in the details,” and it is important to take account of differences in wording. Bill 24 strictly addresses any project as a “carbon capture and storage project,”⁵¹ whereas both Australian laws call them “GHG stream storage sites,”⁵² Montana refers to “carbon sequestration programs,”⁵³ Kansas uses the phrase, “carbon dioxide injection wells”⁵⁴ and Wyoming simply refers to them as

⁵⁰ Jaccard and Sharp, “CCS in Canada,” 80.

⁵¹ The Legislative Assembly of Alberta: The Minister of Energy, *Bill 24, The Carbon Capture and Storage Amendments Act, 2010*, http://www.assembly.ab.ca/ISS/LADDAR_files/docs/bills/bill/legislature_27/session_3/20100204_bill-024.pdf

⁵² Government of Queensland, *Greenhouse Gas Storage Act 2009* AND Government of Victoria, *Greenhouse Gas Geological Sequestration Act 2008*

⁵³ House. *An Act Regulating Carbon Sequestration*, Montana 2009, S.B. 498, <http://leg.mt.gov/bills/2009/sesslaws/ch0474.pdf>

⁵⁴ House, *An Act Enacting the Carbon Dioxide Reduction Act*, K.S.A. 2006, HB 2419, <http://www.kansas.gov/government/legislative/bills/2008/2419.pdf>

“geological sequestration sites.”⁵⁵ Alberta is the only legislation that has specifically provided clarity to state to stakeholders that their Act explicitly covers CCS projects and, is CCS specific in nature.

V.2 The United States

In 2009, the USA was the second largest emitter of GHG emissions worldwide.⁵⁶ Several states⁵⁷ have enacted CCS laws, and like Alberta are committed to preserving their resource driven economies. In 2010, Canada announced their intention to harmonize their emissions reduction legislation and policies with the United States.⁵⁸ This has created a cross-border relationship between Canada and the USA that is now even more important as our emissions targets are intertwined with one another. Both countries set an emissions reduction target to reduce GHG emissions by 17% from 2005 levels by 2020.⁵⁹ CCS projects are being considered as an option to reach these targets.

In Wyoming, Kansas and Montana there is extensive capacity for CCS storage sites much like in Alberta.⁶⁰ In 2007, Kansas passed House Bill No. 2419, the *Carbon Dioxide Reduction Act*. The legislation much like Alberta created a *Carbon Dioxide Injection Well and Underground Storage Fund*, which is to be used for a variety of CCS, related purposes. Unlike Alberta, Kansas has established a precise fee of \$0.05/metric tonne injected.⁶¹

Unlike Alberta, the approach to liability in Kansas is that the government is *not* prepared to assume a conditional transfer of long-term liability for storage sites.⁶² The Kansas government will instead operate under the “polluter pays” principle. Whoever is operating the well will be responsible for the stored CO₂ for the lifetime of the project,

⁵⁵ House. *An Act Relating to Carbon Sequestration*, Wyoming 2009, H.B. 0058, <http://legisweb.state.wy.us/2009/Bills/HB0058.pdf> AND House. *An Act Relating to Environmental Quality*, Wyoming 2010, H.B. 0017, <http://legisweb.state.wy.us/2010/Enroll/HB0017.pdf>

⁵⁶ Global CCS Institute, *Country Snapshots: CCS In The United States*, 2013: <http://www.globalccsinstitute.com/location/united-states>

⁵⁷ Besides Wyoming, Montana and Kansas states that also have CCS legislation are: Washington, Texas, Oklahoma, North Dakota, Utah, West Virginia, and Louisiana. See Aldrich and Koerner’s piece “Assessment of Carbon Capture and Sequestration Liability Regimes,” or Appendix 1.

⁵⁸ Wilkinson, “CCS: Identified Challenges to Implementation”

⁵⁹ Natural Resources Canada, *Minister Oliver Reinforces Importance of Canada-U.S. Energy Relationship*, April 24, 2013: <http://www.nrcan.gc.ca/media-room/news-release/2013/7064>

⁶⁰ Ingelson, Kleffner and Nielson, “Long-Term Liability,” 433

⁶¹ Aldrich and Koerner, “Assessment of Carbon Capture and Sequestration Liability Regimes,” 41

⁶² Ingelson, Kleffner and Nielson, “Long-Term Liability,” 468.

and for any damages that may arise. An operator will also be subject to a penalty of ten thousand dollars if it has been found that any CO₂ leakage has taken place and, “in the case of a continuing violation, every day such violation continues shall be deemed a separate violation.”⁶³

The CCS legislation in Wyoming is contained through two bills. House Bill 58 passed in 2009, addresses the ownership and liability of material injected for geological sequestration⁶⁴ and, House Bill 17 passed in 2010 created the *Geologic Sequestration Special Revenue Account*.⁶⁵

In stark contrast to Alberta, the state of Wyoming has declared that liability related to CO₂ sequestration rests indefinitely with the injector and that no transfer of liability will take place. Wyoming therefore limits any long-term liability on the part of the state and instead places the burden on the parties that inject the CO₂. Any funds that are put into the account will “be used only for the measurement, monitoring and verification of geologic sequestration sites following site closure certification.”⁶⁶ Therefore the fund, which is subsidized by well operators, is to only be used if there is a default on the part of the permit holder and the Department of Environmental Quality needs to remedy the problem. The inclusion of the account into law leaves open the question of whether or not the state *could* at some point assume limited liability due to the wording within certain sections. Section 1(d) states:

The existence, management and expenditure of funds from this account shall not constitute a waiver by the state of Wyoming of its immunity from suit, nor does it constitute an assumption of any liability by the state for geologic sequestration site or the carbon dioxide and associated constituents injected into those sites.⁶⁷

This statement results in some ambiguity within the Act because, as noted in House Bill 58, the state will not take on long-term liability. But according to this statement they will take over some monitoring if the account is used, but they will not release the operator

⁶³ *An Act Enacting the Carbon Dioxide Reduction Act*, K.S.A. 2006

⁶⁴ *An Act Relating to Carbon Sequestration*, Wyoming 2009

⁶⁵ *An Act Relating to Environmental Quality*, Wyoming 2010

⁶⁶ *Ibid.*

⁶⁷ *Ibid.*

from any liability if this were to happen. This confusion could lead to problems once CCS projects are up and running in Wyoming.

In May 2009, an Act for CCS was approved in Montana, which provides more options for companies injecting CO₂ than is found in the legislation passed in both Wyoming and Kansas.⁶⁸ Senate Bill 498, *An Act Regulating Carbon Sequestration*, incorporates elements, which can be found in Kansas', and Wyoming's CCS laws as discussed above. Like Wyoming and Kansas, Montana has set up a geologic storage reservoir account, which an operator will pay into, based on each tonne of CO₂ injected.⁶⁹ Sections 3 and 4 of the Act address liability, but not in the same way as the Act's from Wyoming and Kanas do. The framework is important for the flexibility that it offers in terms of liability transfers. This legislation is unique in that an operator has the option to actually choose *not* to transfer liability to the state and instead retain all liability requirements. Therefore unlike the Governments of Wyoming, Kansas, and Alberta, the Montana government gives well site injectors a choice. If they choose to not partake in a liability transfer then they will retain any fees that were put into the account for the monitoring and management of the injection site.

What is also particularly important is Section 4 of the Act, which addresses closure certificates.⁷⁰ A closure certificate in Montana will not be issued until an allotted amount of time has passed. Section 4(3) states "the certificate may not be issued until at least 15 years after carbon dioxide injections end," further noting in 4(6), "after issuing a certificate of completion, the board shall ensure adequate monitoring by the operator of the wells and reservoir, verifying compliance with subsection (4) for a period of 15 years."⁷¹ Therefore the total closure period will take thirty years before the government will take over any liability obligations.

⁶⁸ Ingleson, Kleffner and Nielson, "Long-Term Liability," 445.

⁶⁹ *An Act Regulating Carbon Sequestration*, Montana 2009

⁷⁰ Ibid.

⁷¹ Ibid.

V.3 Australia

As one of the first countries to introduce CCS legislation, Australia set a precedent for the development of CCS frameworks internationally.⁷² Australia, like Canada is a country rich in natural resources. With significant amounts of petroleum, coal and natural gas the country is a significant net exporter of energy.⁷³ Black coal plays a large role in the economy of Australia and, several state Governments across the country see CCS as a way in which to deliver “clean coal.”⁷⁴ Australian state legislation serves as a good comparison to Alberta based on their similar energy intensive economies.

In the state of Queensland the government enacted the *Greenhouse Gas Storage Act* (GGSA) in 2009. A key shortcoming of the GGSA is that it fails to expressly address long-term liability obligations or costs the way Alberta’s Bill 24 does. Sections 27 and 28 of the GGSA, like Section 15 of the MMA, address state ownership of storage reservoirs. In Alberta the Minister may enter into agreements with respect to pore space for the issuing of a lease agreement in order to store substances.⁷⁵ In the GGSA section 27 declares, “All GHG storage reservoirs in land in the State are and are taken always to have been the property of the State.”⁷⁶ Therefore, like Alberta any injector must enter into an agreement with the state before any operations can take place. As well, much like the Albertan legislation, a GHG lease does not have a fixed term and the lease will therefore continue until the time it is surrendered or ends, leaving no settled time frame for which to assure the Queensland Government when they might become later responsible for the injected GHG stream.

The Victoria Act specifies with considerable detail the information that must be provided when surrendering a storage site. The *Greenhouse Gas Geological Sequestration Act, 2008* (GGGSA) imposes strict obligations on license holders to meet the long-term monitoring and verification costs associated with CCS injection before

⁷² Amelia Thorpe, “Too Little, Too Soon? An Assessment of Carbon Capture and Storage Legislation Against the New Standards Set for Clean the Clean Development Mechanism,” *Climate Law* 3, no. 1 (2012): 140

⁷³ Global CCS Institute, *Country Snapshots: CCS in Australia*, May 14, 2103: <http://www.globalccsinstitute.com/location/australia>

⁷⁴ Thorpe, “Too Little, Too Soon?” 139.

⁷⁵ *Mines and Minerals Act, RSA 2000*

⁷⁶ Government of Queensland, *Greenhouse Gas Storage Act 2009*

surrendering a storage site. The GGGSA provides a comprehensive outline as to what a proper MMV plan will include and what the Minister must make sure is covered before he or she will administer a lease or closure certificate. These would be things such as: making sure the formation is geologically suitable for permanent storage, ensuring that the greenhouse gas substance will be contained within the injection area, that no risk of harm to the public or environment will exist, a calculated estimation as to the rate and volume of the substance being injected, an assessment of the effect any leakage could have on public health and other resources, as well as an estimate of the costs that will need to be paid in order to carry out the MMV activities after injection has ceased.⁷⁷ The MMV plans in the GGGSA provides a much more comprehensive outline than what currently exists in Alberta's legislation, which only states that a lessee must submit an MMV plan without expanding on anything further.⁷⁸

VI. Analysis

Laws when set in motion become a constraining factor on any policy options that can take place moving forward. In particular, laws tend to have a great deal of inertia, and it is often easier to pass them than repeal them. From this perspective it may be viewed as somewhat fortunate that the Alberta law related to CCS as it currently stands is somewhat incomplete. This allows us to “fill in the gaps” by analyzing the best practices of other jurisdictions.

It is clear when comparing the provincial legislation passed for CCS in Alberta with that of other jurisdictions that a key issue concerns the laws that cover the transfer of long-term liability from the operator to the government. An examination of the legislation from other jurisdictions suggests that clarity is vital - there should be complete information and no confusion within statutes when it comes to liability. It is of the utmost importance to get it right; for the safety of the people of Alberta, but also to encourage the investment needed to see these projects get off the ground.

⁷⁷ Government of Victoria, *Greenhouse Gas Geological Sequestration Act 2008*: A more comprehensive list can be found within Part 5 of the GGGSA, under Division 6: 94 (a-m) Content of Injection and Monitoring Plan.

⁷⁸ *Mines and Minerals Act, RSA 2000*

It seems obvious that in order to get the desired investment in Alberta a transfer of liability at some point is needed so that operators do not carry the lifelong burden of a CCS injection well. However, one must evaluate the implications of determining where liability best lies. One of the most important questions regarding CCS law has been whether or not responsibility after closure will be transferred from the operator to the state.⁷⁹ The polluter pays principle versus placing the liability on taxpayers is an important and controversial issue. As time passes, it will be increasingly unlikely that an operator will still be a viable entity of discharging its liabilities and, if someone were to suffer and a site had become orphaned due to a company going out of business then this harm will not be compensated.⁸⁰ Therefore, it seems preferable to have the government assume the liability after a certain amount of time has passed. Of the jurisdictions discussed above Kansas, Wyoming, and the State of Victoria, do not eventually pass the liability onto the government. Those governments are running the risk of having many orphaned CCS sites. As Nigel Bankes notes the “government will need to provide the *ultimate* assurance.”⁸¹ He goes on to state that, “abandoned wells have been identified as one of the most probable leakage pathways for CO₂.”⁸²

Risks will be reduced if wells are taken over by responsible parties who are able to monitor them at regular intervals. This is where the government steps in. Long-term monitoring by the government is an effective measure to control the risks that CO₂ storage wells may encounter. The Alberta government is willing to take on the transfer of liability due to the fact that most CCS risks decrease over time. (Appendix 2) In rare cases when leaks do occur the PCSF would be used to cover any remediation costs. The fact that CCS is seen as a societal good in Alberta justifies the potential risk that may be borne by taxpayers.

Although the state of Kansas’ approach to liability is that the government is not prepared to take on any transfer of long-term liability, there are two key attributes of the *Carbon Dioxide Reduction Act* that sensibly inform Alberta’s legislation. First, as

⁷⁹ Barton, “Carbon Capture and Storage Law for New Zealand,” 30.

⁸⁰ Bankes, Poschwatta and Shier, “The Legal Framework,” 623.

⁸¹ Ibid.

⁸² Ibid., 596.

discussed above, Kansas implements a specific fee for their fund. Secondly, a fine of ten thousand dollars per day will be charged against the operator if their storage well is found to have released CO₂ back into the atmosphere. These two figures provide a useful reference point for Alberta because the province has yet to put a dollar amount on what will be going into the PCSF, and has not established a fee for damages that occur if leakage happens during the CCS injection phase.

Kansas has set their fee at \$0.05 per metric tonne being injected into the well. An amount per tonne provides clear understanding of how much a project could potentially cost a CCS investor. By ensuring a dollar amount is written into law, the Albertan government will be able to ensure that once the PCSF is in operation a continual amount of money will be deposited into the fund for each tonne of sequestered CO₂. The government could also take the administration of the fee one step further and implement \$0.05 per metric tonne as the base rate to be paid for each project however, leave it to their own discretion as to whether or not an increase in the fee may occur depending on certain injection site criteria which will be evaluated by the MMV criteria.

The responsibility to pay a ten thousand dollar fine per day if a CO₂ leakage does occur during injection further places accountability upon the operator for damages that may arise during the injection period. Damages paid should be assessed based upon the amount of CO₂ that has leaked into the atmosphere. As, not all leaks are the same size and cause the same amount of damage, the ten thousand dollars fine may also be used as a base amount. The fine should be adjusted to reflect the CO₂ that has escaped and the social costs involved in the clean up. A monetary value for damages that occur ensures that the operator is aware of the consequences they will face if management of a site fails to stop a leak from occurring.

A comprehensive MMV plan will aid the government in settling a correct fee for the PCSF. An MMV plan similar to the state of Victoria would cover the determination of the fee based on criteria of the injection project and, could then contemplate the fee increase depending on MMV evaluation standards. Therefore a straight-forward MMV plan will need to be developed in order to come to an understanding from both the government and operators as to what criteria are absolutely needed before a CCS project

can first be given the go ahead. When all standards are met a project can be carried out. The next step for Alberta will be to develop their MMV framework. I suggest that the same principle criteria that are used in Victoria be considered. The coverage of apparent dangers, monetary amounts and volumes of CO₂ being sequestered within the *Greenhouse Gas Geological Storage Act's* MMV plan will provide legal understanding between all parties as to the criteria that must be met before a project can commence and before a closure certificate can be issued.

The length of time for which monitoring and verification is required is the subject of much discussion. While some have argued for extensive on-going monitoring a more practical solution would be for monitoring to taper off once it has been demonstrated that the plume of CO₂ is no longer moving.⁸³ At this time a closure certificate can be issued and the government will take over any further liabilities. This is why it is best to place specific time frames upon the transfer of liability before a closure certificate can be issued. If liability is transferred too soon then the operator may fail to adequately seal and monitor the storage site. Proper framework and time periods must be incorporated into Albertan law establishing how long each step in the process will take. It provides certainty to both operators and legislators. A CCS project will require proper communication and verification before liability is transferred. This will ensure smoother transitions once liability has been taken over by the government.

I suggest implementing timeframes similar to those in Montana where a closure certificate will not be issued until at least fifteen years after the injection of CO₂ has ended. Following this is another fifteen-year time span, during which the well operator has been issued a certificate of project completion for the site, but must continue monitoring and verification to ensure that the CO₂ is stable. The whole closure and transfer of liability process therefore takes thirty years from start to finish. A thirty-year span when written in law provides a definite time coverage contract that if breached could lead to the well operator facing additional charges. It also allows an operator to say that the government cannot hold them responsible after this period of time has passed.

⁸³ Bankes, Poschwatta and Shier, "The Legal Framework," 619.

Incorporating a minimum closure period into the law will enhance the confidence of the public in the closure and transfer of liability process. Since, CCS in 2015 will be new for Alberta and the closure process itself is still of concern to the general public, the requirement of a minimum period is important to build confidence that risks are understood and manageable before any liability is assumed by the Government of Alberta.⁸⁴

These three policy questions come full circle. It is vital to start with the development of a complete MMV plan, which will provide within it criteria for fees per metric tonne of CO₂ injected, fines for leakage, and specific time-periods before the provincial government will take over liability. The cross-jurisdictional legislative understanding of CCS laws passed in other states is crucial in order to get an understanding of just where the Albertan provincial legislation passed for CCS can do better and where we can also learn from those who are trying to ultimately reach the same goals as we are.

VII. Policy Implications

Climate change policy is controversial in Alberta. The need for a reduction in GHG emissions is important, yet the resource industries that drive the economy of the province cannot be compromised. CCS technology is viewed by some as a way of dealing with these competing objectives. CCS has been identified as an important policy driver for GHG reduction in the province. The province is committed to the goal of having CCS projects account for almost seventy percent of Alberta's future emission reductions.⁸⁵ Indeed, the province has not announced any other policy initiatives intended to deal with GHG emissions. This suggests that it is all the more important to get the legislation regulating CCS right.

Public policy must balance the need to protect the public from the long-term damage posed by GHGs by facilitating the introduction of CCS, but also protect the

⁸⁴ Fernandez, Leask and Arnot, "Liability for Sequestered CO₂," 11.

⁸⁵ Massicotte, Ross and Thompson, "The Changing Legislation," 313.

public from any damage that may be posed by the process.⁸⁶ It is up to policymakers to balance these two objectives in order to properly trade off the environmental benefits against the costs associated with the risk of storing CO₂. While some solutions for combatting climate change are obvious others need more consideration. CCS is a very complex operation. A good policy will therefore address shortcomings within current CCS written legislation and allow the public to accept and feel safe when these projects are up and running. A key component to achieving public acceptance is that effective CO₂ reduction will take place in a way that meets the commitment of sustaining the environment, but also by promoting public acceptance of CCS projects within Canada and internationally.

Policy makers are very aware that energy policy is being driven by environmental policy and CCS is a good example of this. This is important for Alberta because if production is to be ramped up emissions will grow as well. A climate change policy that may work well for Alberta is CCS, based on the industries that drive the economy. However, costs also factor greatly into the adoption of CCS technology and are playing a large role in whether or not the two projects still set to take place, will be up and running by 2015. While, the Alberta carbon tax is another means in which the province is committing to reducing GHG emissions, this policy is actually hindering the chances of CCS being carried forth in the province. Policy makers need to also be seeking ways in which to make the economics of CCS more attractive.

If comprehensive policies are not developed before 2015, Alberta runs the risk of never seeing CCS implemented. Some have argued that Canada has the potential to emerge, as a leader in CCS research and technology⁸⁷ and Alberta in particular has an opportunity to establish itself as the hub of a truly Canadian made industry.⁸⁸ With the geological potential within the province for large storage sites it seems rational that Alberta would use the same geological formations that endowed them with vast supplies of resources in the opposite way to help abate emissions. When the proper legal

⁸⁶ Ingelson, Kleffner and Nielson, "Long-Term Liability," 465

⁸⁷ ICO₂N Companies, *Carbon Dioxide Capture and Storage: A Canadian Energy Opportunity*, October 2009, 7: http://www.ico2n.com/wp-content/uploads/2010/07/ICO2N-Report_09_final2.pdf

⁸⁸ Thomson and Khare, "Carbon Capture and Storage," 116.

framework is settled within Alberta, it will be time to start the learning by doing process. Planning for all circumstances creates optimism, however until legislation is tightened and projects are operational acceptance of these projects will be questionable.

It must be emphasized that this process will not simply be a quick fix to an immediate problem, the provincial government is trying to reconcile the country's ongoing reliance on fossil fuels with the need to reduce GHG emissions and it is proving to be one of the country's greatest challenges.⁸⁹ CCS is a potential enabler to solve this problem. If implemented on a large scale CCS has the potential to resolve the conflict between fossil fuels and climate risk. If CCS projects are carried forth successfully there will be an opportunity for Alberta to emerge as a world leader in the implementation of the technology and the legislative and regulatory framework that supports it. CCS has the potential to cast Alberta in a positive light for the obligations they are making to stop GHG emissions from growing, in sharp contrast to its current position as the country's largest GHG emitter.

Finally a move forward with CCS projects will mean that Alberta like other states is willing to resolve any legal or regulatory issues that may pose problems in the future.⁹⁰ Preparedness is essential for the long-term scope of these projects. In terms of making sure Alberta has the proper legislation moving forward knowledge sharing will be vitally important in order to clarify not only public policy issues but also to find solutions to make the CCS process run as smoothly as possible.

VIII. Conclusion

While a current legal framework for CCS in Alberta does exist, it will not be operational until projects are up and running in 2015. In order to ensure that no liability issues arise from the sequestration of CO₂ after this time it is important that the Government of Alberta get this framework right. It is only prudent to learn from other legislations around the world to ensure a well functioning legal environment in which sequestration can take place. A cross-jurisdictional scan can fill in several of the policy

⁸⁹ Mitrović and Malone, "Carbon Capture and Storage (CCS) Demonstration Projects in Canada," 5686.

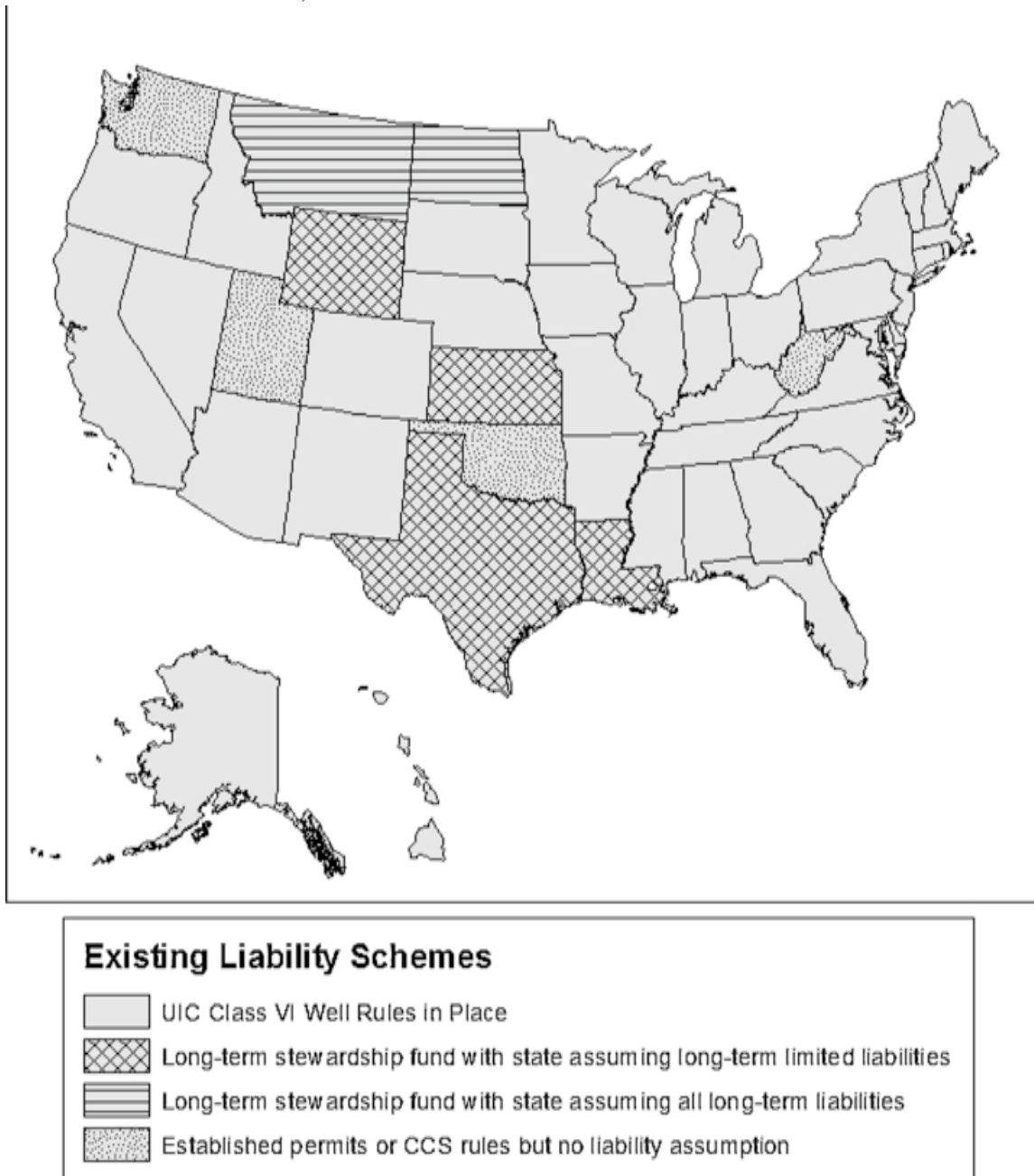
⁹⁰ Ibid., 5687.

problems that Alberta's *Carbon Capture and Storage Amendments Act* did not address when it received Royal Assent in 2010. No other jurisdiction is currently operating CCS projects in saline aquifers, which allows for Alberta to become a global leader in this process. However, for this to happen practical, responsible legislation must be in place with strong, straightforward guidelines for the government and operators to abide by. We can see from all other jurisdictions covered in this work that no single piece of legislation is perfect. Some have better coverage in certain areas and it is important to understand how other states cover Alberta's policy gaps in a better manner. The policy problems when addressed through other legislations give us a stepping-stone of how Bill 24 still needs to be improved. The province must address these three policy issues before 2015, or suffer from unknown outcomes related to time frames, costs associated with the PCSF and MMV guidelines.

IX. Appendix

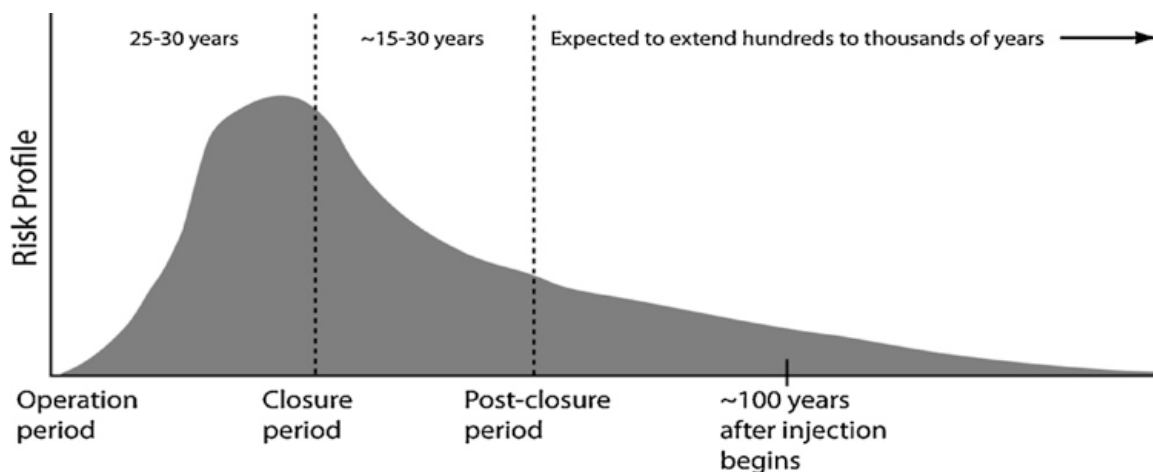
Appendix 1: Summary of Existing Liability Schemes in the U.S.

Source: Aldrich and Koerner, 2011



Appendix 2: Timing and Severity of CCS Risks

Source: Aldrich and Koerner, 2011



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