

2013

2015

2020

2025

2030

2035

2040

2045

2050

CSA Z741-12 and requirements for geologic storage

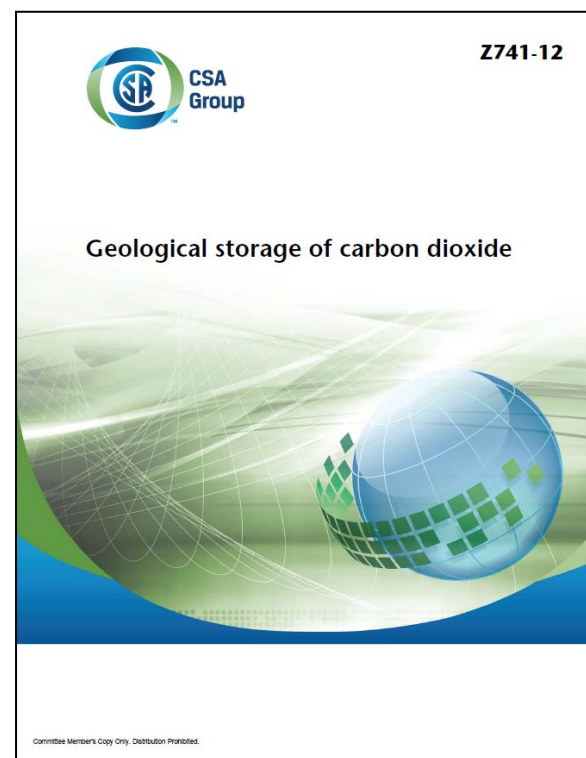
6th International IEA CCS Regulatory Network Meeting
28 May 2014

Sean McCoy
Energy Analyst, CCS Unit



What is CSA Z741-12?

- CSA Z741-12 was the first national standard for geologic storage of CO₂
- It has been approved as a national standard in Canada (by SCC) and the United States (by ANSI)
- It was drafted by an open US-Canadian technical committee between mid-2010 and late-2012
- Funding was provided by the Government of Canada, Government of Saskatchewan, and Shell through IPAC-CO₂





Scope of the CSA CCS Technical Committee

The Committee is responsible for **developing and maintaining** standards related to geological storage of CO₂. The Committee scope covers all aspects of the geological storage of CO₂ including, but not limited to:

- a) Screening and site selection;
- b) Design;
- c) Injection;
- d) Operation and maintenance;
- e) Closure and long-term stewardship;
- f) Risk management as it relates to development sites;
- g) GHG quantification and verification.



CCS Technical Committee Membership

Approximately 40 members with balanced representation from:

- Owner/operators
- Service companies & consultants
- Governments & regulatory authorities; and
- Academic & NGOs

J. Aarnes

S. Anderson

S. Bachu

R. Baker

M. Blincow

D. Boyler

S. Carpenter

M. Celia

R. Chalaturnyk - *Chair*

O. Cicchini

I. Duncan

K. Durocher

R. Esposito

M. Fernandez

S. Forbes - *Vice-Chair*

A. Greeves

W. Gunter

K. Heal

W. Hillier

K. Hnottavange-Telleen

S. Imbus

J. Kelly

J. Kirksey

M. Leering - *Project Manager*

H. Longworth

M. McCormick

S. McCoy

S. McLellan

M. Nasehi

M. Nickolaus

R. Page

N. Ripepi

R. Slocomb

J. Sparks

R. Sweatman

C. Voss

J. Walker - *Project Manager*

P. Warwick

S. Whittaker



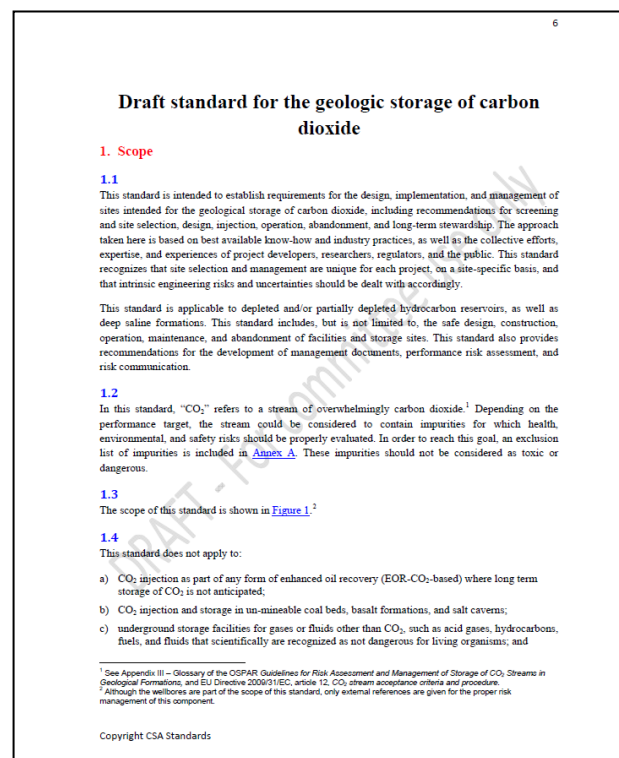
CSA CCS Technical Committee Timeline

2010	September	Terms of reference for TC developed
	November	1 st Meeting of TC and agreement on scope (Calgary, Alberta)
2011	May	Revision of seed document by working groups
	June	2 nd Meeting of TC to review public draft (Denver, Colorado)
	October	Working group revisions to public draft
	December	Public review of draft standard
2012	January	TC revisions to draft standard based on public comments
	April	3 rd Meeting of TC to finalize draft standard (Calgary, Alberta)
		Editing and national approvals
	October	Publication of CSA Z741-12



Seed Document for Standard

- Written by IPAC-CO₂ and CSA Standards
- Provided as a starting point for discussion
- Presented with the look and feel of a standard
- However, technical committee completely restructured and heavily revised the seed document to create the draft standard





CSA CCS Standard objective and scope

1.1 This Standard

- a) establishes requirements and recommendations for the geological storage of carbon dioxide. The purpose of these requirements is to promote environmentally safe and long-term containment of carbon dioxide in a way that minimizes risks to the environment and human health.
- b) is primarily applicable to saline aquifers and depleted hydrocarbon reservoirs and does not preclude its application to storage associated with hydrocarbon recovery.
- c) includes, but is not limited to, the safe design, construction, operation, maintenance, and closure of storage sites.
- d) provides recommendations for the development of management documents, community engagement, risk assessment, and risk communication.



CSA CCS Standard objective and scope

1.1 This Standard

- a) establishes requirements and recommendations for the geological storage of carbon dioxide. The purpose of these requirements is to promote environmentally safe and long-term containment of carbon dioxide in a way that minimizes risks to the environment and human health.
- b) is primarily applicable to saline aquifers and depleted hydrocarbon reservoirs and does not preclude its application to storage associated with hydrocarbon recovery.
- c) includes, but is not limited to, the safe design, construction, operation, maintenance, and closure of storage sites.
- d) provides recommendations for the development of management documents, community engagement, risk assessment, and risk communication.

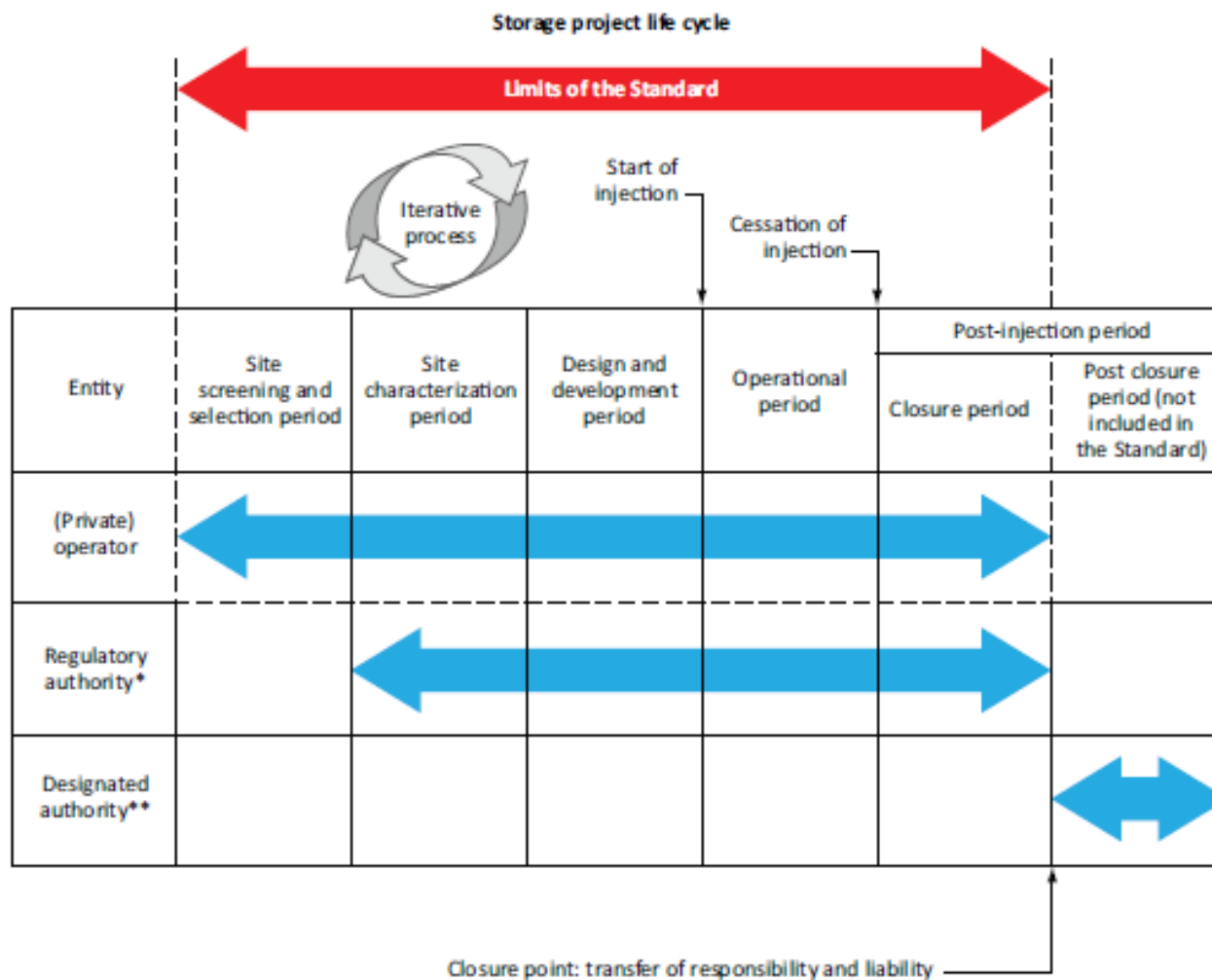


CSA CCS Standard objective and scope

1.1 This Standard

- a) establishes requirements and recommendations for the geological storage of carbon dioxide. The purpose of these requirements is to promote environmentally safe and long-term containment of carbon dioxide in a way that minimizes risks to the environment and human health.
- b) is primarily applicable to saline aquifers and depleted hydrocarbon reservoirs and does not preclude its application to storage associated with hydrocarbon recovery.
- c) includes, but is not limited to, the safe design, construction, operation, maintenance, and closure of storage sites.
- d) provides recommendations for the development of management documents, community engagement, risk assessment, and risk communication.

Project lifecycle and scope



*This Standard acknowledges that permitting/approval by regulatory authorities will be required, throughout the project life cycle, through the closure period, in order for a project to proceed through the project life cycle. The permitting process is not included in the standard.

†In some cases, the designated authority might be the same as the regulatory authority.



Draft CSA CCS Standard table of contents

1. Scope
2. Reference publications
3. Definitions
4. Management systems
5. Site screening, selection, and characterization
6. Risk management
7. Well infrastructure development
8. Monitoring and verification
9. Closure



Clause 4: Management systems

The intent of management systems is to ensure that existing best practices are followed and to allow and promote improvement in the CCS field. Management systems also help to ensure that quality assurance/quality control, regulatory compliance, process improvements, and efficiency improvements are integrated into regular management processes and decision-making, as well as ensuring project transparency so that project stakeholders, regulatory authorities, and the public develop confidence in the management and implementation of storage projects.



Clause 5: Site selection and characterization

- Identify prospective CO₂ storage sites, gather necessary information on the prospective sites, and use this information to select the most promising candidates for further characterization.
- Demonstrate that candidate sites are likely to have sufficient capacity to accept the anticipated final volume of CO₂, sufficient injectivity to accept CO₂ at projected supply rates, and containment characteristics that ensure effective retention of the injected CO₂.
- Demonstrate that storage of the CO₂ stream at the candidate site(s) does not pose unacceptable risks to other resources, to the environment and human health, and to project developers, owners, and operators.



Clause 6: Risk Management

The purpose of risk management is to ensure that the opportunities and risks involved in an activity are effectively managed and documented in an accurate, balanced, transparent, and traceable way. Effective risk management should:

- a) help demonstrate achievement of objectives and improve performance relative to elements of concern;
- b) support strategic planning and development of robust project and change management processes;
- c) help decision makers make informed choices, prioritize actions, and distinguish among alternative courses of action;
- d) account for uncertainty, the nature of that uncertainty, and how it can be addressed; and
- e) recognize the capability, perceptions, and intentions of external and internal stakeholders that can hinder achievement of objectives.



Clause 7: Well infrastructure development

- 7.1 Materials: Selection of suitable materials for equipment
- 7.2 Design: Safe design of drilling and completion operations and wells
- 7.3 Construction: Drilling and completion, workovers, and abandonment of wells
- 7.4 Corrosion control: Special design and operation considerations
- 7.5 Operation and maintenance: Maintaining integrity of wells and surface equipment



Clause 8: Monitoring and Verification

The purpose of monitoring and verification (M&V) is to address health, safety, and environmental risks and assess storage performance. Monitoring, verification, and accounting activities support a risk management strategy that enables an assessment of storage performance and provides confidence that greenhouse gas reductions are real and permanent.



Clause 9: Closure

The purpose of Clause 9 is to provide guidance to and establish predictability for project operators and regulatory authorities regarding the expectations of the closure period. The intentions of the closure period are to demonstrate the following:

- a) sufficient understanding of the storage site's characteristics;
- b) low residual risk; and
- c) adequate well integrity.



CSA Z741-12 and the ISO Process

- CSA Z741-12 is serving as the seed document for ISO TC 265 Working Group 3
- In the ISO process, the scope has been revised to explicitly exclude storage associated with hydrocarbon recovery (e.g. CO₂-EOR)
- Each clause of the seed document is being thoroughly reviewed to:
 - ensure it is representative of international best practice;
 - appropriate for a wide variety of regulatory environments; and
 - For application to offshore storage (CSA Z741-12 doesn't address offshore operations)

2013

2015

2020

2025

2030

2035

2040

2045

2050



Thank-you!

Sean McCoy, Ph.D.
Energy Analyst, CCS Unit

Telephone: +33 (0)1 40 57 67 07
Email: sean.mccoy@iea.org
Web: www.iea.org/ccs/