JULY 16, 2019

Testing the ISO Carbon Dioxide Geological Storage Standard (ISO 27914) Against a U.S. CO_2 Storage Site Characterization Program

Outline

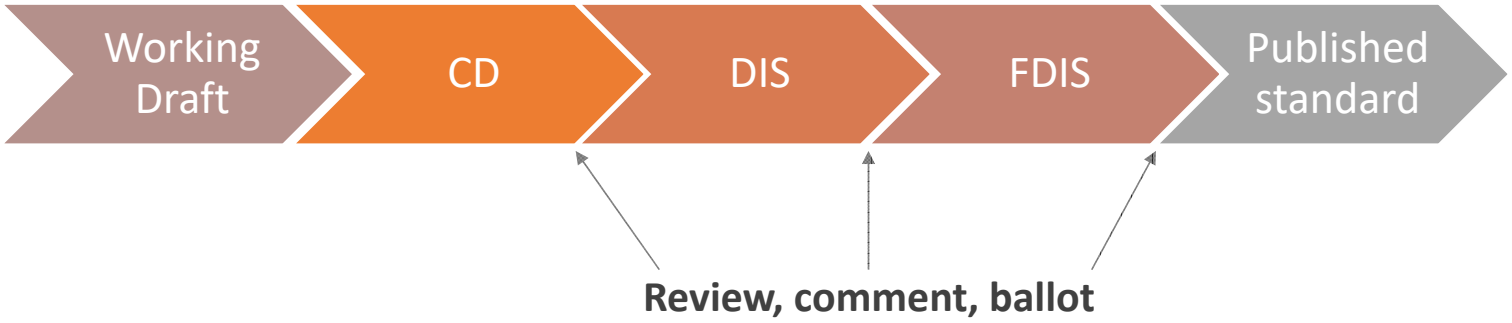
- Background
  - Project ECO_2S
  - ISO
  - TC265
  - US TAG
- ISO 27914
- ECO_2S vs ISO 27914
- Future assessment

Background

- Project ECO_2S stakeholders came up with the idea to assess a published ISO CCS standard against an active U.S. CO_2 site characterization project
  - CSA Group contracted to assist
- The goal of the project is to develop a report that highlights the similarities and differences that exist between the requirements in ISO 27914, *Geological Storage* and project ECO_2S
- Such a report will serve to:
  - showcase project ECO_2S as a world class CO_2 storage facility as well as the support of the DOE for such work;
  - highlight the progress made to date at the Kemper County energy facility;
  - be an outreach and education piece for the CCS community in the U.S. and abroad; and
  - inform future decisions at project ECO_2S, as well as modifications to future editions of the standard.

ISO

- International Organization for Standardization
- Non-governmental organization based in Geneva
- 164 ‘National Member Bodies’
- 786 Technical Committees and Subcommittees
- 22,572 International Standards published
- Consensus-based standard development process



Technical Committee 265

Participating Members (20)

- Australia (SA)
- Canada (SCC)
- China (SAC)
- France (AFNOR)
- Germany (DIN)
- India (BIS)
- Italy (UNI)
- Japan (JISC)
- Korea, Republic of (KATS)
- Luxembourg (ILNAS)
- Malaysia (DSM)
- Mexico (DGN)
- Netherlands (NEN)
- Norway (SN)
- Portugal (IPQ)
- Saudi Arabia (SASO)
- South Africa (SABS)
- Spain (UNE)
- United Kingdom (BSI)
- United States (ANSI)

ISO/TC 265/WG 1	Capture
ISO/TC 265/WG 2	Transportation
ISO/TC 265/WG 3	Storage
ISO/TC 265/WG 4	Quantification and Verification
ISO/TC 265/WG 5	Cross Cutting Issues
ISO/TC 265/WG 6	EOR Issues

CO2GeoNet	The European Network of Excellence on the Geological Storage of CO2
CSLF	Carbon Sequestration Leadership Forum
EIGA	European Industrial Gases Association
GCCSI	Global CCS Institute
IEA - énergie	International Energy Agency
IEAGHG	The IEA Greenhouse Gas R&D Programme
WRI	World Resources Institute

Established in 2011, Chaired by Canada

TC265 published standards

- **ISO/TR 27912:2016:** Carbon dioxide capture systems, technologies and processes
- **ISO 27913:2016:** Pipeline transportation systems
- **ISO 27914:2017:** Geological storage
- **ISO/TR 27915:2017:** Quantification and verification
- **ISO 27916:2019:** Carbon dioxide storage using enhanced oil recovery (CO_2-EOR)
- **ISO 27917:2017:** Vocabulary -- Cross cutting terms
- **ISO/TR 27918:2018:** Lifecycle risk management for integrated CCS projects
- **ISO 27919-1:2018:** Performance evaluation methods for post-combustion CO_2 capture integrated with a power plant

U.S. TAG to TC265

- Technical Advisory Group (TAG)
  - Managed by an SDO (CSA Group)
- Accredited by American National Standards Institute (ANSI)
  - ANSI is the 'National Member Body' to ISO
- Consists of 44 experts from across the U.S. including oil/gas operators, research institutes, academia, government agencies, and consultants
- Main functions of the TAG are drafting, review on TC265 standards
  - Also adopt ISO standards in to the U.S.

ISO 27914, *Geological Storage*

1. Scope
2. Normative references
3. Terms and definitions
4. Management systems
5. Site screening, selection, and characterization
6. Risk management
7. Well infrastructure
8. CO2 storage site injection operations
9. Monitoring and verification
10. Site closure


INTERNATIONAL STANDARD

ISO 27914

First edition
2017-10

Carbon dioxide capture, transportation and geological storage — Geological storage

Capture, transport et stockage géologique du dioxyde de carbone — Stockage géologique

Reference number
ISO 27914:2017(E)

© ISO 2017

Scope

ISO 27914:

- establishes requirements and recommendations for the geological storage of CO2 streams
- applies to onshore and offshore geological storage (including hydrocarbon reservoirs)
- recognizes that site specific conditions and existing regulatory and permitting processes may impact conformance

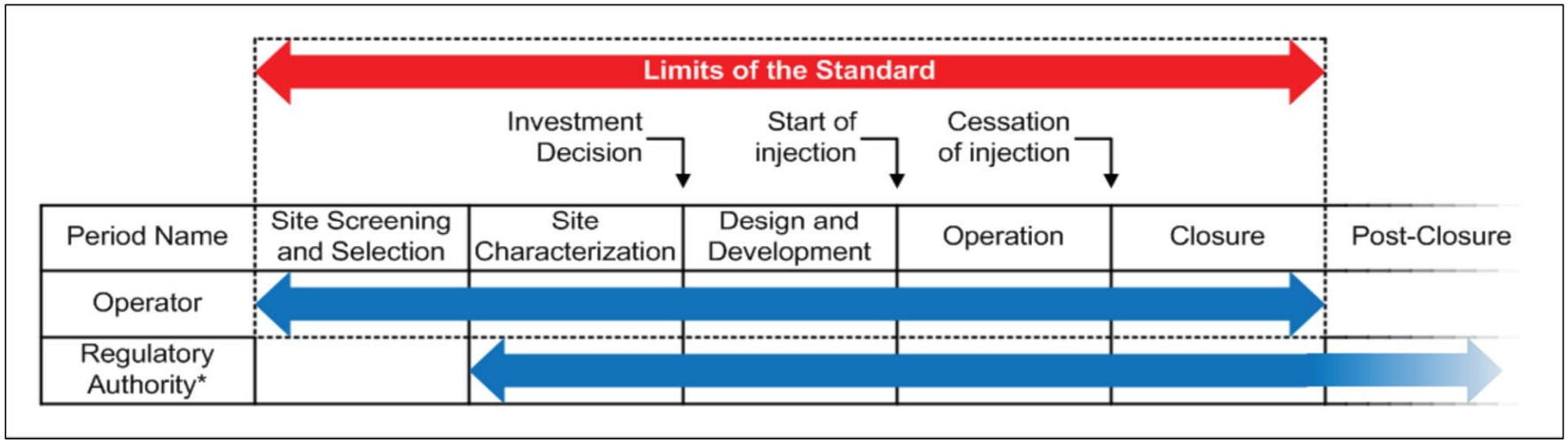
Does not apply to:

- the post-closure period
- CO_2-EOR
- the disposal of other acid gases except as considered part of the CO_2 stream
- the disposal of waste and other matter added for purpose of disposal
- storage in coal, basalt, shale and salt caverns
- underground storage using any form of buried container

Scope cont'd

- Does not apply to, modify, interpret, or supersede any national or international regulations, treaties, protocols or instruments otherwise applicable to the activities addressed in this document

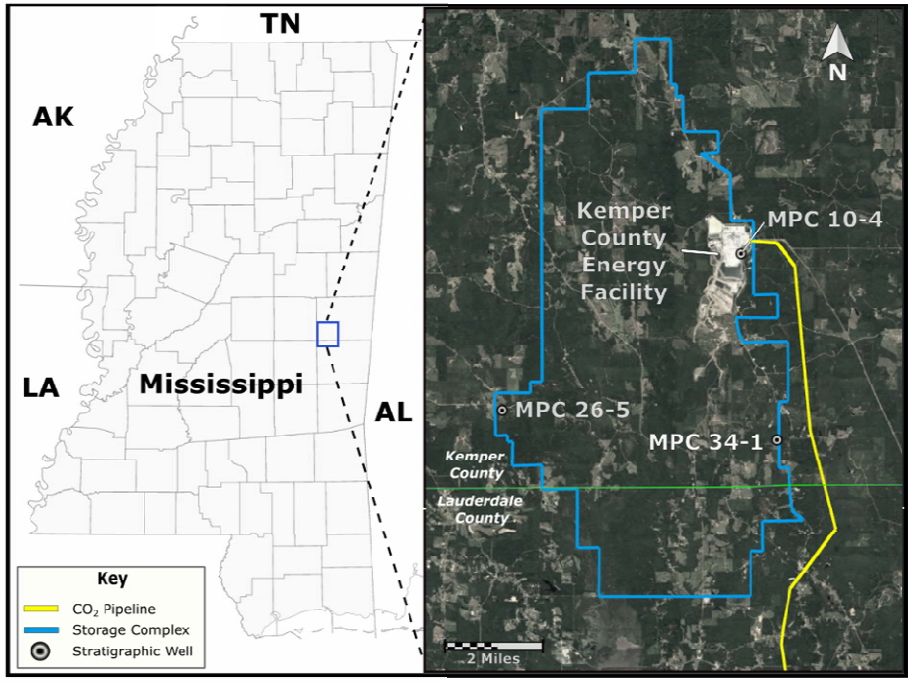
- Does not apply to or modify any property rights or interests in the surface or the subsurface (including mineral rights), or any pre-existing commercial contract or arrangement relating to such property

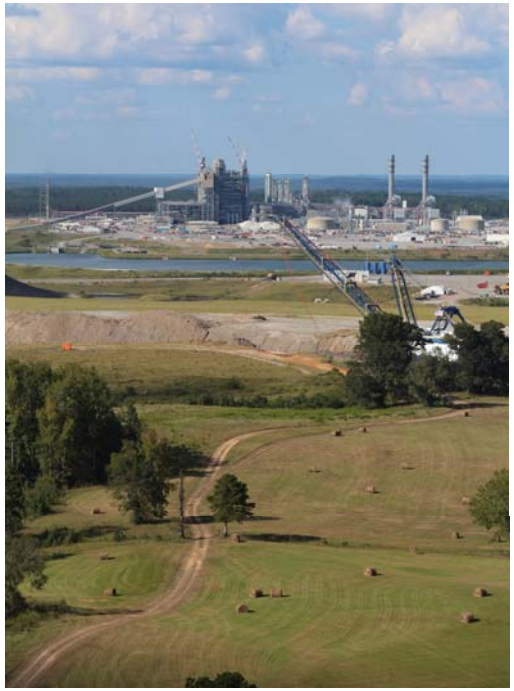


Project ECO_2S

- Project ECO_2S, located adjacent the Kemper County energy facility in Mississippi, is a CO_2 storage site characterization project supported by the DOE CarbonSAFE initiative
- The Project Team is led by Southern States Energy Board, Mississippi Power Company and Southern Company Services, with technical support from Advanced Resources International and a host of key subcontractors

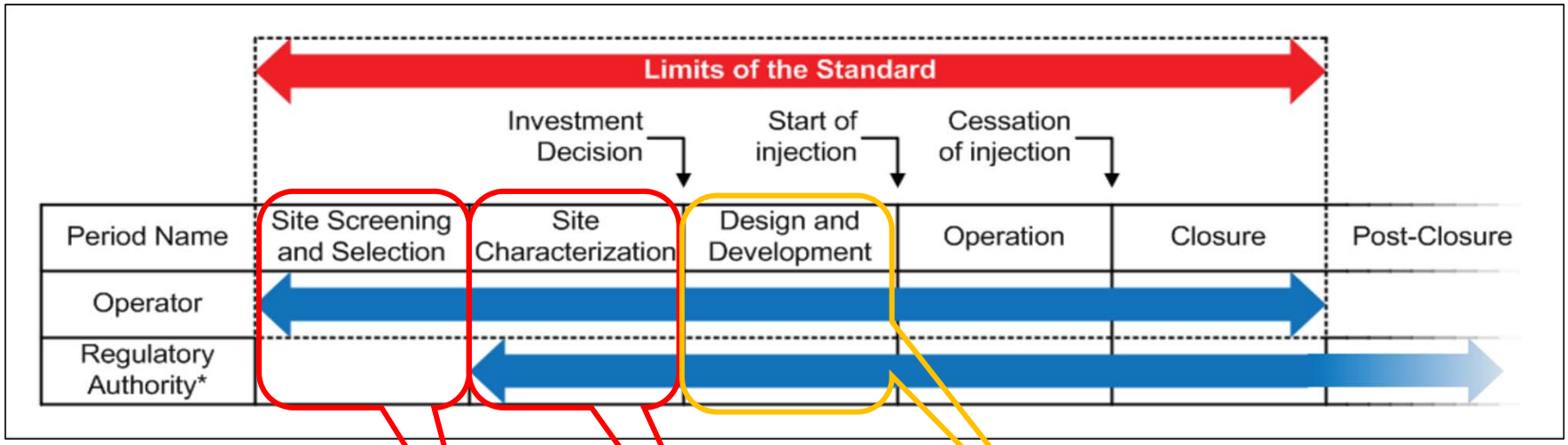
Project ECO$_2$S





- The goal of Project ECO2S is to demonstrate that the subsurface at Kemper CO_2 can safely and permanently store commercial volumes of CO_2
- The project team has established a 30,000 acre area of interest which contains gigatonne CO2 storage potential

Project ECO2S Progress



CarbonSAFE Phase 1 (2017)

CarbonSAFE Phase 2 (2017-2020)

CarbonSAFE Phase 3-4 (2020-24) ??

ECO_2S vs ISO 27914

- ECO_2S is currently in the CarbonSAFE feasibility phase (II), which is comparable to the site screening, selection, and characterization provisions in ISO 27914. The standards clauses on management systems and risk assessment are also relevant and will be included in the reports assessment
- The assessment contained within the report looks closely at the applicable ISO 27914 requirements and recommendations and then comments on how ECO_2S has followed a similar path, taken a different course of action, or has not yet conducted the activity in question
- Based on CarbonSAFE program requirements and phase timing, early projections point to the possibility of project ECO_2S ultimately being able to conform to ISO 27914

ECO_2S vs ISO 27914

- Early reviews of the assessment show that ECO_2S conforms reasonably well to the requirements and recommendations outlined in ISO 27914, including:
  - Site screening, selection and characterization
  - Injection modeling
- There are several exceptions, however, rooted in project timing differences and the obligation of ECO_2S to meet contractual and/or applicable state and federal regulatory requirements. Examples:
  - Currently, project management is the responsibility of the ECO_2S project partners, including the DOE. At some point those responsibilities, including resource allocation, communications and documentation will become the responsibility of the operator;
  - Some stakeholders, including regulatory authorities have not been extensively consulted in the current ECO_2S risk management process; and
  - Finally, transparency and risk communication have not been fully developed at this project phase.
- These items will be addressed in future ECO_2S phases and will eventually be the responsibility of the site operator to manage

Future assessment

- As project ECO$_2$S progresses to future phases of planned activity, an opportunity will arise to conduct further assessments with ISO 27914
- The clauses not included in the report being developed, which could be the subject of future assessment, include:
  - Clause 7 – Well infrastructure
  - Clause 8 - CO_2 Storage Site Injection Operations
  - Clause 9 – Monitoring and verification
  - Clause 10 – Site closure

Thank you.

Brian Zupancic
Project Manager, Natural Resources

8501 E. Pleasant Valley Rd.
Cleveland, OH

brian.zupancic@csagroup.org