# Advancing CCUS in Developing Countries

Prepared for:

**AAPG/SEG/SPE CCUS Conference**

Prepared By:

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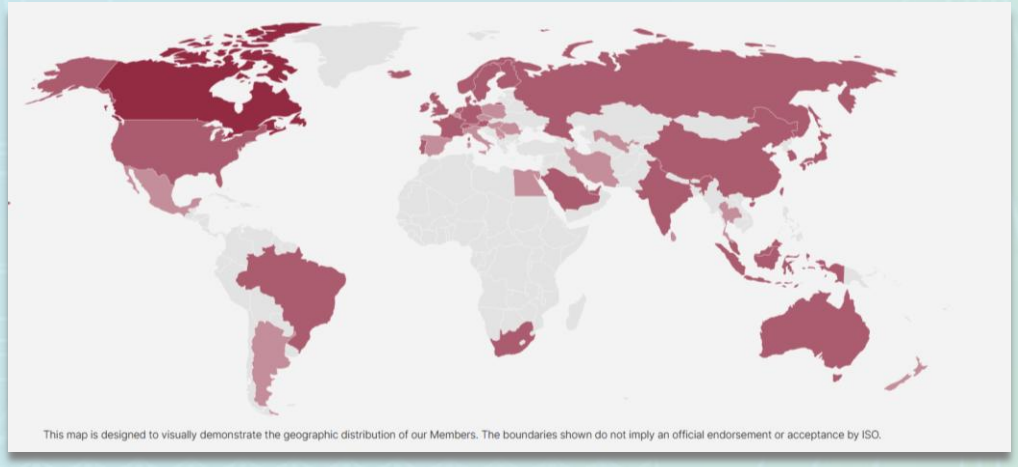
**George R. Brown Conference Center**
**Houston, TX**

Advanced Resources International, Inc.

# Membership: ISO/TC-265

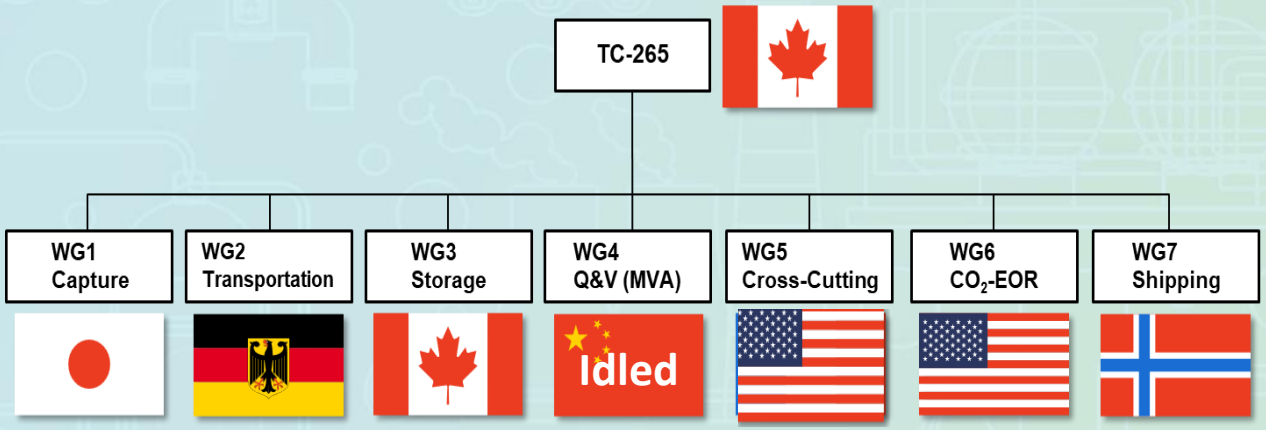
**Intent:** "prepare International Standards for the design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the field of CCS."




A wide range of stakeholders/countries involved:

- 6 working groups (WG)
- 28 countries participating
- 18 observing members
- 19 liaisons (+ liaison ISO committees)

✓ 15 publications and counting
✓ 5 ongoing projects



# ISO/TC-265

## Standards

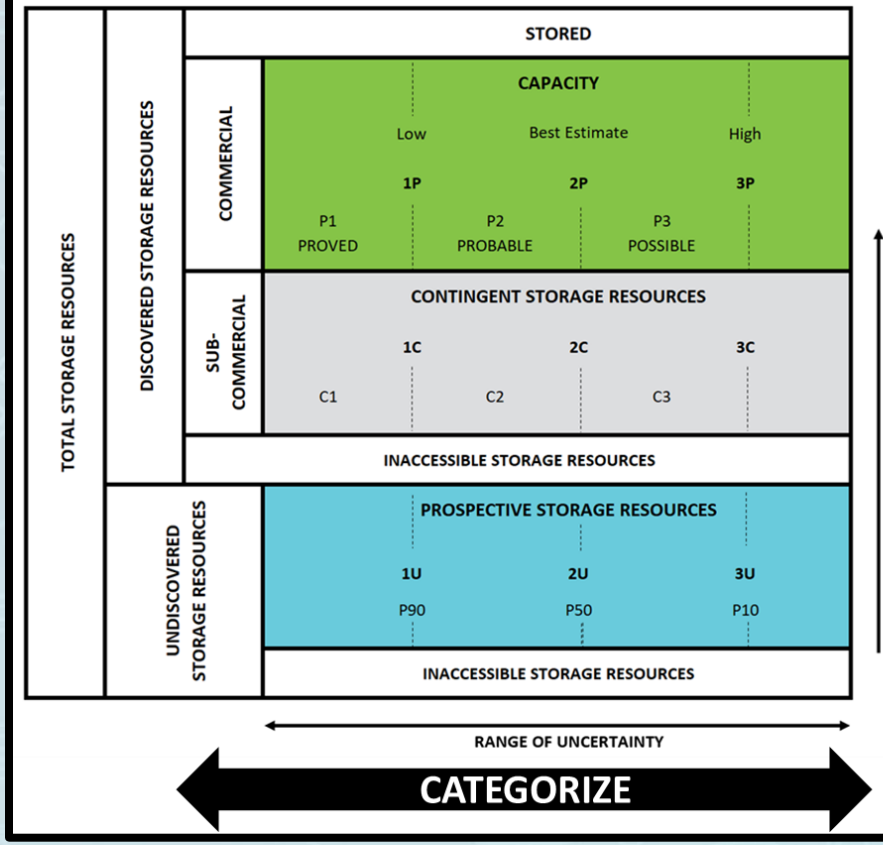
- Developed based on a consensus of the members and revisable,
- Voluntary – not rules or laws; not mandated,
- If there is a regulation or law, the standard cannot be preferred, and
- Standard may be incorporated or adopted into regulation, in whole or part.

## Overview of ISO / TC 265

- TC, comprised of subject matter experts, write standards,
- Participating member countries approve standards,
- Standards reviewed to be revised/updated every 5 years,
- Standards are primarily taken into use by private stakeholders in project documentation, and
- Countries may adopt the standards.

# SPE's $CO_2$ Storage Resources Management System

There is a recognized need to be able to describe the $CO_2$ storage resources of a project in relation to the certainty of the estimate and related to a project's increasing chance of commerciality.




## Resource Classification

Reflect chances of **commercial** success for a specific project (y-axis)

Storable quantities classified as Capacity, Contingent or Prospective Resources **based on project maturity**

## Resource Categorization

Reflect **uncertainty** in estimated storable quantities associated with a project

Based on natural, engineered, economic factors **specific to project** definition and scope (e.g. geologic, technical conditions, injection and storage requirements, economics)

- Sister document to SPE PRMS for oil and gas reserves.
- Sponsored by AAPG, EAGE, SEG, SPEE, SPWLA, and WPC.
- SRMS, its Guidelines, and Training modules curated by about 30 SMEs.

# Goals and Benefits of Standards

## Goals & Benefits

- Promote knowledge transfer and dissemination,
- Unlock legal challenges,
- Provide industry-driven guidelines, and
- Enable incentives.

## Goals & Benefits

- Support viable public-private partnerships and allocation of risk and liability,
- Enable cost reductions and economic growth, and
- Support public acceptance and trust.

# How Standards are Used by Regulators

**Many countries have a long tradition of referring to technical standards for performance-based framework.**

- Usually referred to as optional,
- Offshore petroleum operations rely on a large number of standards for technical operations and HSE,
- A number of existing standards and best practices for petroleum operations may be reused for offshore CCS, and
- CCS-specific standards are already referred to and used.

# Referred to in Frameworks, Processes and Projects

Referred to in legal frameworks and regulatory processes, such as:

- **Norwegian** $CO_2$ safety regulation guidelines refer to both ISO:27913 and ISO:27914
- **United States'** IRS refers to ISO:27916 in 45Q tax credits for $CO_2$-EOR
- The **European Union** taxonomy
- MRV Plans in **Alberta, Canada**
- Recommended guidelines for planning and evaluating $CO_2$ storage resources in **Japan**

Used in known demonstration projects, such as:

- The risk management approach in the **Norwegian** Longship project
- Well design, inspection and testing, as well as $CO_2$ delivery specifications in the **Dutch** Porthos project
- **Danish** permitting and tender processes for $CO_2$ storage in the Greensand project
- Site feasibility of the Obskiy (Yamal) and Tadebyayakhinskiy (Gydan) licenses in **Russia**
- The **Canadian** Aquistore project to assess e.g., injectivity, containment and capacity

Used in other schemes and initiatives, such as:

- Eligibility criteria for $CO_2$ stored from steel processes, in **Climate Bonds Initiative**
- Monitoring requirements in the methodology for biomass fermentation with $CO_2$ storage, **Gold Standard**

# United States National Technology Transfer and Advancement Act (NTTAA)

In general, the NTTAA states that federal agencies and departments **shall**:

- **Use technical standards developed or adopted by voluntary consensus standards bodies** if compliance would not be inconsistent with applicable law or otherwise impracticable; and
- Consult with voluntary, private sector, consensus standards bodies and shall, when such participation is in the public interest and is compatible with agency and departmental missions, authorities, priorities, and budget resources, **participate in the development of technical standards**.

# U.S. Example

Long tradition of referencing standards and best practices in guidelines and frameworks, e.g., for oil and gas and pipeline transportation

ISO/TC-265 standard for $CO_2$-EOR referenced by the Internal Revenue Service as an available (non-mandatory) tool to obtain tax credits under the 45Q regime:

> §1.45Q-3 (b) Requirements for secure Geological storage. For purposes of the section 45Q credit, qualified carbon dioxide is considered disposed of by the taxpayer in secure geological storage such that the qualified carbon dioxide does not escape into the atmosphere if the qualified carbon dioxide is
>
> (2) Injected into a well that
>
> (ii) Is used as a tertiary injectant in a qualified enhanced oil or natural gas recovery project and stored in compliance with applicable requirements under 40 CFR part 98 subpart RR, **or the International Organization for Standardization (ISO) standards endorsed by the American National Standards Institute (ANSI) under CSA/ANSI ISO 27916:2019, Carbon dioxide capture, transportation and geological storage—Carbon dioxide storage using enhanced oil recovery ($CO_2$-EOR) (CSA/ANSI ISO 27916:2019).**

# Norwegian Example

- Long tradition of referencing standards and best practices in guidelines and not directly in the act or regulation in the offshore oil and gas industry extended to CCS

- **Example: Regulations relating to safety and working environment for transport and injection of $CO_2$ on the continental shelf**
  - ✓ Section 11: " Matters relating to safety and working environment in the plan for development and operation of a subsea reservoir for injection and storage of $CO_2$ and specific license for the installation and operation of facilities for transport"
    - ➢ Guideline says: To assess the well barriers to existing wells when storing $CO_2$, DNVGL-RP-J203 Section 7 and ISO 27914 Chapter 7.6 **should be used**.
  - ✓ Section 16: "Pipeline systems"
    - ➢ Guideline says: For pipeline systems, ISO 13623 with the ISO 27913 supplement and DNVGL-ST-F101 with the DNVGL-RP-F104 supplement **should be used.**

# Danish Example

- Long tradition of referencing standards and best practices in guidelines and not directly in the act or regulation in the offshore oil and gas industry extended to CCS
- **Example: the Greensand project**
  - ✓ Transporting $CO_2$ from Belgium and storing it on the Danish continental shelf
  - ✓ First injection March 2023
  - ✓ Small-scale demonstration project that may end up full-scale after FID in December 2024
  - ✓ Danish legal framework for $CO_2$ storage supplemented
    - ➢ The site selection was performed in accordance with ISO 27914, certified by a third-party verifier
    - ➢ The Danish regulators have further provided the option to develop and operate the $CO_2$ storage site pursuant to ISO 27914:2017 through the permitting process

# Canadian Example

Long tradition of referencing standards and best practices in guidelines and frameworks, e.g., for oil and gas and pipeline transportation

- **Example: CCS Summary Report of the Regulatory Framework Assessment**
  - ✓ "it will be important for the Government of Alberta to continue to leverage local and global CCS expertise and knowledge. One important piece is the Canadian Standards Association (CSA) document Z741-12: Geological Storage of Carbon Dioxide"
  - ✓ CSA Z741 -12 was the seed document for ISO 27916
- **Example: Quantification Protocol for Enhanced Oil Recovery**
  - ✓ Used ISO 27916 as an important source document, refered to repeatedly

EU Taxonomy: a classification system, establishes a list of environmentally sustainable economic activities

- ✓ Technical screening criteria: "For the exploration and operation of storage sites within the Union, the activity complies with Directive 2009/31/EC. **For the exploration and operation of storage sites in third countries, the activity complies with ISO 27914 for geological storage of $CO_2$**"

# Dissemination is Key

- There are 28 p members and 18 o members.  That isn't the whole world.  So, getting the word out is an ongoing effort.
- On top of that, we initiate new work products every year.  So, despite being in existence since only 2011, TC 265 is quite dynamic.
- We use presentations, workshops, technical papers, handbooks, etc.


# Building Blocks for Developing Countries

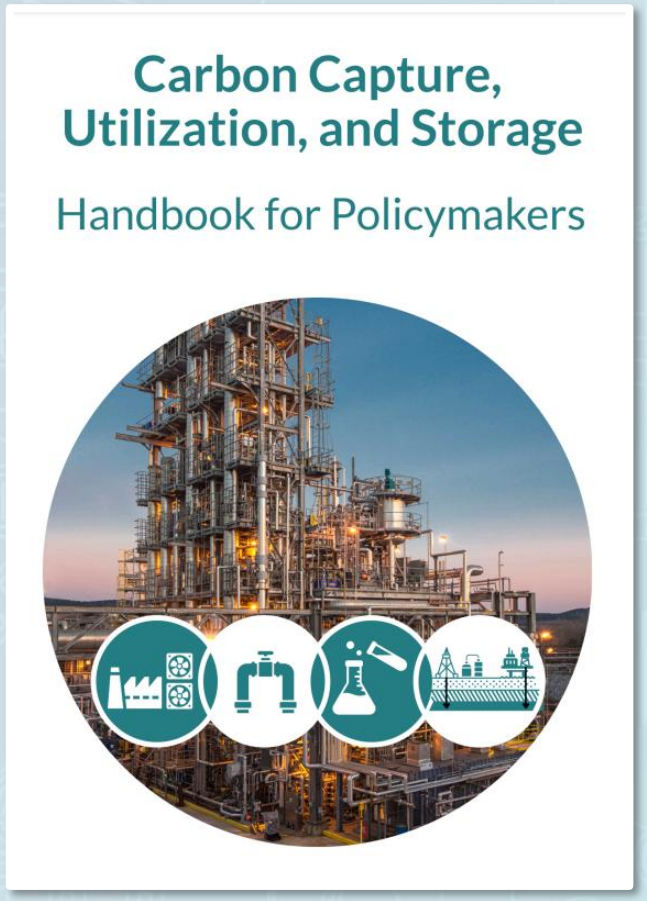
Brazil, Egypt, India, Indonesia, Malaysia, Thailand, Timor Leste, and Vietnam (among others) are looking to develop CCUS rules/regulations have led to increased interest in international standards.



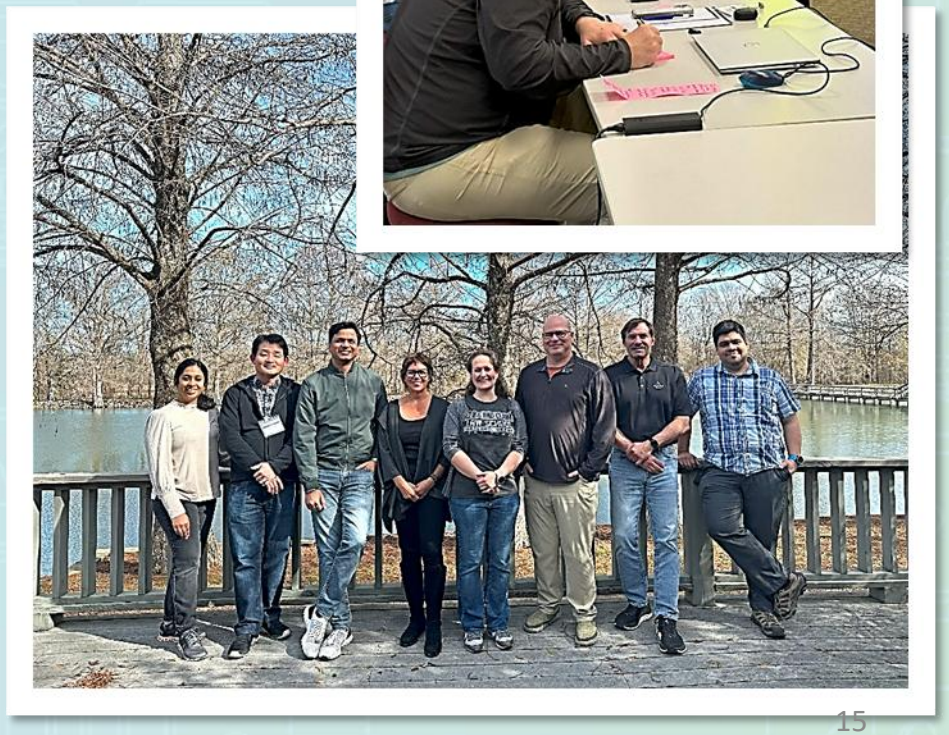









# CCUS Handbook for Policy Makers



**Available here:**
https://cldp.doc.gov/carbon-capture-utilization-and-storage-ccus-resources


# Questions?

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Arlington, VA 22203
Phone: (703) 528-8420

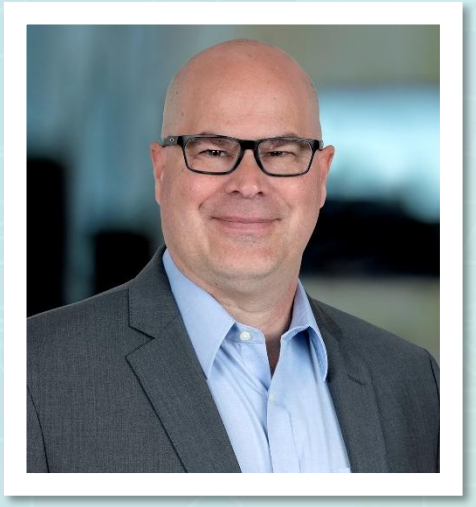
**Columbus, OH**
1840 Mackenzie Dr., Suite 100
Columbus, OH 43220

**Knoxville, TN**
4110 Sutherland Ave.
Knoxville, TN 37919

# Back-up slides

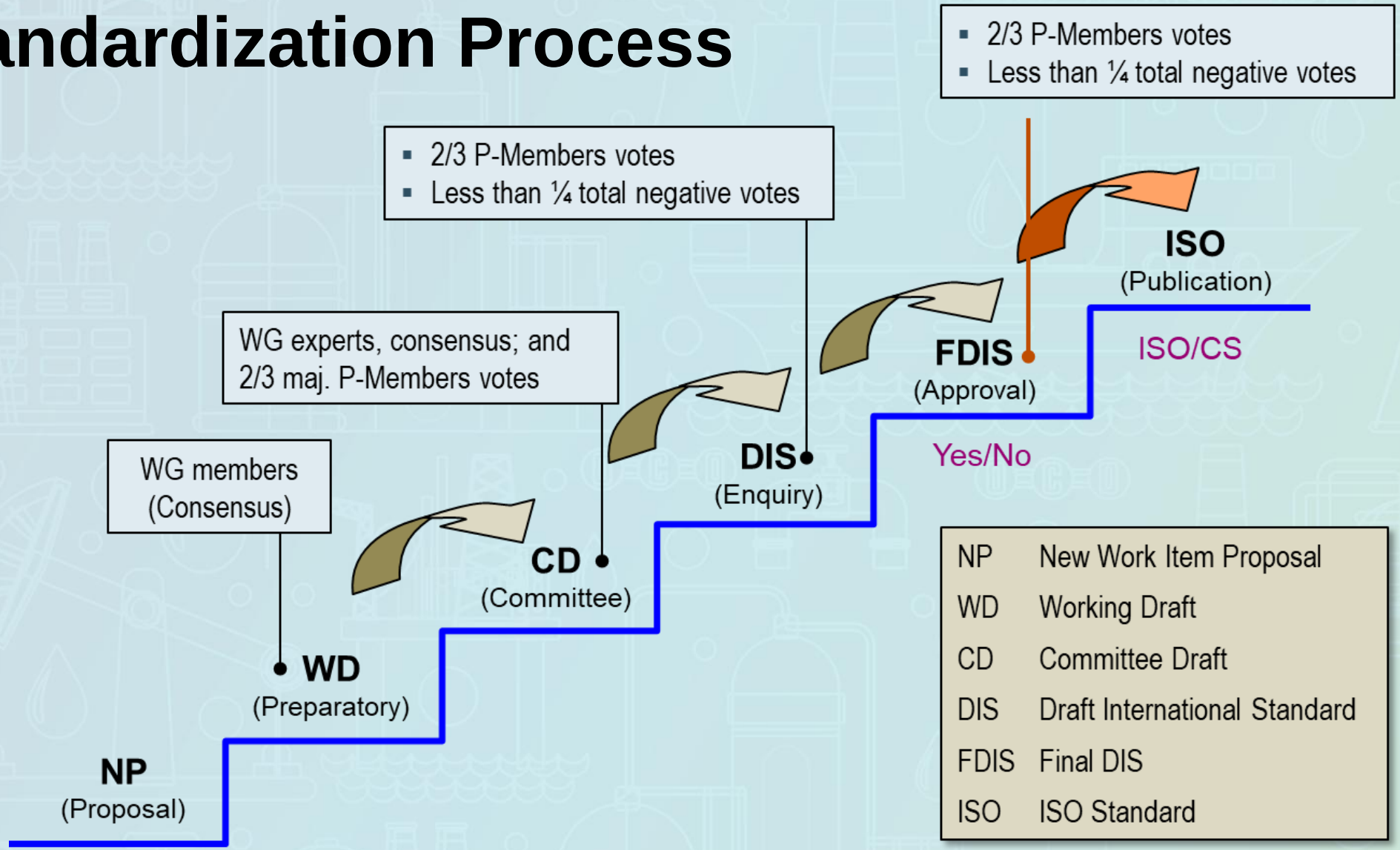
# ISO Standards for CCUS

**Ingvild Ombudstvedt**
IOM Law



**George Koperna**
Advanced Resources International

# ISO Standardization Process



# Revising the 27914 Standard for $CO_2$ Geological Storage

**ISO 27914 originally published in 2017**

- Provides requirements and recommendations for the geological storage of $CO_2$ streams, the purpose of which is to promote commercial, safe, long-term containment of carbon dioxide in a way that minimizes risk to the environment, natural resources, and human health
- Includes activities associated with site screening and selection, characterization, design and development, operation of storage sites, and preparation for site closure
- Used by countries: Norway, Denmark, Canada

**Reopened for revision in 2022**

- Includes an expansion of scope to include a new clause on quantification and verification
- Will be updated to accommodate for experience and learnings since publication in 2017
- The planned timeline is 24 months for the revision

# ISO 27916 for $CO_2$-EOR

## Standard for $CO_2$-EOR published 31 January 2019

- Provides important tools for among other things:
  - ✓ geological characterization;
  - ✓ containment assurance;
  - ✓ unlocking access to allowances under e.g. ETS, 45Q; and
  - ✓ replacing natural with anthropogenic $CO_2$.
- Applies to quantification and documentation of total $CO_2$ being stored in association with $CO_2$-EOR
- Contains background data and information about $CO_2$-EOR globally
- Allows for quantification calculation of natural, anthropogenic and in-situ $CO_2$
- The standard was reopened for revision in 2024
- Upcoming publication: Transition from $CO_2$-EOR to CCS


INTERNATIONAL STANDARD
ISO 27916

First edition
2019-01

Carbon dioxide capture, transportation and geological storage — Carbon dioxide storage using enhanced oil recovery ($CO_2$-EOR)

*Captage, transport et stockage géologique du dioxyde de carbone — Stockage du dioxyde de carbone au moyen de la récupération assistée du pétrole (RAP-$CO_2$)*

Reference number
ISO 27916:2019(E)

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# 6 Published Standards; 7 Published Technical Reports; 6 Standards Under Direct Responsibility of ISO/TC 265

- **ISO 27913**
  - ✓ Developed in 2016. Under revision
  - ✓ Covers pipeline transport of carbon dioxide
  - ✓ Used by Equinor, Shell, Total (Northern Lights Project in Norway)
  - ✓ Used by countries: Norway, Canada

- **ISO 27914**
  - ✓ Developed in 2017. Under revision and to add quantification and verification
  - ✓ Covers geological storage of carbon dioxide
  - ✓ Used voluntarily by several projects
  - ✓ Used by countries: Norway, Denmark