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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)

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Contents

Page

iTeh Standards
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Document Preview
ISO 27916:2019
https://standards.iteh.ai/catalog/standards/sist/e6e1aa2c-1d1a-4d8-6bac6aabab2d/iso-27916-2019

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This document was prepared by Technical Committee ISO/TC 265, *Carbon dioxide capture, transportation, and geological storage*.

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Introduction

This is the first edition of the standard entitled: *Carbon dioxide capture, transportation and geological storage — Carbon dioxide storage using enhanced oil recovery (CO_2-EOR).* The subject matter of this document is a new work product and does not cancel or replace any other documents in whole or in part related to the subject of CO_2-EOR.

Carbon dioxide enhanced oil recovery (CO_2-EOR) is a technique for increasing the recovery of hydrocarbons from an oil field.

The process involves using wells to inject volumes of CO_2 at pressures where the injected CO_2 usually mixes with the oil, changing the properties of the oil and enabling it to flow more freely to production wells. In most cases, a CO_2-EOR project is designed as a closed-loop system whereby some of the injected CO_2 is co-produced with the oil and then separated in above-ground recycling facilities prior to being reinjected into the oil reservoir. CO_2 that is injected into the project reservoir is contained as an inherent element of the injection and production operations, and this document requires that such containment be demonstrated. CO_2 that is injected and remains trapped in the project reservoir (or EOR complex) during and after oil production activities is not released to the atmosphere, and this trapping is referred to as "associated storage". Annex A provides a detailed description of the CO_2-EOR process as presently used (and potential "next generation" uses) and the associated storage that occurs as an intrinsic part of those operations. Although methane is often present in EOR project reservoirs, this document does not specifically address methane or other greenhouse gases. The demonstration requirements for safe, long-term containment, however, address assessment of trapping and potential leakage pathways that would likely assure containment of methane as well as CO_2. As detailed in Annex A, CO_2-EOR has been deployed internationally for several decades and has potential to expand. CO_2-EOR is commercially valuable today because it allows for the additional recovery of hydrocarbon resources while simultaneously trapping injected CO_2 for safe, long-term containment as a part of the process.

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This document applies to quantifying and documenting the total CO_2 (and optionally the anthropogenic portion of the CO_2) that is stored in association with CO_2-EOR. The document recognizes that CO_2-EOR is principally an oil recovery operation. Associated with this oil recovery, however, safe and long-term CO_2 storage occurs. The absence of an accepted standard for demonstrating the safe, long-term containment of CO_2 in association with CO_2-EOR and documenting the quantity of associated stored CO_2 constitutes one of the barriers to the increased use of anthropogenic CO_2 in CO_2-EOR operations. The purpose of this document is to remove that barrier and thereby facilitate the exchange of goods and services related to the increased use and emissions reductions through associated storage by providing methods for demonstrating the safe, long-term containment of, and determining the quantity of CO_2 stored in association with CO_2-EOR. The document does not address the financial consequences that may or may not result from documenting storage of CO_2 in association with CO_2-EOR operations.

This document does not provide requirements for the selection, characterization or permitting of sites for CO_2-EOR projects because those sites are selected, characterized, and permitted pursuant to requirements and standards applicable to oil and gas exploration and production. Likewise, this document does not specify environment, health and safety protections or corrective action and mitigation requirements that are provided by the regulations and standards applicable to all hydrocarbon production operations. (A list of many of the existing standards applicable to CO_2 injection wells and oil and gas operations is presented in the Bibliography.) This document does provide requirements for demonstrating that the site in question is adequate to provide safe, long-term containment of CO_2, for demonstrating that the CO_2 flood is operated in a way to assure containment of the CO_2 in the EOR complex, and for quantifying associated storage.

This document provides for the quantification of the CO_2 that is stored in association with CO_2-EOR operations. The results of quantifications under this document could be used as input for calculations conducted in accordance with a number of other standards, protocols or programs for the quantification or reporting of greenhouse gas emissions, mitigation, or reductions, including those complying with ISO 14064-1, ISO 14064-2 and ISO 14064-3. Specifically, this document provides for the identification and quantification of CO_2 losses (including fugitive emissions) and quantification of the amount of CO_2

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stored in association with CO_2-EOR projects. Such quantification could be used in a broader scheme for the quantification and verification of emissions and emission reductions over the entire carbon capture, transportation and storage chain. Specifically, using this document will provide quantification results that could be used as input to approaches described in ISO/TR 27915 for Quantification & Verification (Q&V). In addition, the quantification of CO_2 stored in association with a CO_2-EOR project pursuant to this document could be combined with the quantifications generated under ISO 27920, Carbon dioxide capture, transportation, and geological storage — Quantification and Verification, which is currently under development. The quantification of the storage associated with a CO_2-EOR project that occurs as part of a CCS project chain could be combined with the quantification of one or more capture, transportation and geological storage systems to produce a total quantification for the entire CCS project chain. Under some emissions quantification and reporting regimes, CO_2 quantities stored in association with CO_2-EOR are either treated as not emitted and excluded from calculations or subtracted as offsets.

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