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Please fill in your abstract title.	Strategic R&D Pillars of Electromagnetic Methods for Reservoir Mapping and Monitoring

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Abstract

Accurate reservoir saturation mapping and monitoring is a critical challenge for oil companies. The vision is to develop deep sensing technologies, which enable a game changing impact to support intelligent field developments, with time-lapsed saturation monitoring capabilities.
Electromagnetic (EM) methods, among others such as seismic and gravity, have a potential pivotal role in this vision.

Research and development (R&D) strategies have to be put in place in the industry to allow their massive and cost effective deployment, beside the current promising pilot testing status. We analyze in detail potential R&D pathways, following the classical approaches for innovation: incremental and disruptive.

This work outlines the strategic directions of incremental R&D practices toward the vision of developing EM technologies deployable in a cost effective and massive way in the oil industry, for reservoir characterization and monitoring.

The objective is to integrate into reservoir management and simulation practices the value of innovative deep 3D EM sensing, potentially available in time lapse during the lifetime of a field. To achieve this ambitious goal, a process of continuous improvement and incremental R&D has to be put in place and properly managed to allow consistent innovation for the value chain of the different pillars of the EM methods: from transmission to acquisition, processing and interpretation.

The R&D continuous improvement spiral approach has to be managed and controlled continuously with relentless pace, till a disruptive game changing innovation occurs, boosting the technology environment or modifying the business context to another dimension, often thanks to cross-fertilization among disciplines, and synergies with other technological and scientific domains.

In this framework of EM methods for reservoir mapping and monitoring, the R&D focus has to be on four main domains or pillars: Transmission of EM signals; Acquisitions of the signals after they have been propagated through the reservoir volumes of interest; Processing & Inversion to derive electrical properties of the underground, and finally Data Interpretation toward hydrocarbon saturation evaluation. These activities have to be time-lapsed deployed to allow consistency and repeatability of the measurements for 4D reservoir fluid saturation monitoring.

Through accurate real-time reservoir fluid characterization, mapping and monitoring, the ultimate goal is to reduce the uncertainties in hydrocarbon localization deep into the reservoirs, enhance confidence in production forecasts and maximize hydrocarbon production.