



## **HADES : A Mission Concept for the Identification of New Saline Aquifer Sites Suitable for Carbon Capture & Storage (CCS)**

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The Hidden Aquifer & Deep Earth Sounder (HADES) is a ground penetrating radar mission concept for identifying new saline aquifer sites suitable for Carbon Capture & Storage (CCS). HADES uses a newly proposed type of Earth Observation technique, previously deployed in Mars orbit to search for water. It has been proposed to globally map the sub-surface layers of Earth's land area down to a maximum depth of 3km to detect underground aquifers of suitable depth and geophysical conditions for CCS.

We present the mission concept together with the approach and findings of the project from which the concept has arisen, a European Space Agency (ESA) study on "Future Earth Observation Missions & Techniques for the Energy Sector" performed by a consortium of partners comprising CGI and SEA. The study aims to improve and increase the current and future application of Earth Observation in provision of data and services to directly address long term energy sector needs for a de-carbonised economy. This is part of ESA's cross-agency "Space and Energy" initiative.

The HADES mission concept is defined by our specification of (i) mission requirements, reflecting the challenges and opportunities with identifying CCS sites from space, (ii) the observation technique, derived from ground penetrating radar, and (iii) the preliminary system concept, including specification of the resulting satellite, ground and launch segments. Activities have also included a cost-benefit analysis of the mission, a defined route to technology maturation, and a preliminary strategic plan towards proposed implementation.

Moreover, the mission concept maps to a stakeholder analysis forming the initial part of the study. Its method has been to first identify the user needs specific to the energy sector in the global transition towards a de-carbonised economy. This activity revealed the energy sector requirements geared to the identification of suitable CCS sites. Subsequently, a qualitative and quantitative analysis was undertaken to ascertain where and how Earth Observation could support the satisfaction of these needs where they have yet to be met by traditional means, (i) firstly through the application of existing Earth Observation missions, (ii) subsequently through Earth Observation missions which are already planned though have yet to be launched or become operational, and (iii) finally through conceptualising and specifying future novel missions which could ultimately satisfy those energy sector needs still unsatisfied by current and planned missions.