

CSEM Method in the Deepwater Plays of the Kutai Basin

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Abstract

Exploration in the deepwater Kutai Basin has been primarily focused on Middle Miocene to Pliocene clastic reservoirs. Proven reservoirs are turbidite sandstones deposited as deep-water slope channels, channel levees and basin floor fans. Mapping the basin floor fans solely using seismic data can be difficult and even though the deposits could be associated with seismic amplitude events, the saturation of any potential hydrocarbons remains unknown. We will explain how, in this case, CSEM comes to the rescue by adding valuable information. CSEM is an excellent technique, not only to determine the presence of a saturated hydrocarbon accumulations, but also helps to define the lateral extent of stratigraphic accumulations, leading to more accurate hydrocarbon volume estimation. Basin floor fans are particularly well suited for CSEM, the deposits are coarse-grained sediments encased in shale. If these deposits are within the zone of CSEM detection and are highly saturated with hydrocarbons, they would be more resistive than the surrounding shale and thus, an anomalous resistor should be visible and imaged with CSEM.

In 2006, EMGS acquired 19 2D CSEM lines covering a total of 830 km over several PSC areas in the Kutai Basin of northwestern Makassar Strait. For each of these lines, a number of EM receivers were deployed. Data from one of these lines, situated in the relinquished former Papalang block, has been re-processed and re-inverted with updated algorithms providing new insight. The 2.5D inversion result shows a high resistive anomaly that stands out from the surrounding, which we believe, is a new lead. Integration of the CSEM inversion result with other geophysical data, such as well logs and seismic, has led us to conclude that there is a high possibility the resistor detected may be related to the result of an accumulation of a significant volume of hydrocarbons. In addition, the absence of any anomaly in the CSEM inversion result over Pandu-01 and Pangkal-01 wells confirms the result of those two dry wells.

Based on the 2D CSEM lines acquired in 2006, it is not possible to delineate the extent of the potential reservoir. Nevertheless, a new 3D CSEM survey over the same area has been acquired recently and the inversion results, when available, will provide a new outlook on the potential of the area.