

ABSTRACT

Identification of Potential Gas Hydrate-Bearing Sediments and Risked Estimates of the Resource in Block 25A, Off the East coast of Trinidad.

Uwaila Charles Iyare

The exploration work in the deep water area of Eastern Trinidad has indicated the existence of an unconventional natural gas resource in the form of gas hydrate from core data collected from this area. However, studies to identify and estimate the gas hydrate resource present in this deeper water beyond the edge of the Continental Shelf are limited.

This study examined the prospect of gas hydrate in the East coast of Trinidad with its seismic signature, a bottom simulating reflector (BSR) and also provides a risked estimate of the gas hydrate resource in this area. The geographic boundary of the study area is a 220 km² area that forms part of the Block 25A located on the east coast of Trinidad. The study used PETREL[®] geophysical software to examine the marine 3D seismic data in this area for a BSR, a seismic anomaly that suggest the existence of gas hydrates. Several seismic attributes like amplitude blanking, reflection strength and instantaneous frequency also helped to identify and qualify the potential gas hydrates across the BSR.

The areal extent of the BSR was estimated at 63 km² which was approximately 29% of the mapped seafloor for the study area. The time thickness between the seafloor and the BSR was observed to vary from 125 to 425 milliseconds. Using a direct time-depth conversion approach with check shot survey data, the time thickness was converted to a thickness between 100 m and 380 m. Furthermore, by assuming that the observed BSR depicts the thermally controlled base of the gas hydrate stability zone (BGHSZ), the thickness of the gas hydrate stability zone (GHSZ) was estimated to average at 230 m. To add confidence to this assumption, the gas hydrate stability zone was modelled using the CSM-HYD (Colorado

School of Mines Hydrate) software with pressure, temperature, water salinity and gas composition data. The modelling showed that GHSZ exist in the study area at the current pressure/temperature conditions.

The gas hydrate resource volume in the 63 km² area was estimated using a volumetric method with resource parameters such as the areal extent, net pay thickness, gas hydrate saturation, effective porosity, and gas hydrate yield. These parameters were collated from the study area as well as regionally located hydrate-bearing sediments, with a similar geological depositional environment to Trinidad east coast. To take into account the variability and the uncertainties in the resource parameters, a probabilistic resource estimate of gas hydrate was calculated by incorporating a stochastic risk analysis.

The resource estimation indicates that the specific (per unit area) amount of gas trapped in potential gas hydrate area averages 7.29 x10⁸ m³ /Km² of gas at standard temperature and pressure. This outcome is significant since if the technical challenges associated with producing this unconventional resource are overcome, the natural gas trapped in the hydrate deposit in the deep water represents a potential additional source of gas which can be used to help meet Trinidad and Tobago future energy needs.

Keywords: Uwaila Iyare, Gas hydrate, 3-D seismic data, BSR, marine sediments, volume estimation, East coast of Trinidad.