Abstract

There are four main Palaeozoic sub-basins in the onshore Carnarvon Basin of Western Australia: the Gascoyne (Ordovician–Permian), the Merlinleigh (Ordovician–Permian), the Byro (Permian only) and the Ashburton (Devonian–Permian). The Gascoyne Sub-basin covers an area of 150000 sq kms (including offshore), with very little modern seismic control and only eight deep exploration wells. Over most of this area, the sedimentary section is Ordovician-Devonian, with Carboniferous and Permian sediments present only in the north. The Merlinleigh and Byro sub-basins are located along the western margin of the Pilbara Block. Petroleum potential exists in the Permian section only, with the Ordovician – Devonian sediments being overmature. The Ashburton Sub-basin is situated northwest of the Pilbara Block and extends offshore, plunging beneath the Mesozoic Barrow Sub-basin. The sedimentary section ranges in age from Devonian–Permian.

Based on the current limited well control, the Palaeozoic sub-basins of the Carnarvon Basin contain excellent marine and non-marine clastic reservoirs together with potential Upper Devonian reefs. The dominantly marine nature of the Palaeozoic provides thick marine shale seals for these reservoirs. Source rock data is very sparse but indicates excellent gas-prone source rocks in the Early Permian and good oil-prone source rocks in the Late Devonian and Late Permian.

Many structures are present in these Palaeozoic sub-basins. However, most of the existing wells were drilled either off structure due to insufficient and poor quality seismic or on structures formed during the Mesozoic and postdating primary hydrocarbon migration from the Palaeozoic source rocks.

With modern seismic acquisition and processing techniques, and a better understanding of the stratigraphy, structural development and hydrocarbon migration, the Palaeozoic sub-basins of the Carnarvon Basin provide the explorer with a variety of high risk, high potential plays without the intense bidding competition currently present along the North West Shelf of Australia.

Introduction

The Palaeozoic sub-basins of the Carnarvon Basin are shown in Figure 1. These are the Gascoyne, Merlinleigh, Byro and Ashburton sub-basins. The Gascoyne Sub-basin contains sediments of Ordovician – Permian age. It is bounded to the east by the Wandagee Ridge; to the south, by the Northampton Block; it was bounded to the west by the continent of India prior to the Mesozoic breakup of Gondwana. The Bernier Platform is a part of the western continental margin of the Gascoyne Sub-basin that remained

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Figure 1: Locality map.