Offshore Seram – Tectonic Setting and Hydrocarbon Prospectivity

Seram Island has attracted petroleum exploration for over 100 years with the first discovery made in 1897 by Bataafsche Petroleum Maatschappij (BPM) close to one of the numerous prolific onshore oil seeps. The Bula field has been producing since 1913 with 20 million barrels produced to date and, more recent Oseil discovery by Kufpec is due onstream in 2002. Seram’s remoteness and complex geology have slowed development of this potentially prolific oil province, but advances in seismic imaging and production technology, combined with improved frontier PSC terms, have revitalized the petroleum exploration and development of the greater Seram Basin.

The Mesozoic bio/lithological assemblage of Seram is characterized by a unique carbonate-dominated assemblage that extends from Buton to Timor. This carbonate fairway was deposited in the mid- to outer shelf regions of the pre-Callovian northern leading edge of the Australian craton. Late Triassic to Early Jurassic oil-prone type II marine source rocks are present on Buton, Buru and Timor with all of Seram’s oils belonging to this family of oils.

Seram marks a transition point within the Australian-Banda subduction complex, being stalled and sutured in western Seram and actively subducting Australian oceanic lithosphere in the Weber Deep to the southeast. The magnitude of uplift and shortening on Seram diminishes away from the western collision zone. Outcrop zones are typical for a fold-thrust belt with the Seram hinterland cored by Paleozoic metamorphics, progressing outboard through a shortened Mesozoic outcrop belt into an active buried fold-thrust belt in the coastal and offshore regions. Earthquake data indicates Seram is currently undergoing transpression due to counter-clockwise rotation. This rotation likely commenced in the early Neogene when Australian plate movements shifted Seram northward into the influences of the westward converging Pacific Plate. Shortening is limited to the outboard region with strike-slip movement dominating the core areas of Seram.

Recently acquired 2D and 3D seismic data define the nature of structuring offshore Seram. Structural culminations appear to be hangingwall rollovers of major thrust complexes, which have been modified to varying degrees by sinistral strike-slip movement. The structural highs are invariably reflected as gravity anomalies and are commonly reflected as bathymetric highs. The Neogene to Recent orogenic event on Seram primarily controls petroleum system dynamics. Tectonic thickening and deposition of a thick syn-orogenic section both contribute to the rapid and efficient maturing of the Mesozoic source section which occurs contemporaneously with trap formation and fracturing of the primary reservoir target Manusela carbonate. Structural modeling indicates that the ongoing transpression at Seram should greatly enhance fracturing and improve the reservoir characteristics within the Manusela carbonate.

A zone of petroleum preservation, coinciding with the buried fold-thrust belt, is defined with current drilling information and from analogy with commercially developed fold-thrust belts. The potentially commercial play fairway at Seram, at 60 kilometres wide, is similar to the width of the productive fairway in the front ranges and foothills of the Canadian Rockies.