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[EA]A Summary of the Petroleum Distribution and Potential of PNG*

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Abstract

The Papuan Basin of PNG is a major hydrocarbon province with the giant Hides Gas Field (1013 MMBOE URR) under production into the PNG LNG Project since 2014, and the Kutubu, Agogo and surrounding Oil Fields under production since 1992 (approx. 870 MMBOE URR) (IHS, 2019). A number of discoveries, including the giant Elk/Antelope Field and the P'nyang and Pasca fields, are under development planning. Discovered resource is estimated at 7 billion boe (IHS, 2019). Mean yet to find oil is estimated at >11 billion boe, suggesting that over half of hydrocarbon endowment of the Papuan Basin has been discovered. These numbers do not include the deep-water offshore part of the basin or other basins north of the PNG thrust belt.

Regional geological mapping of the Oxfordian unconformity across the Northern Australia-East Indonesia Super Gas Province (Figure 1) shows the depocentres that coincide with the most productive hydrocarbon provinces from the Carnarvon Basin to the Browse Basin, the Bonaparte Basin and the Papuan Basin with additional depocentres in West Papua, and to the south in the Cooper-Eromanga Basin. Interestingly, each of these basins is connected to LNG export facilities, indicating the scale of the gas resources present.

It is apparent that all these basins have a similar depositional history, as can be observed on the stratigraphic charts in Figure 2. Triassic to Mid-Jurassic rifting developed extensive fluvial-deltaic successions followed by a passive margin sequence in which near-shore sediments were deposited in an overall transgresssion (Home et al., 1990). In the Australian marine basins this transitions from the Mid-Cretaceous into carbonate shelf deposition that continues to the present day. The Papuan Basin diverges from its Australian counterparts as a result of significant uplift, erosion and non-deposition due to the Coral Sea rifting event in the Late Cretaceous to Palaeogene. In PNG, carbonate shelf development does occur during the Tertiary and continues today offshore but has been interrupted onshore by the collision tectonics since the Miocene that has given rise to extensive uplift and erosion of the basin depocentre in the PNG foldbelt.

Like other Mesozoic basins across the Northern Australia-East Indonesia Super Gas Province (Barber and Winterhalder, 2012) the Papuan Basin is overwhelmingly gas-prone (Figure 3) as a result of mixed terrestrial organic material accumulated in pre-, syn- and post-rift lower delta plain coals in the Late Permian to Jurassic. Localised Oxfordian-Kimmeridgian rhomboid syn-rifts, such as the Dampier, Vulcan and PNG foreland basins contain more oil-prone source rock material.

Exploration activity onshore PNG has been hampered by the difficult logistical challenges that arise due to a harsh environmental landscape. Consequently, 2D seismic is expensive and data quality generally poor and no 3D seismic has been attempted. Although there is a paucity of seismic data, the technical success rates from exploration drilling have been surprisingly high (~46%), but due to challenging development logistics this has translated into few commercial fields.

Exploration drilling data show that the Papuan Basin has a five times lower number of wells than the Carnarvon Basin (160 wells vs. 800 wells, respectively). Creaming curves (Figure 4) defined for the Foldbelt, the Eastern Carbonate Province and the Foreland province suggest that significant potential remains in each of these areas for further discoveries with significant volume still likely to be found in the Foldbelt and Eastern Carbonate Trend. Discovery size in the Foreland Area is expected to be smaller than the other areas and unlikely to justify threshold volumes for a standalone LNG development. These resources may however be useful add-ons to existing LNG developments once ullage and infrastructure are more accessible.

References Cited

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HIS, 2019, Dashboard, Field Reserves and Production.

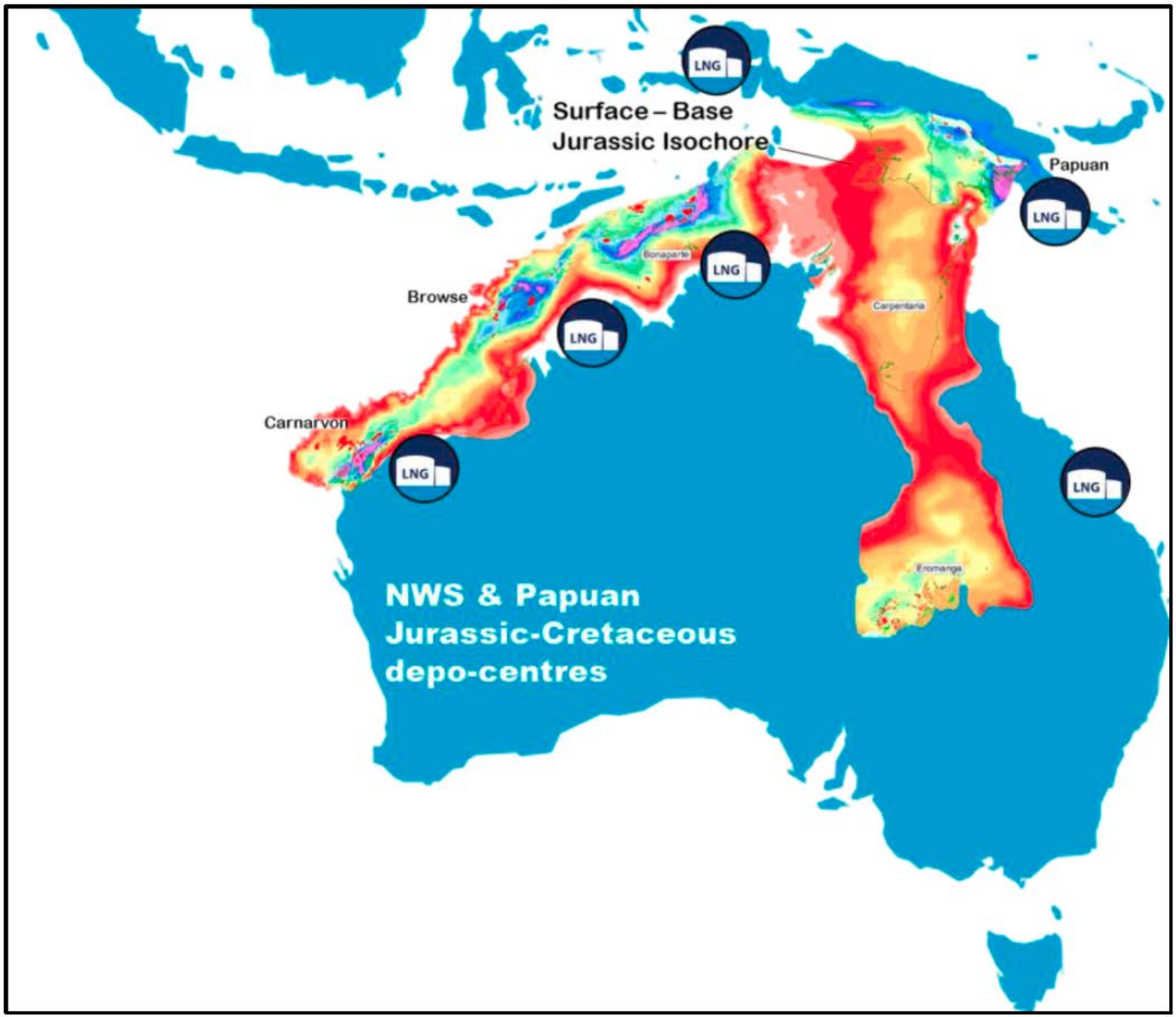

Figure 1. Regional thickness of sediment above the Oxfordian Unconformity (JUOX). LNG plants are seen to be associated with these major depocentres.

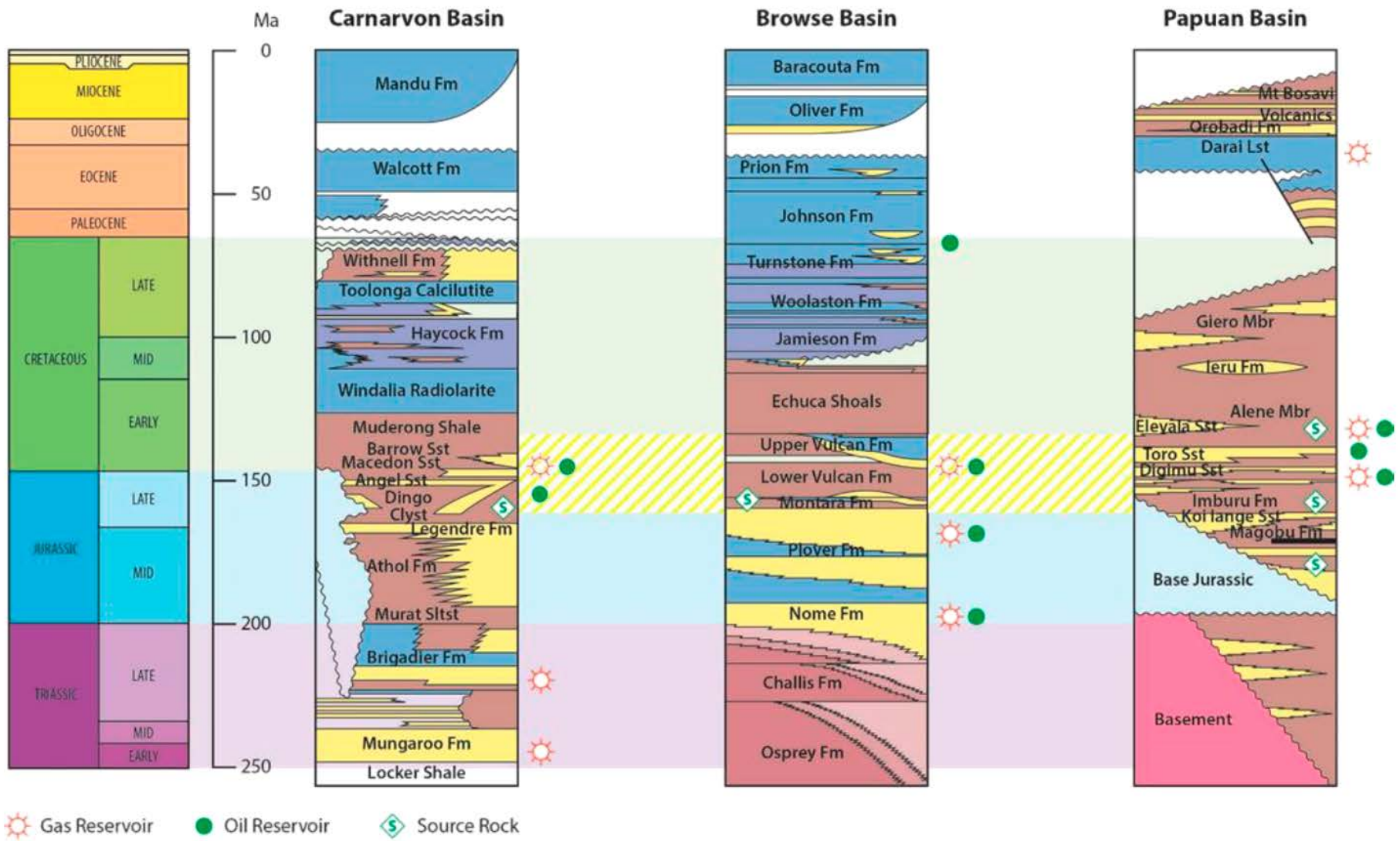

Figure 2. Stratigraphic charts from the Carnarvon, Browse and Papuan basins. Most of the hydrocarbons within these basins are hosted within similar packages.

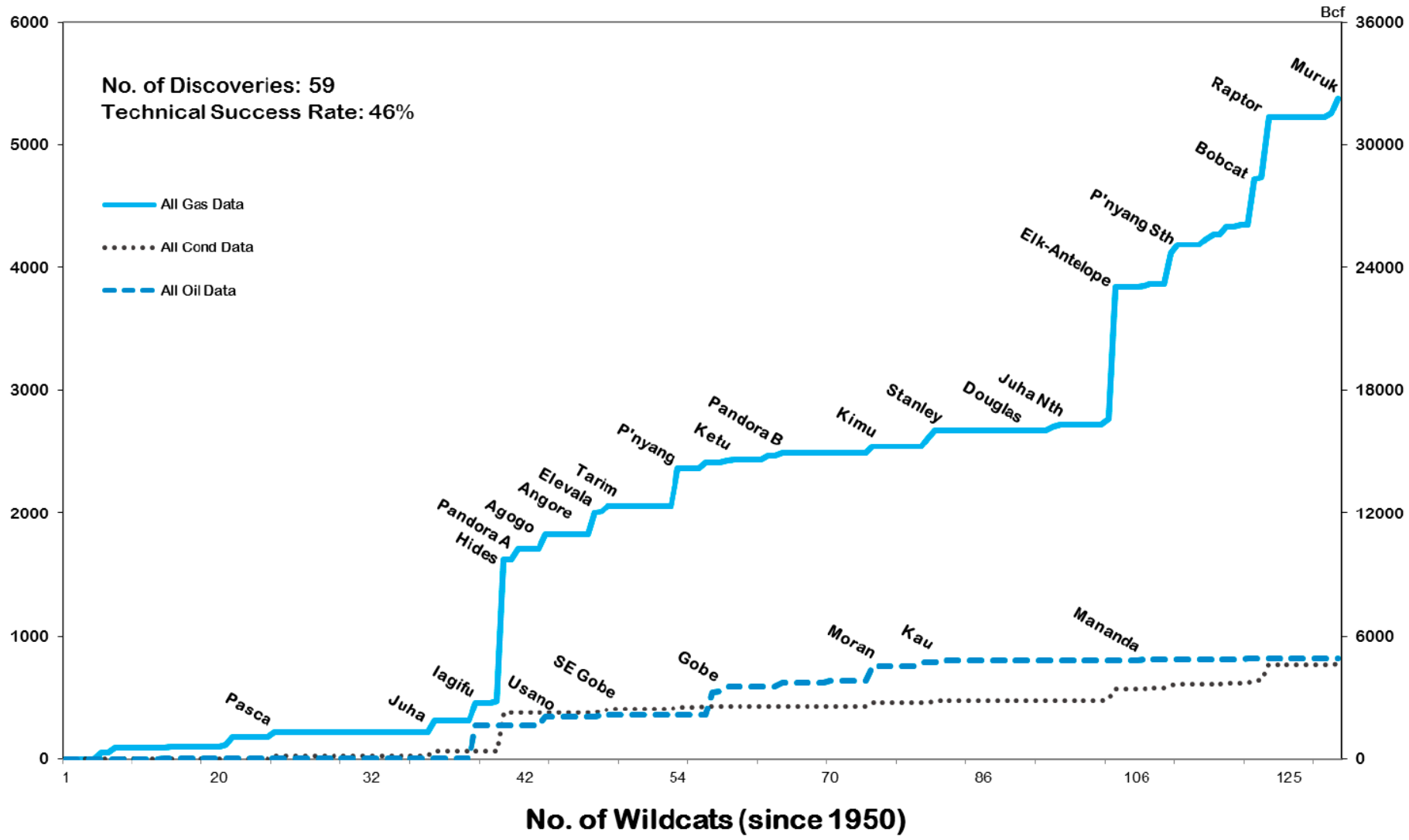

Figure 3. Creaming curves beginning in 1950 for Gas, Condensate and Oil fields.

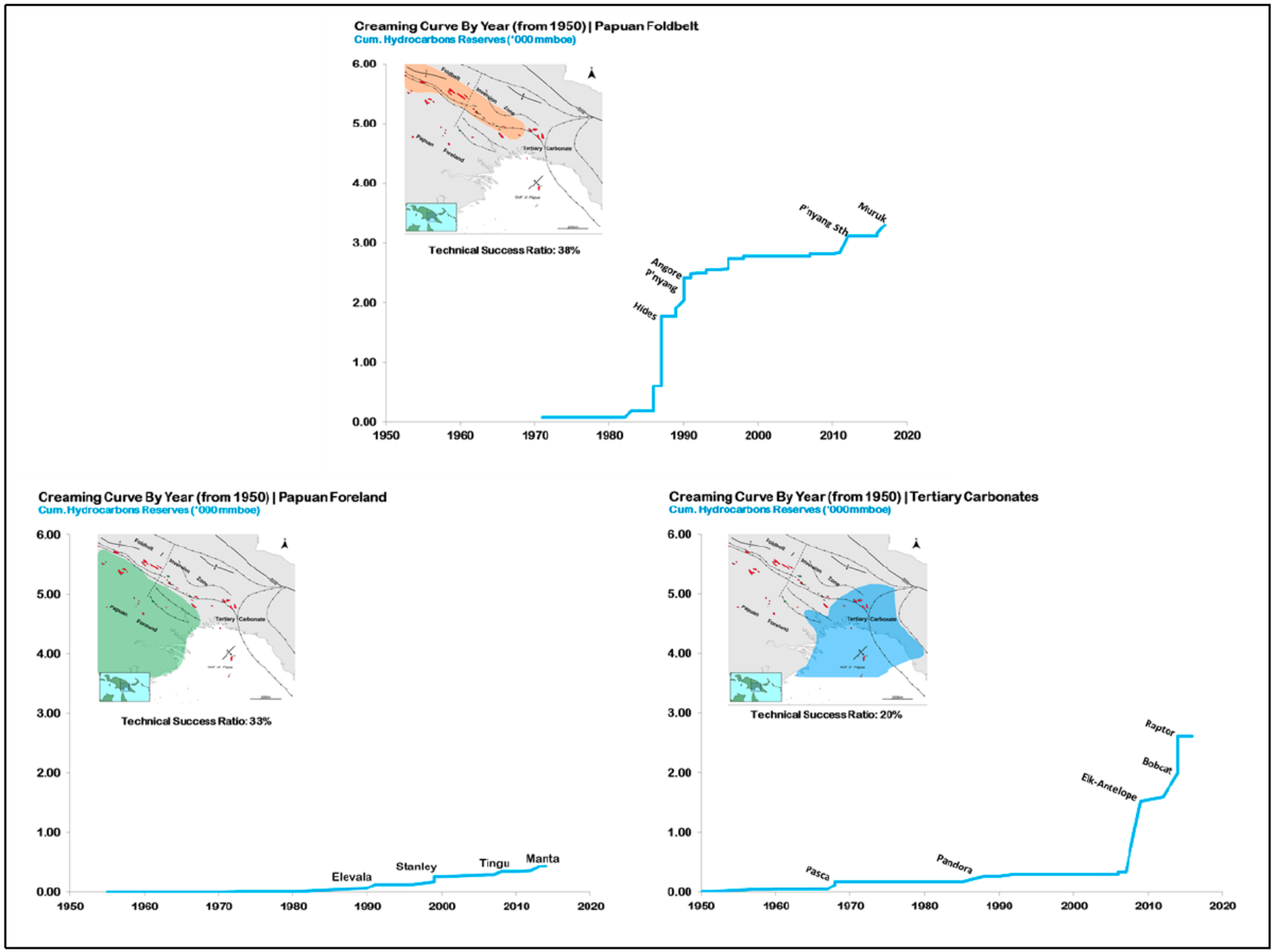

Figure 4. Creaming curves for different provinces within the Papuan Basin.

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