ORAL PRESENTATION

Day 3: 5th April 2019

Session 12: NW Borneo and Philippines

Chairs: John Cole – Shell, Art Morado - Consultant

15:45	Real Time Isotope Logging in Central Luconia Province, Offshore Sarawak: Assessing Seal Competency using Contrasting Results from Two Recent Exploration Wells	Bob Davis	Mubadala Petroleum
16:05	Philippines SC 49 - From Exploration to Exploitation	Edgar Cutiongco	Polyard Petroleum
16:35	Frontier Sabah Unveiled - Latest Regional 3D Seismic Reveals the Petroleum Potential of Offshore Sabah	Tad Choi	PGS

The Seapex Exploration Conference
SEC2019
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ORAL PRESENTATION

Real-Time Isotope Logging in Central Luconia Province, Offshore Sarawak; Assessing Seal Competency Using Contrasting Results from Two Recent Exploration Wells

Robert C. Davis[1], Ana Gironés[2]

[1]*Mubadala Petroleum, Malaysia*

[2]*Geolog International, Malaysia*

bob.davis@mubadalapetroleum.com

Mud gas isotope analysis (MGIL) is an old geochemical technique which began by offline GC-IRMS analysis of the headspace in canned cuttings samples (Mattavelli et al, 1983). It gained a new lease of life around the turn of the 21st century with the advent of routine isotube analysis (e.g. Ellis et al, 2003; Dawson and Murray, 2011), but only recently have advances in acquisition methods enabled such measurements to be reported while drilling (e.g. Niemann et al, 2010; Hammerschmidt et al, 2014).

Mubadala Petroleum's recent drilling campaign in Central Luconia Province, offshore Sarawak, produced one hydrocarbon discovery and one dry hole. Real time mud gas isotope analysis was commissioned in addition to routine mud logging. The objective of this analysis was primarily to assist with post-well evaluation, particularly with respect to charge focus and seal competency, in the light of numerous sub-commercial discoveries and dry holes in the vicinity. Column heights in Luconia reefs appear to be controlled by several mechanisms: access to charge (migration focus), overpressure, and thief zones interbedded with sealing lithologies. It was anticipated that a continuous isotope profile through the overburden would greatly assist in differentiating general seal failure due to overpressure, from discrete thief beds or absence of thermogenic charge, in the event of a dry hole.

The data are similar to those provided by isotube mud gas programs, except in real time, and at several orders of magnitude higher sampling density (every few minutes during active drilling), giving a much higher resolution isotope log. The down-side is that reliable measurements require minimum hydrocarbon concentrations in the hundreds of ppm – an order of magnitude or more greater than required for offline measurements. Methane isotopes easily distinguish between biogenic and thermogenic gas, and the degree of mixing, which is extremely useful in establishing whether migrating gas has infiltrated the overburden and to which stratigraphic level.

Results from the two wells were highly contrasting. The isotope profile from the dry hole was entirely biogenic, whereas the discovery revealed abundant thermogenic gas in overburden, hundreds of metres above the target reservoir. Data were used in conjunction with seismic profiles and a high-resolution basin model to identify the failure mechanism for the dry hole and improve our understanding of the plumbing beneath Central Luconia pinnacle reefs, thereby allowing better polarisation of charge risk in undrilled targets.

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SPEAKER BIOGRAPHY

Bob is Mubadala's Subject Matter Expert for petroleum systems in Southeast Asia. He is a graduate of Nottingham University, and holds a Master's degree from the University of Newcastle-upon-Tyne. Bob spent the early part of his career in Indonesia, as a geochemist and basin modeller consulting for numerous mid-sized and major oil companies. He moved to Australia with Woodside Energy in 1999 where he worked the North West Shelf and southern margin basins, followed by an international assignment to Houston, Texas in 2007, evaluating the petroleum systems of the deep water Gulf of Mexico. After short stints with Apache, BP and Statoil, he settled in Malaysia in 2015, where he guides Mubadala Petroleum's basin modelling, geochemical, and internal petroleum systems training programs.

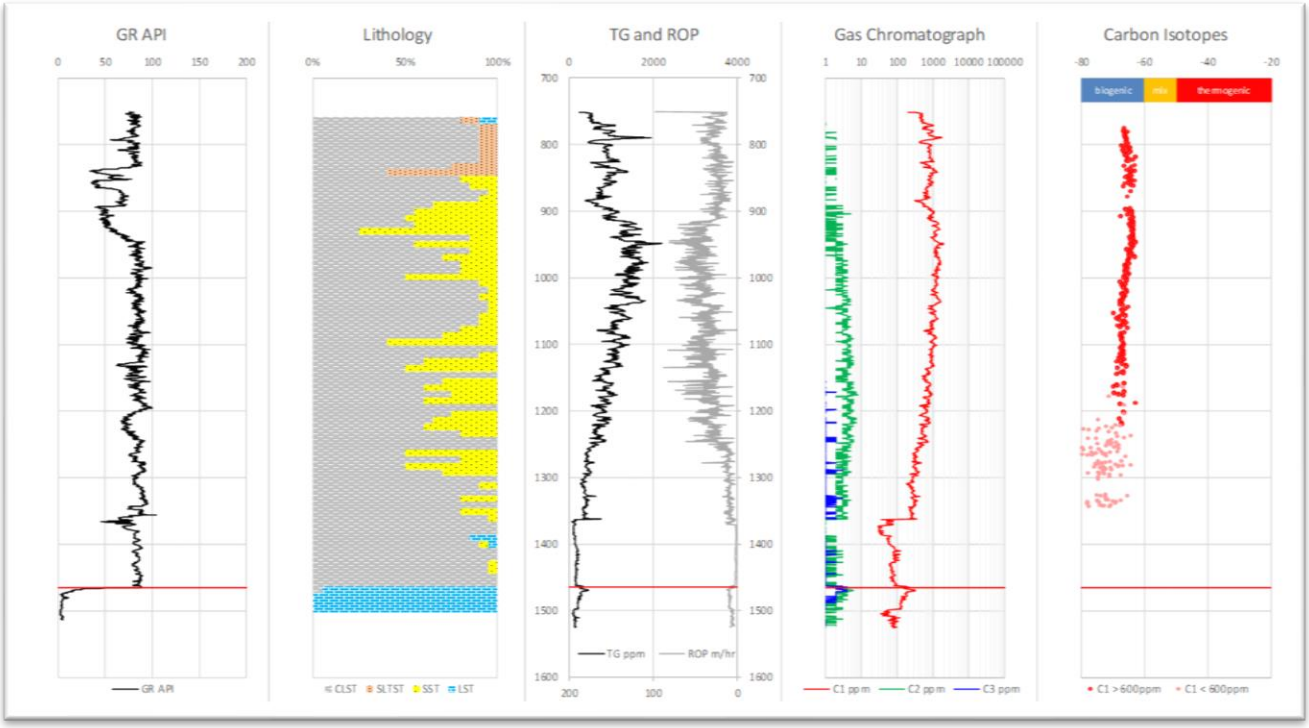

Figure 1. Log data and isotopes from dry hole

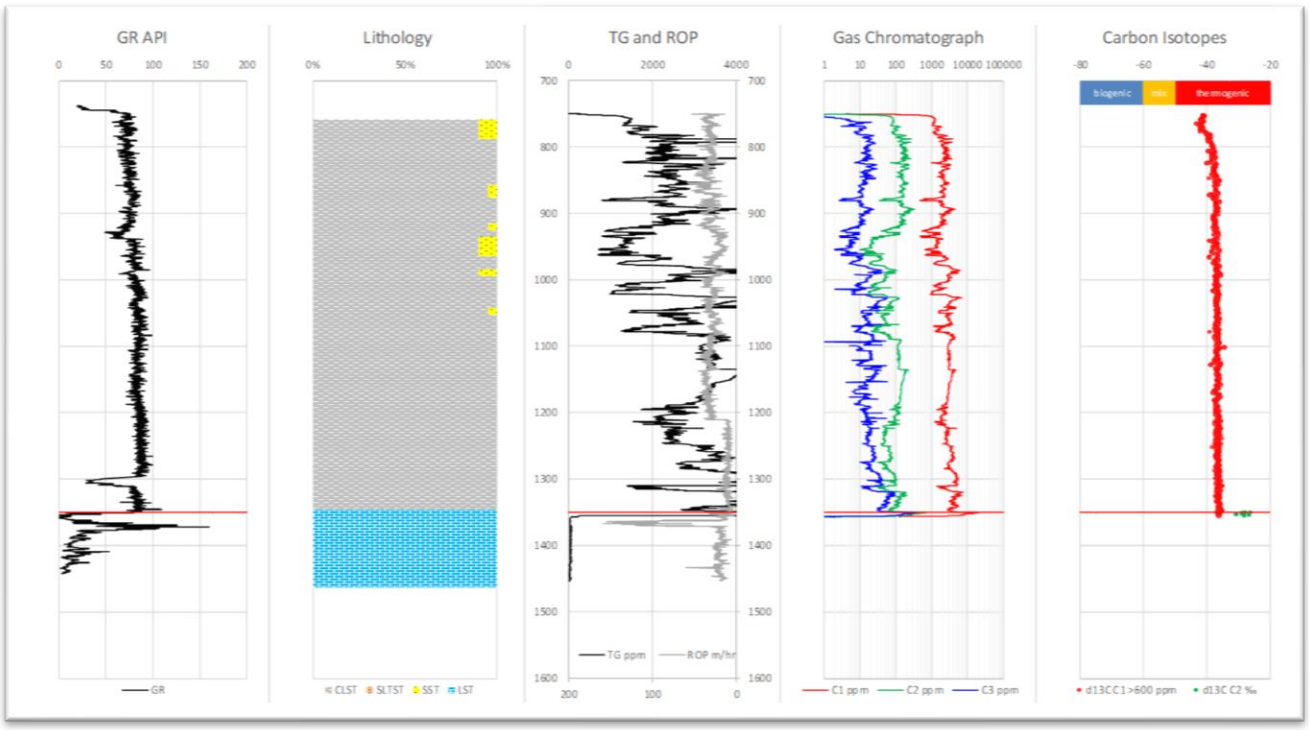

Figure 2. Log data and isotopes from discovery well

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Philippines SC 49: From Exploration to Exploitation

Edgar Benedict C Cutiongco[1]

[1]*Polyard Petroleum, Philippines*

edgarbenedictccutiongco@gmail.com

Marginal field development in the Philippines, especially onshore oil and gas discoveries are gaining traction due to the confluence of several factors that makes the project cross over from exploration to exploitation.

Investments during the exploration and appraisal phase of the cycle would seem daunting and unjustifiable if the expectation is not properly managed. The direct effect of reluctance to properly test and evaluate the prospect would lead to unresolved issues on productivity and deliverability of the wells. Thin reservoirs in compartmentalized fault blocks make the evaluation complicated. The five appraisal wells in the Alegria Field were completed and drill stem tested to get the optimal flow rate. Several zones were tested using a series of shut-in, flow and build up periods. Pressure on the sand face is maintained by varying the choke size to maintain a manageable pressure decline and to prevent movement of sand. Each well would have specific set parameters in order to maintain reservoir pressure. Maintaining modest production rates for each well, a low cost but safe and efficient operational structure, a ready market for crude sales, a well-organized end to end logistic strategy and an equitable oil price, would be the basis for the sanction.

Keywords: marginal field, Philippines, Alegria

SPEAKER BIOGRAPHY

Edgar Benedict Cruz Cutiongco Is a licensed geologist, a senior lecturer at the UP National Institute of Geological Sciences, with a Master of Science degree in Petroleum Geoscience from the Universiti of Brunei Darussalam. He is an oil and gas exploration and production specialist with over 25 years of experience and currently the Assistant Country Manager of Polyard Petroleum International Group, as well as the Vice President of the Petroleum Association of the Philippines.

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Frontier Sabah Unveiled - Latest Regional 3D Seismic Reveals the Petroleum Potential of Offshore Sabah

Dr Tad Choi[1], Andy Bromley[1], Ching Tu[2], Michelle Tham[2]

[1]*PGS, Malaysia*

[2]*WesternGeco, Malaysia*

tad.choi@pgs.com

INTRODUCTION

The NW Sabah Basin covers an area of approximately 43,000 km^2 with marine Tertiary beds typically more than 8 km thick. It receives its major sediment input from the Baram Delta, which is a prolific hydrocarbon province extending from Brunei to NW Sabah, as well as from the Champion and Meligan deltas. Gravity loading and thin skinned deformation has resulted in a fold and thrust belt in the inboard area. This initiated near the shelf in the Mid Miocene, which then propagated north-westward in the Pleistocene. This fold and thrust belt, which hosts turbidite reservoirs within anticlinal structures, has been the major focus and most successful play area in the basin to date.

Further outboard of the fold and thrust belt, beyond the Sabah Trough, lies the NW Sabah Platform, also known as the Dangerous Grounds. It consists of rifted continental fault blocks that split during the opening of South China Sea. Eocene-Oligocene pre- and syn-rift packages that were deposited during this extensional phase potentially host source rocks that could be mature at present-day to charge the overlying mid-Miocene carbonate targets. This Play type was recently tested in the Sabah Trough and was a technical success.

EXPLORATION OPPORTUNITIES UNVEILED

This first ever multiclient 3D survey in Malaysia which encompasses the outer Sabah Thrust Belt, the Sabah Trough and the Dangerous Grounds has a footprint of approximately 37,000 km^2 as of today, with more to come. It has become the ultimate explorer's tool in paving the way to better understand the frontier areas of the greater Sabah Basin. This study has established a new stratigraphic sequence for the Dangerous Grounds and the Sabah Trough based on the high quality measured broadband seismic dataset, which has enabled detailed seismic mapping of the basin fill packages. This has helped better understand the basin development as well as the exploration potential of these outer basins.

At PESGB/SEAPEX London 2018, the author presented the initial geological findings of this frontier basin based on 18,000 km^2 of this multiclient dataset. A new basin stratigraphy, various play types and seismic evidence of a working petroleum system was presented. The evidence for a working petroleum system has now been tested and proven by the recent Tepat-1 discovery well.

The continual expansion of this Sabah multiclient dataset enables explorers to further investigate the subsurface and chase these play types further along the fold and thrust belt, Sabah Trough and Dangerous Grounds. Now with a further 19,000 km^2 of broadband seismic available, we present further findings and insights from this mega multiclient data of approximately 37,000 km^2 that covers the frontier Sabah Basin.

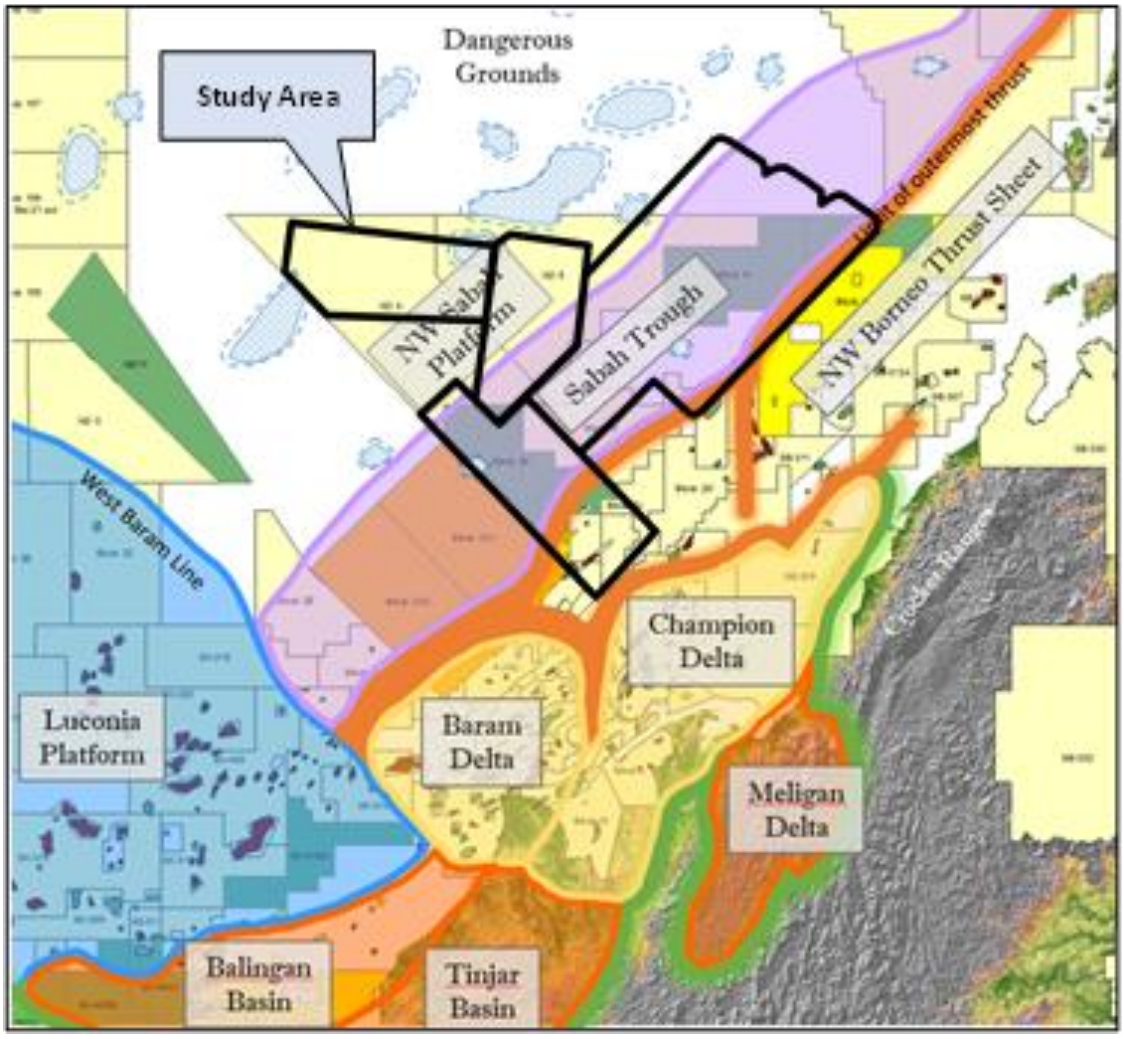

Figure 1. Location map of NW Sabah highlighting the study area. The map also illustrates the various geological terranes

SPEAKER BIOGRAPHY

Tad is currently a New Ventures Manager for Petroleum Geo-Services (PGS) in their Asia-Pacific headquarters office in Kuala Lumpur. He has nearly two decades working in the oil and gas industry primarily as an explorationist, working with Woodside Energy and then a Principal Geoscientist with PGS. He has interpreted seismic data from regional to prospect scale from most of the prolific hydrocarbon bearing basins throughout NW Shelf Australia and SE Asia.