Guyana-Suriname Basin rejuvenation leveraging ML-based technology as part of Fully Integrated Subsurface Evaluation

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Abstract

The Guyana-Suriname Basin (GSB) has recently experienced a very active exploration period with impressive string of hydrocarbon discoveries, initiated by Liza-1 in the Guyana side, all the way to the latest discoveries by Apache/TOTAL and PETRONAS in the Suriname side, the basin has yielded ~10 Bboe recoverable reserves to date. Suriname is placed as an ideal locus for exploration investment with very favourable fiscal terms and significant YTF resources, significant activity is anticipated in the region over the next several years.

Despite its long presence in Suriname, PETRONAS has recently planned to rejuvenate its strategic and tactical approach to improve accuracy and efficiency of the subsurface evaluation as a key component to keep up with the increasing pace of exploration activities. These include the desire to achieve a step-change in the overall process of subsurface evaluation, and to deliver on near-term business priorities for ongoing exploration in deepwater Suriname. Updated gross depositional environment maps are required, in particular, an improved prediction of the stratigraphic and geographic distribution of source rocks constraining the active petroleum systems in the basin to de-risk the phase prediction for the next pre-drill prognosis.

In collaboration with Halliburton Landmark Solutions, the team proposed a new approach to deliver an integrated workflow that uses prediction across different scales of basin to prospect evaluation. The proposed workflow is significantly differentiated from traditional approaches through the use of next generation subsurface interpretation technologies including application of physics-based automation and Machine Learning for seismic and well, the leverage of NefteX® Predictions proprietary data, standards and content as a contextual infrastructure for calibration with PETRONAS data, and the nature of the end to end integration marrying the big picture of geological forcing factors to local prediction away from good data control. It drives efficiency, integration, consistency, and reproducibility to reduce uncertainty and improve understanding of risk, with significant potential gains in the quality of outcomes. Execution of this workflow will not only have value for developing pre-drill prognosis, but also in demonstrating the next generation approach of fully integrated subsurface analysis for developing advanced insights combining best-in-class technology, people and process. While the workflow is implemented in a frontier/emerging play exploration effort, the same techniques can be applied in more mature basins for near-field exploration, or appraisal and development of discoveries. The insights generated are applicable across the entire asset lifecycle.
Fit-for-Purpose Integrated Regional Workflow

1. Assisted Lithology Interpretation
2. Nefex Prediction Context
3. Sequence Stratigraphic Interpretation (Nefex framework)
4. Cloud Processing Fault Likelihood Attributes
5. ML Dense Horizon Interpretation
6. Forward Stratigraphic Modelling
7. Basin Modelling

PETRONAS Wells

PETRONAS Vel. Model Building
PETRONAS Biostrat
Update Nefex PaleoDEM
PETRONAS 3D Reconstruction

PETRONAS Regional Fault Interpretation
PETRONAS Geochem and pore pressure