

A No-Drill Decision for Beige Deepwater Prospect: An Integrated Subsurface Perspective

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ABSTRACT

The Beige prospect is an exploration opportunity in deepwater – offshore Gulf of Guinea. A key business driver was to drill 2 exploration wells to test the prospect for commercial hydrocarbon volumes and in a success case tie-back to a nearby Bassa Floating Production Storage and Offloading (FPSO) facility. Following the outcome of neighboring Bassa-X Near Field Exploration (NFE) well that drilled into a Class II/III AVO anomaly which turned out wet, the Beige prospectivity maturation was deferred for revalidation using the latest (2022) seismic (broadband), well data and incorporate the postmortem results from Bassa-X exploration well outcome. Preliminary 2023 assessment of the Beige opportunity showed significant change in the overall geology requiring a full revalidation. A suite of reliable technology was deployed in the subsurface evaluation leading to an improved understanding of the prospect. Artificial intelligence-backed applications were utilized to generate fault probability cubes using full-stack conditioned relative acoustic impedance and Wide Band Spectral Decomposition (WBSD) seismic volumes. While elevation decomposition and amplitudes from auto-tracked events provided a better understanding of stratigraphy & structural elements for each reservoir. Differentiating seismic quantitative interpretation (QI) methodologies – Rock Physics analysis, AVO inversion of LambdaRho/MuRho formed the basis for polarizing false positive anomalies from hydrocarbon bearing reservoirs while amplitude versus depth analysis was deployed for fluid contacts prediction. The revalidated results confirm that the Beige Deepwater opportunity is valid. However, in comparison with previous evaluation a ca.43% reduction in recoverable volume was observed. This was largely due to shorter predicted column height & higher water saturation with 3 of the 5 business case targets not meeting commercial volume threshold. Body-KA – the largest volume carrier was observed to be highly compartmentalized with significantly low volumes for each fault block. The recommendation from the subsurface team enabled an on-time business decision to suspend Beige exploration well from the drilling sequence until an optimally commercial development approach is realized and focus resources to mature recently high-graded Bassa NFE opportunities.

Keywords: Amplitude, AVO, Channels, Deepwater, DHI, Exploration, False Positive, Inversion, LambdaRho, MuRho, Porosity, Prospect, Seismic

INTRODUCTION

Hydrocarbon exploration is an expensive venture saddled with lots of uncertainty and many unknown factors. A decision to drill could result in a giant discovery, a modest discovery, or a dry hole (Hamid and Baharlou 1984).

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Using experts' judgments and the available information, we estimate the volume of recoverable oil in a given reservoir, matching that with an estimated probability of success (POS) coupled with economics, a decision to drill or not to drill is taken on a prospect. The factors affecting the decision are assigned numerical values using judgments of geologists, geophysicist, and petroleum engineers. The probabilities of the outcomes are determined and the "expected value" of each decision is computed (Hamid and Baharlou 1984). Hence, the oil and gas industry rely on various subsurface data and interpretations to minimize uncertainties and risks and maximize gains from wells. Dry holes typically provide a

wealth of useful subsurface information. However, when dry holes are drilled post drill or postmortem studies are either not properly done or the well failure mechanism is incorrectly determined (Samis and Milkov 2019).

A dry well was recently drilled in the neighbouring Bassa deepwater field targeting the Body-X channelized fan system. The failure mode for the Bassa-X exploration well was identified based on the comprehensive multi-disciplinary integrated evaluation of both pre- and post-drill reports, 3D seismic, well logs, geochemical and source rock data. The Body-X sand failed due to lack of petroleum migration from deep seated Oligocene source rock. This learning was then applied to the Beige prospect and adjudged to be a viable opportunity albeit with sub-commercial value. Hence a no drill decision was taken on the Beige prospect.

GEOLOGIC SETTING

The study area is in the mid to lower slope deep-water setting, offshore Niger Delta in the Gulf of Guinea, which is situated along the West Africa passive margin (Figure 1). The basin evolution is attributed to the breakup of the South American and African plate in the Mid to Late Cretaceous (Whiteman, 1982). The end of rifting in the Late Cretaceous was followed by a post rift sedimentation phase in the Tertiary, and progradation of the delta seaward from the Eocene (Doust and Omatsola 1990). Significant sediment influx from the hinterland into the basin via the Niger-Benue fluvial system in the west and the Cross River in the East was seen from the Late Oligocene and increased steadily up to Plio-Pleistocene times (Whiteman, 1982). A series of canyons developed during the Tertiary that incised into the shelf margin and extended basinward. Canyons like the Mahin, Opuama, Benin, Escravos, Lagos and Ramos Canyons (Burke *et al.*, 1972, Petters 1984) formed major point-sourced conduits for sedimentation in the deep-water environment (Figure 1). These northeast-southwest orientated canyons or the equivalent paleo-canyons actively fed sediment from the delta front and shelf margin staging area to the slope and deeper basin from the onset of delta formation and ocean formation up until the present day. The principal mode of downslope transport was by turbidity currents and associated mass transport processes leading to the deposition of sand-rich turbidites (Adeogba *et al.*, 2005). These formed the principal reservoirs and plays for active hydrocarbon exploration and production today. Marine sedimentary unit – the Akata Formation underlies the entire Tertiary Niger Delta stratigraphic sequence from onshore to offshore. This Formation is characterised by pelagic silt, mud and shale with an abundance of fauna and flora that has enabled an age assignment of Paleocene to Recent (Doust and Omatsola 1990). The marine mud crops out offshore in the form of mud diapirs that have developed as a result of smectite – rich sediment deposited underneath a rapidly prograding Eocene to Miocene delta

complex (Whiteman 1982). This has further resulted in an overpressured condition in the marine sediments (Cohen and McClay, 1996). Diapiric movement of the Akata muds is still active and significant distribution of diapirs has been visible around the continental slope and sea-floor where they are revealed as mud volcanoes (Graue, 2000). This mud diapirs are partly responsible for modifying the slope system leading to the development of both structural and stratigraphic traps particularly within the study area. The Akata Formation is thought to be the primary source rock in the Niger Delta petroleum province, although source rocks have also been encountered in the shallow Agbada shales (Evamy *et al.*, 1978, Ekweozor and Daukoru, 1984, Lambert-Aikhionbare and Ibe, 1984, Bustin, 1988, Haack *et al.*, 2000, Samuel *et al.*, 2009).

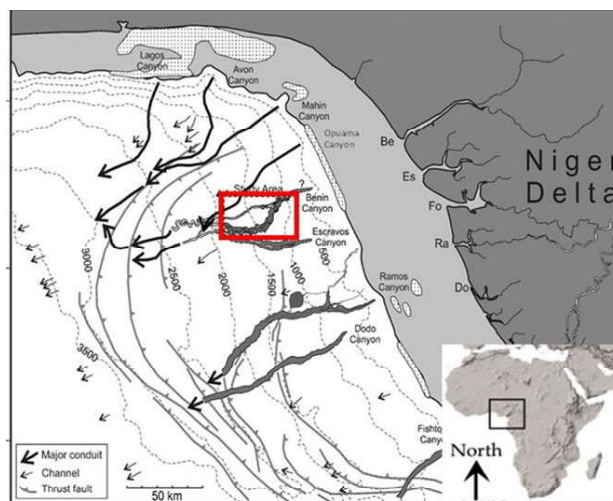


Figure 1: Location of the Western Niger Delta showing bathymetry, major submarine canyons and study area in red rectangle (modified after Deptuck *et al.* 2007).

DATA AND METHODOLOGY

The 3D seismic data used in this study is a broadband seismic recently acquired using the streamer technology with a cable length of 10050m (Figure 2A). This data was acquired after the drilling of Bassa-X exploration well in 2022 to enable an improved understanding of the subsurface across the study area. The seismic showcases the structure and stratigraphy within a six second two-way time (TWT) window. The frequency of this survey is broadband (see Figure 2B). Broadband entailed preserving both the useful low frequency and the noise-free high frequency. Some of the noise attenuated include swell noise, random noise, noise trains and residual noise. Velocity model building approach was full waveform inversion (FWI). In addition, an anisotropic velocity model was added as a second pass. The velocity product in the end was properly constrained by geological boundaries – faults and stratigraphy.

The data was processed using Kirchhoff PreSDM algorithm. In comparison to the legacy KLSM (Kirchhoff Least Square Migration) seismic data which underpinned the drilling of the Bassa-X. The processing algorithm deployed in the latest seismic data resulted in a broadband frequency content with high resolution, good signal to noise ratio, improved structural imaging, better amplitude balancing and seismic loop continuity. The data is a zero-phase seismic with a negative polarity (anti-SEG) displayed as a trough that represents an increase in acoustic impedance. Processing of the data was also performed to obtain high-quality angle stack of near (0° - 10°), mid (10° - 20°), far (20° - 30°) and the ultra-far (30° - 40°). A full stack volume (0° - 40°) was also generated.

Several wells have been drilled in the neighbouring Bassa field including the Bassa-X near field exploration well. This study enjoys a good spread of good quality data acquired across the wells with basic logs such as gamma ray, resistivity and acoustic logs – density, compressional and shear sonic logs required for quantitative interpretation.

Reliable technologies were deployed in the subsurface evaluation leading to an improved understanding of the Beige prospect. Artificial intelligence-backed applications were utilized to generate fault probability cubes using full-stack conditioned relative acoustic impedance cube and Wide Band Spectral Decomposition (WBSD) volumes. While elevation decomposition and amplitudes from auto-tracked events provided a better understanding of stratigraphy & structural elements for each reservoir. Differentiating seismic quantitative interpretation (QI) methodologies – Rock Physics

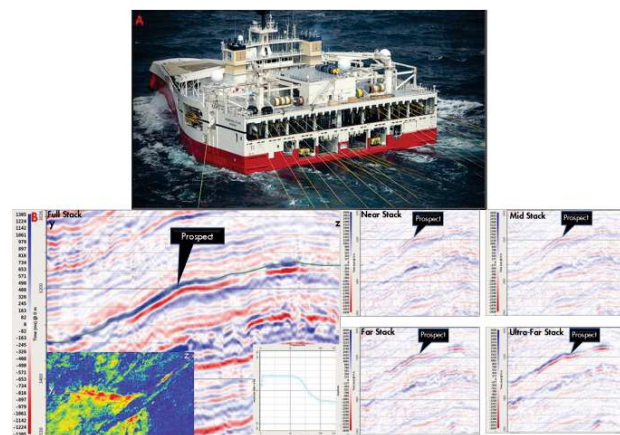


Figure 2: A) Data acquisition at the study location showing streamer lines connected to the seismic vessel. B) Section view from the Post Stack seismic data taken across the study reservoir; inserts show bright spot amplitude anomaly and the amplitude spectrum revealing the broadband frequency. Seismic section view of Near, mid, far and ultra far seismic illustrating AVO behaviour at the prospect location.

analysis, AVO inversion of LambdaRho/MuRho formed the basis for polarizing false positive anomalies from hydrocarbon bearing reservoirs while amplitude versus depth analysis was deployed for fluid contact prediction.

BASSA-X POSTMORTEM (ANALOGUE)

Background

Bassa-X was planned targeting Body X—a channelized fan system (Figure 3). Having already proven hydrocarbons in stratigraphically equivalent sands north of the prospect, the pre-drill assessment of the petroleum system elements such as structure, reservoir and charge (access to hydrocarbons) were classified as a low risk. The major geologic risk attributed to the prospect was trap. Relying on the stratigraphic trapping element, the pre-drill geologic probability of success (gPOS) was estimated as 57% (Ogunlana et al., 2023).

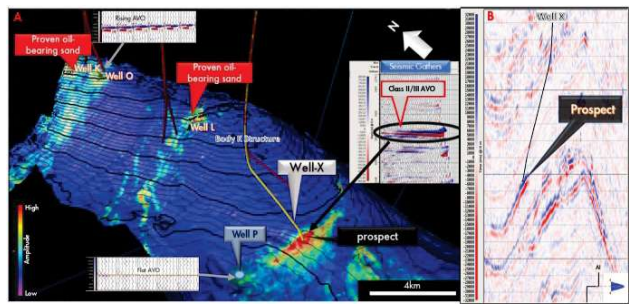


Figure 3: A) Amplitude draped on structure highlighting the bright spot at the location of the Body X prospect relative to proven hydrocarbon penetrated by Wells L, K & O. The Figure also shows the AVO behaviour at the crest of structure is comparable with the AVO at the proven oil reservoirs north-west of the prospect (modified after Ogunlana et al. 2023). B) Seismic section showing the well path targeting the prospect

Bassa-X Well Outcome

The well discovered excellent reservoir properties of 78ft feet thick sand with 32% porosity and 100% net-to-gross but turned-out water bearing with no evidence of hydrocarbon. The encountered reservoir properties were better than the prognosticated ranges (Figure 4). There were no indications of thermogenic hydrocarbons in the entire stratigraphic interval drilled by Well-X. All the sands penetrated in this well were brine filled.

Bassa-X Post Drill Evaluation

A post-mortem was conducted focused on two key areas. 1) To understand which failed element of the petroleum system resulted in the wet well outcome (Ogunlana et al. 2023) and 2) from geophysical perspective, what is responsible for bright spot and the strong AVO response which turned out to be wet.

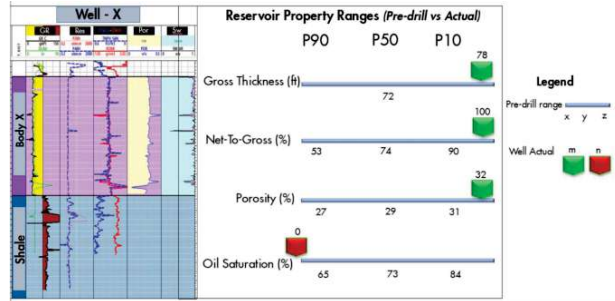


Figure 4: Wireline logs of Well X showing excellent rock properties compared to the pre-drill prediction (modified after Ogunlana *et al.* 2023).

Assessment of Petroleum System Element

The post-mortem identified two possible geological failure mechanisms; a) Trap integrity and b) Access to hydrocarbon charge. The post-mortem identified two possible geological failure mechanisms; a) Trap integrity and b) Access to hydrocarbon charge.

Trap Integrity: Trap integrity re-assessment of the prospect showed that the prospect is in a structurally 'quiet' area without evidence of faults (on the seismic) which could breach the trap (Figure 5). On seismic, there is evidence of a stratigraphic pinch-out of the sand body (prospect) into the adjacent marine shales, thus providing a lateral seal to prevent escape of hydrocarbons.

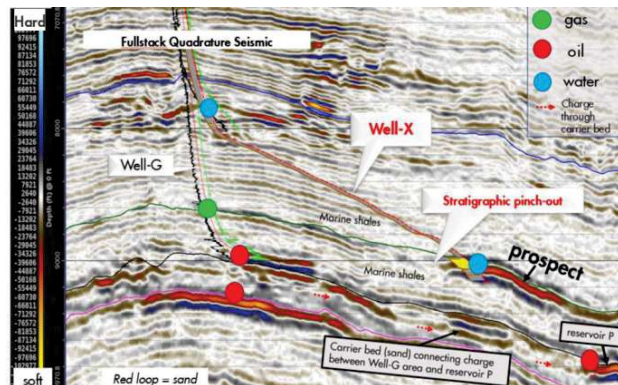


Figure 5: Seismic section showing nearby hydrocarbon discoveries and stratigraphic trap of prospect (After Ogunlana *et al.* 2023).

Access to Hydrocarbon Charge: Since hydrocarbon charge in the field is proven by producing reservoirs, it meant that local charge access to individual sand bodies might be the issue. Therefore, a charge migration re-assessment was conducted in a bid to better understand the major migration pathways for hydrocarbon discoveries within the field. It was observed that the big hydrocarbon-filled sands are either in direct communication with deep-seated faults extending into the source kitchen or are in communication with other sand bodies (carrier beds) connected to such faults (Figure 6). Faults F1 and F5 serve as principal migration conduits for hydrocarbons from the source kitchen into the shallower sections where the oil

and gas discoveries are. The hydrocarbons would have migrated updip to fill the reservoirs in Well-B area to the north-west before backfilling downdip towards Well-C in the south. However, the prospect at Bassa Well-X lacks proximity or connectivity to these deep faults. The oil discoveries in nearby Well-C are enabled by carrier beds (connected to fault F1 updip) which are missing between Well-C and Well-X in the prospect area, thereby limiting charge from the north (Ogunlana *et al.* 2023).

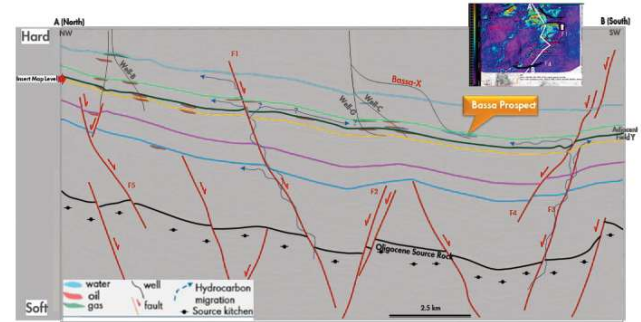


Figure 6: Seismic section showing major hydrocarbon charge migration pathways within the field (Line of section A-B shown on inset map, After Ogunlana *et al.* 2023).

Geophysical Assessment

Direct Hydrocarbon Indicator (DHI) Assessment: The predrill seismic evaluation of the Body X prospect revealed a high amplitude anomaly with a Class II/III AVO response. The strong amplitude anomaly or bright spot showed very weak conformance to structure (see Figure 3 above) and no other evidence of any other DHI such as flat spot was observed. Further post drill evaluation tied the high net-to-gross of 100% and porosity above 30% as the major factor responsible for the seismic response although brine filled, hence a false positive. So, the key challenge was how do we polarize false positive from true hydrocarbon bearing sands having similar amplitude response. Rock physics analysis and AVO simultaneous inversion was deployed to help differentiate false positive and hydrocarbon bearing sands.

Rock Physics Analysis: Rock physics trends were investigated across selected wells within the study area. The objective is to investigate elastic properties that can be used to discriminate AVO false positive sands from true/conventional hydrocarbon and brine sands. Two elastic properties showed promising results: LambdaRho – a measure of compressibility & a fluid indicator and MuRho – a measure of rigidity & a proxy for lithology. LambdaRho and MuRho are derived from P-impedance and S-impedance elastic properties based on equations 1 and 2 below:

$$\text{LambdaRho} = AI^2 - 2SI^2 \text{ (EQU 1)}$$

$$\text{MuRho} = SI^2 \text{ (EQU 2)}$$

Note: AI = density × compressional (p) velocity

SI = density × shear velocity

Where AI = Acoustic (P) Impedance and SI = Shear impedance.

From the rock physics cross plot (Figure 7), conventional hydrocarbon bearing sands were characterized with low LambdaRho values including the Body X sand and other sands that have been classed as false positives. In the MuRho space, conventional hydrocarbon and brine bearing sands have low MuRho values, whereas the Body X and other false positives displayed a higher-than-expected MuRho suggesting increased rigidity compared to conventional hydrocarbon and brine filled sands despite having high porosity values like conventional hydrocarbon bearing sands. The rock physics results thus indicate that MuRho can serve as a tool for discriminating false positives from conventional hydrocarbon and brine bearing sands.

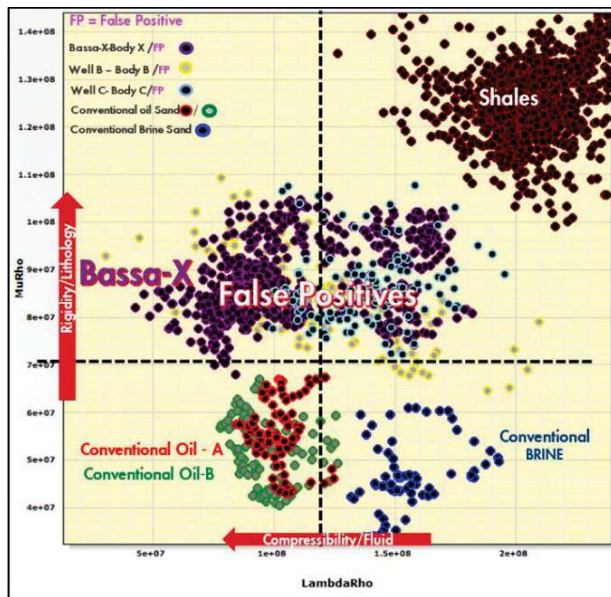


Figure 7: Well log-based rock physics cross plot of MuRho versus LambdaRho revealing the distinct behaviour of all false positive sands including the Bassa X-Body X sand with anomalously higher MuRho values compared to conventional oil and brine bearing sands.

Seismic inversion: Considering that rock physics analysis revealed MuRho in conjunction with LambdaRho as elastic tools for discriminating false positives from convention hydrocarbon and water bearing sands, simultaneous inversion also known as pre-stack AVO inversion technique was deployed to calculate both elastic properties from 3D seismic data. In the study area 3D cubes of P-impedance, S-impedance and density were modelled by performing simultaneous inversion on four angle stacks - the near (0° - 10°), mid (10° - 20°), far (20° - 30°) and the ultra-far (30° - 40°) seismic volumes. The P-impedance and S-impedance cubes were mathematically integrated using equations 1 and 2 above to generate LambdaRho and MuRho seismic volumes. The LambdaRho model on the map view reveals low values

like a hydrocarbon bearing sand (Figure 8A) but the MuRho models clearly shows that the Body X sand is a false positive with high MuRho values (Figure 8B) as predicted from the Rock physics cross plot (Figure 8C). On the cross plot both the absolute values from the model and the log based lambdaRho and MuRho values seat in the same top left quadrant.

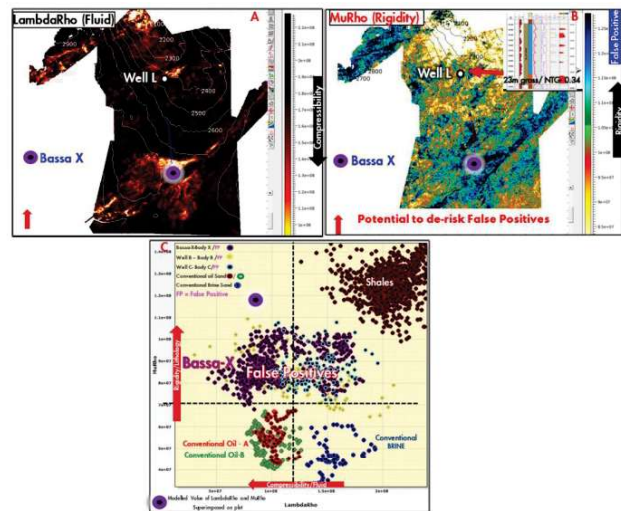


Figure 8: A) LambdaRho map showing low values for the BassaX well-Body X sands indicating high compressibility like typical hydrocarbon sands. B) MuRho map with higher-than-expected values indicating rigid sands, thus confirming a false positive. C) The cross plot highlights the absolute value of MuRho and LambdaRho from the inversion model (bright purple circle) although slightly higher but seats nicely on the same quadrant as the log-based data of Body X from Bassa-X Well.

The concepts described above for the Bassa Exploration analogue case was deployed to test the technical viability of the Beige prospect and economic analysis was also carried out to further confirm commercial success.

THE BEIGE PROSPECT

Six reservoirs – Body-KA (North & South), Body-KB, Body-KC, Body-KD and Body-KE were considered for Beige prospect maturation; however, this paper would focus mainly on the reservoir with the largest volume potential – the Body-KA. The methodology and concept deployed for Body-KA reservoir was also adopted for the remaining five potential reservoirs.

Geological Description

The Body-KA reservoir seats on a heavily faulted channel-over Nose structure. It is segmented into two fault blocks – the Northern block (red polygon) and the complexly faulted Southern block (yellow polygon). The AVO attribute map below (Figure 9) reveals a likely sand fairway from the north with an environment of deposition interpreted as confined channel complex. Its reservoir

equivalent – the Body-Z sand was penetrated by well B3 and B6 that encountered good quality hydrocarbon bearing reservoirs. With the success of these wells and other major discoveries further north of the prospect with similar geophysical signatures, a low risk to reservoir presence was defined for Body-KA opportunity.

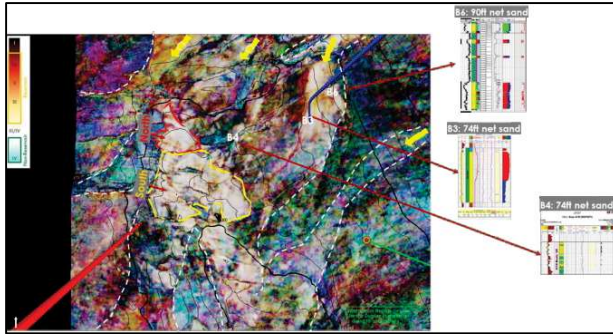


Figure 9: An AVO attribute map highlighting the Body-KA North (red polygon) and Southern (yellow polygon) prospect. Yellow arrow indicates sediment flow direction. Bright colours represent sand prone facies.

Assessment of Petroleum System Element.

Considering that the postmortem analysis for Bassa-X exploration well (described above) revealed trap integrity and access to hydrocarbon charge as the major failure mechanism that resulted in a dry well outcome, the assessment for the Beige prospect would therefore be focused on these two elements. The other petroleum system elements were adjudged to be of low risk.

Trap integrity of the Body-KA sand: The Body-KA is interpreted as a combination trap opportunity with the faults contributing to the structural elements while pinch out of the sands into adjacent marine shales provides the

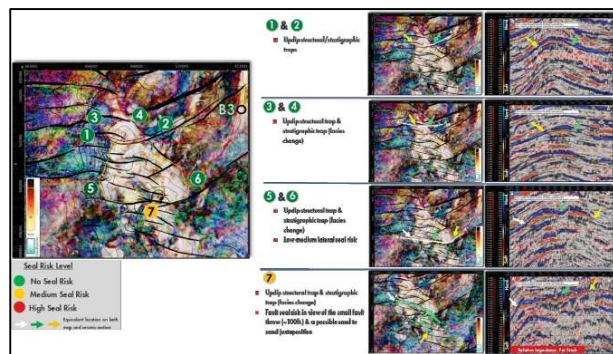


Figure 10: AVO attribute map shows sand prone facies with high amplitude anomaly reflected in bright colours while marine shales/non reservoirs are in darker colours. The map reveals severe faulting of the Body-KA sand particularly towards the south with a potential seal risk at the "7" location. The associated seismic section view highlights the interplay of stratigraphy and structure along the line of section on the map.

stratigraphic component. With the high faulted nature of the southern segment, it is likely that the east-west bounding fault further south may not be sealing in view of the small fault throw relative to the average thickness of the potential reservoir sands, hence leading to a possible sand-to-sand juxtaposition (see Figure 10). This was also supported with fault seal analysis study done to model the sealing potential of the east-west fault bounding the southern block. The fault seal analysis reveals a low shale gouge ratio (SGR) of about 0.22 at the area of juxtaposition (see Figure 11), therefore implying low fault seal capacity – most likely open leading to leakage/spill.

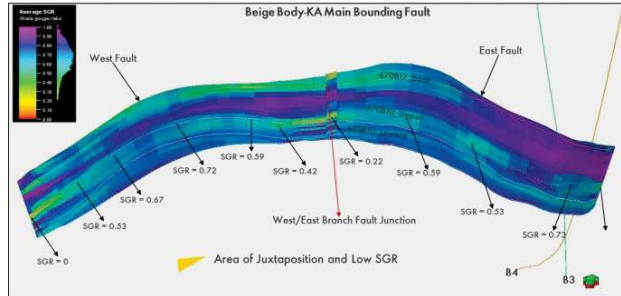


Figure 11: The average SGR value of the area of juxtaposition around the west-east branch fault junction of the main bounding fault is 0.22 implying low fault sealing capacity.

Access to Hydrocarbon Charge: The seismic section below reveals a deep-seated fault (F1) that plumbs into the Oligocene source kitchen and therefore could serve as a major conduit that feeds the target reservoirs within the Beige Prospects including the Body-KA sand. Hence charge is not seen as a risk to the viability of the Body-KA opportunity.

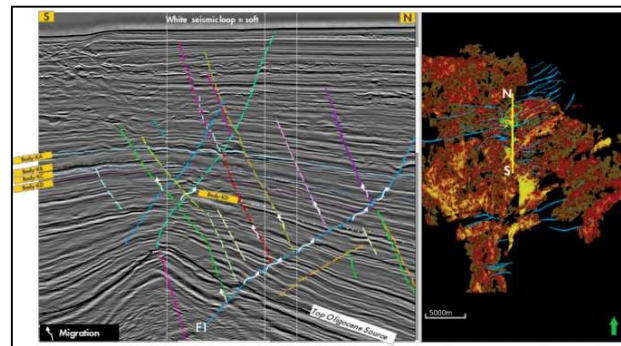


Figure 12: Seismic section view shows deep seated fault plumbing in the Oligocene source rock serving as potential migration part for hydrocarbon to shallower reservoirs.

Geophysical Assessment

The geophysical assessment for Body-KA was centred around three main areas; 1) to check for any direct hydrocarbon Indicator (DHI) that reliably confirms the likelihood of hydrocarbon presence, 2) the prediction of

fluid contacts, i.e oil-water-contact (OWC) and 3) as a follow up to DHI, the polarization of false positives.

DHI Assessment: The Body-KA sand is interpreted to reflect an AVO anomaly plus three main DHI's. Amplitude maps from four seismic sub-stacks (near, mid, far & ultra far) shows a *Class III AVO* behaviour, this is consistent with pre-stack gathers also indicating strong amplitude progressively increasing with offset. Similar AVO expression from both the maps and pre-stack gathers was also interpreted in the adjacent Body Z proven oil accumulation, hence serving as a calibration point for the Body-KA prospect. The significant high amplitude anomaly seen from the maps particularly the Far and ultra far Maps can be interpreted as a bright spot DHI anomaly. Although bright spots are not always unique to hydrocarbon just like the Bassa-X well that drilled into a bright spot anomaly that turned out wet. Depth contour grids draped on the amplitude map reveals a strong *conformance or fit to structure*. In addition, a SW-NE seismic section reveals the presence of a *flat spot* indicative of a potential hydrocarbon contact. The amplitude conformance to structure and the flat spot gives further

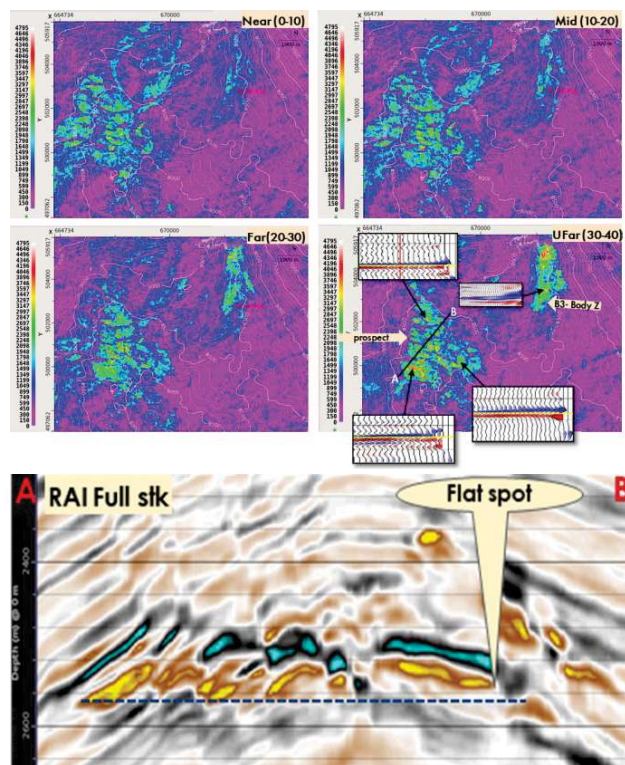


Figure 13: Amplitude maps and pre-stack gathers reveals strong Class III AVO amplitude increasing with offset similar to proven Body-Z reservoir at well B3 location. Depth grids draped on the map also shows conformance of the amplitude to structure. The relative acoustic impedance (RAI) seismic section view highlights the presence of a flat spot.

credence to the Body-KA bright spot anomaly as a likely hydrocarbon prone reservoir sand (Figure 13).

Fluid Contact Prediction: Amplitude versus depth technique was utilized for fluid contact prediction. This technique relies on the fact that density and velocity vary between hydrocarbon and water, and therefore the hydrocarbon amplitude particularly for shallow unconsolidated sands would be higher with a strong negative reflection coefficient compared to brine sands which would reflect a weak amplitude and a positive reflection coefficient. Hence when a cross plot of amplitude is made against depth an inflection point is observed between the high amplitude for hydrocarbon and the weak amplitude for water indicative of a potential hydrocarbon-water contact. A potential oil-water contact at 8506ft and 8330ft was predicted respectively for the north and southern compartments of the Body-KA prospect (Figure 14).

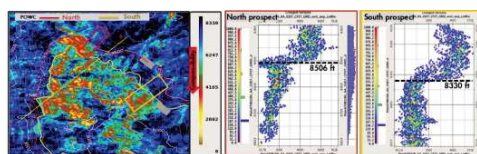


Figure 14: Amplitude map with the red and yellow polygon used to make the amplitude versus depth cross plot for the North and South prospects. An inflection point can be interpreted from the cross plot for both the North and South indicating a likely OWC at 8506ft and 8330ft respectively. The red and yellow contours on the map represent the predicted contacts.

False Positive Assessment: Simultaneous AVO inversion was deployed as a tool to differentiate true hydrocarbon bearing sands from potential false positive. The LambdaRho and MuRho maps show expected low values at the Body-KA prospect like the adjacent time equivalent hydrocarbon bearing sand proven by the B3 well which serves as a good calibration for the prospect (Figure 15). False positives are typically characterized by high MuRho values (highlighted in blue, see Figure 8B for Body-X sand) and low LambdaRho values while hydrocarbon bearing sands would have low values for both MuRho and LambdaRho. For example, the hydrocarbon bearing sand at the location of the B3 well.

Overall Subsurface Evaluation Results

Based on the recent subsurface evaluation using the latest broadband seismic a cumulative 43% volume reduction is seen across the six opportunities within the Beige prospect including the Body-KA north and south reservoir that has been extensively discussed above.

Economic Assessment

The commercial viability of the Beige prospect is hinged primarily on the proposed development plan – to drill a producer and an injector well pair and tie back to the

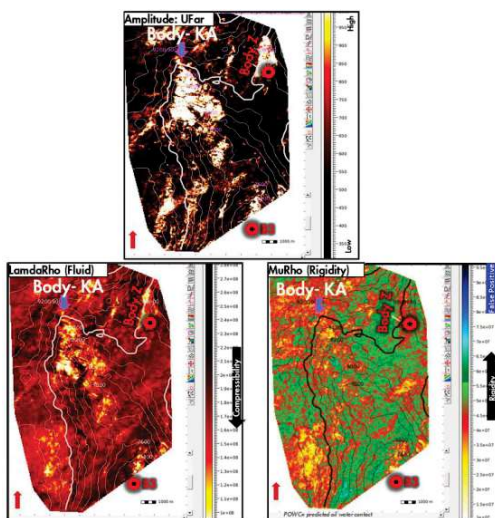


Figure 15: Body-KA is characterized by high amplitude anomaly, low LambdaRho values indicative of highly compressible hydrocarbon bearing sands and low rigidity observed from the low MuRho values which also suggests that the Body-KA sand is not a false positive.

Table 1: A Summary of the Beige Prospect for all target reservoirs. Of the six potential reservoirs, only the Body-KD sand showed an increase in recoverable volume in comparison to previous evaluation.

Target Reservoirs	2023 Preliminary Assessment (Evaluation Based on Legacy KISM Seismic)		2024 Assessment (Evaluation Based on latest broadband Seismic)	
	POS	Comments	Final POS	Comments
Body-KA South	0.67	No significant change in subsurface evaluation in comparison to legacy interpretation	0.67	Requires multiple wells for development
Body-KA North	0.67	No significant change in subsurface evaluation in comparison to legacy interpretation	0.68	Lower vol owing to shallower predicted contact & higher water saturation
Body-KB	0.26	POS downgraded due to: • Low updip vs downdip ratio • Potential thief sand • Access to charge risk	0.38	Small GI uplift for bright spot Lower volume owing to deeper crest & higher water saturation
Body-KC	0.43	POS downgraded due to: • Low updip vs downdip ratio • Potential thief sand	0.54	Small GI uplift for bright spot Lower vol owing to shallower predicted contact (limited to shallower structural confinement)
Body-KD	0.70	No significant change in subsurface evaluation in comparison to legacy interpretation	0.59	Possible sand on sand juxtaposition Lateral seal risk Potential reservoir facies observed beyond updip limit
Body-KE	0.50	Lower POS due to assumed poorer NTG	0.49	Possible sand on sand juxtaposition Lateral seal risk Thief sand

GI: Quantitative Interpretation; POS: Probability of Success

existing Bassa Floating Production Storage and Offloading (FPSO) facility which is located 6km from Beige. Given the significant reduction in the revalidated volume estimate, an economic limit test was used to re-assess commercial viability which confirmed that the Beige opportunity did not pass in-house economic screening criteria. For example, The Body-KA Southern Prospect which is the largest prospective target is highly faulted, compartmentalized into four different fault blocks. Each compartment would require a dedicated producer-injector well pair (See Figure 16 below) and with the low materiality of each compartment, its development would not meet required economic screening criteria.

A decision was therefore, made to suspend further maturation of the Beige prospect until such a time when technology or macroeconomic circumstances would allow the opportunity to be developed profitably.

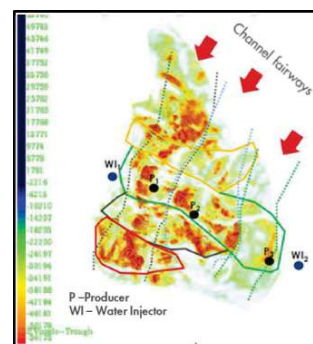


Figure 16: Four fault blocks interpreted on the amplitude map. The development concept for a block is illustrated on the geo-body extraction map.

CONCLUSION

The Beige prospect was matured drill-ready for 2022 as a strategic fit to keep the Bassa FPSO full. Following the disappointing outcome of Bassa-X Near Field Exploration (NFE) campaign and the acquisition of the latest broadband seismic, the Beige opportunity was deferred for revalidation. The revalidation resulted in a 43% volume reduction falling below the commercial cut-off hence a no-drill business decision was taken on the prospect.

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