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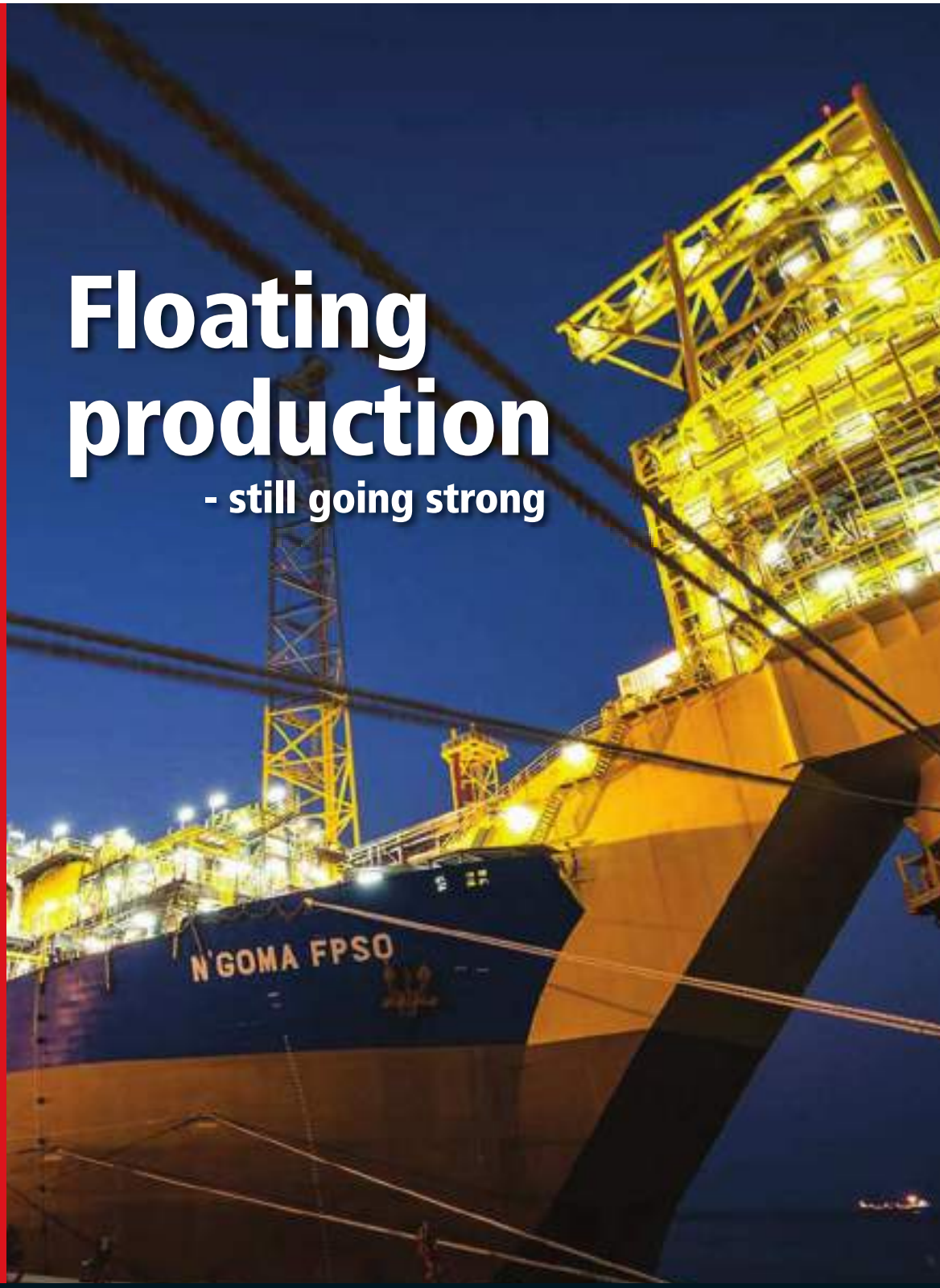
Covering the Oil and Gas Industries

Europe €10, Ghana CD18000, Kenya Ksh200, Nigeria N330, South Africa R25, UK £7, USA $12

Arnaud Breuillac, president of exploration and production at Total.
See page 16.



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Contents

The FPSO N´Goma sailed from the Paenel shipyard to Eni´s Block 15/06 in Angola.

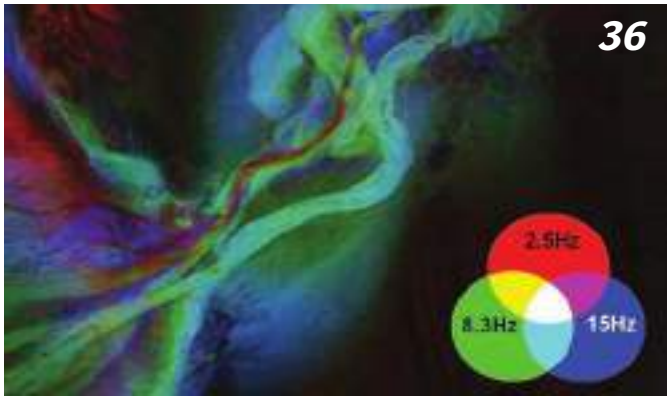
Editor's note

DESPITE THE SLUMP in crude oil prices, it is established African exporters that stand to benefit from the general market tightening that is expected. Projects in West Africa will largely continue to fuel Africa's subsea demand. Much of West Africa's production growth during the past decade or so can be attributed to the increasing move offshore, notably in the deepwater off Nigeria and Angola, but also in new territories such as Ghana. Floating production systems (FPS) have become an ingrained feature of this industry.

Angola sits on world's 17th largest oil reserves – conservatively estimated at 12.9bn barrels (third-biggest in Africa) – and could be twice that size according to some industry experts. Recoverable oil reserves and production could rise steeply over the coming decade if the most optimistic projections about Angola's pre-salt blocks prove correct.

This issue also looks at local content. In Angola the local workforce occupies an important place in the deep offshore CLOV development, for which a considerable amount of equipment was manufactured locally.

As always we bring you news of the latest oil and gas developments as well as features and analyses on topical issues. Please do get in touch with your feedback and any suggestions for topics you would like to see covered.



Colour blend 3D visualisation of 2.5Hz, 8Hz and 15Hz dominant frequencies in a horizontal slice of a BroadSeis volume in the Kwanza Basin.Courtesy CGG Data Library.

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Executives' Calendar 2015

APRIL			
22-23	**Ghana Summit**	ACCRA	www.cwcghana.com
22-23	**Africa Upstream and Downstream Conference**	ABUJA	www.s-scg.com
22-24	**2nd Congo International Mining Conference & Exhibition**	BRAZZAVILLE	www.ciemcongo.com
22-24	**CIMEOGIS 2015**	ABIDJAN	www.cotedivoiresummit.com
27-29	**4th East Africa Oil & Gas Expo 2015**	NAIROBI	www.expogr.com
29-30	**8th Annual Sub-Saharan Africa Oil & Gas Conference**	HOUSTON	www.energycorporateafrica.com
29-30	**M2M for Oil & Gas**	LONDON	www.smi-online.co.uk
MAY			
4-7	**OTC 2015**	HOUSTON	www.otc.net
12-14	**Oil & Gas Fundamentals**	JOHANNESBURG	www.cwcschool.com
19-20	**Platts Global Crude Oil Summit**	LONDON	www.platts.com
20-21	**2nd Uganda Mining, Energy and Oil & Gas Conference and Exhibition**	KAMPALA	www.umec-uganda.com
20-22	**SA Industry & Technology Fair**	JOHANNESBURG	www.exhibitionsafrica.com
20-22	**Petro.t.ex Africa 2015**	JOHANNESBURG	www.exhibitionsafrica.com
26-28	**12th Africa Independents Forum**	LONDON	www. petro21.com
JUNE			
1-5	**26th World Gas Conference**	PARIS	www.wgc2015.org
3-5	**Oil & Gas Fundamentals**	CAPE TOWN	www.cwcschool.com
8-10	**Negotiation Skills in Oil & Gas**	LAGOS	www.cwcschool.com
10-11	**West Africa Oil & Gas Security Summit**	LAGOS	www.waoilgassecurity.com
10-11	**Egyptian Power and Electricity Summit**	CAIRO	www.electricityegypt.com
18-19	**5th Zambia International Mining and Energy Conference and Exhibition**	LUSAKA	www.zimeczambia.com
23-25	**2015 African Assembly**	PARIS	www.oilcouncil.com

Readers should verify dates and location with sponsoring organisations, as this information is sometimes subject to change.

6th Ghana summit

IT IS A significant period in the Ghanaian energy industry. Whilst foreign investment is steadily growing in the region, shifting global oil prices and Ghana's energy shortfall has forced local Ghanaian companies to assess how this affects their business. Now, more than ever, it is absolutely crucial to be in tune with the industry and build reliable partnerships.

President John Dramani Mahama and Minister of Energy and Petroleum at the FMC Technologies stand.

Going into its 6th year, the Ghana Summit is the most successful and most established oil, gas and power event in Ghana, bringing together regional and international industry leaders. It is the only event of its kind to be fully supported by the Government of Ghana, with key endorsers including the Ministry of Petroleum; Ministry of Power; GNPC; Petroleum Commission; Ghana Gas; ECG, VRA and GRIDCo.

The summit has a long-standing tradition of driving growth and investment into Ghana, and of energising local Ghanaian content. With the opportunity to meet policy makers and fellow regional experts, this year's SME-centric programme will focus on empowering local Ghanaian businesses. Topics to be discussed will include:

- **What are the local content expectations of SMEs with regards to roles and responsibilities from the government, IOCs and the private sector?**
- **Is further regulation needed to supplement the local content bill and ensure the industry continues to develop and progress forward?**
- **How is the government incentivising internationals to enter the market and adjust to new local content requirements?**
- **Using local talent to develop local talent – a collaborative approach.**
- **Developing the next generation of Ghanaian geologists.**

Safety: key focus area for OTC

THIS YEAR, SAFETY will again be a key focus area for OTC as an incident anywhere in the world impacts the industry across the globe. In addition to showcasing the latest safety technologies on the show floor, OTC's technical sessions will delve into the importance of industry collaboration.

"The future of offshore exploration and production is also deeper and more remote than ever. Many sessions in our technical programme will explore this 'last frontier,' including new deepwater plays, and the technologies needed for drilling and producing in water depths beyond 3,000 meters," said Ed Stokes, OTC board chairman.

"Another session that is eagerly anticipated is the "Offshore Energy Development: Improving Federal & State Co-operation" panel, which will take place Monday morning and feature US governors discussing the appropriate role of the various coastal states in the US and the federal government in making decisions for offshore development. We anticipate a lively discussion as the government recently announced a plan to open the Atlantic Ocean from Virginia to Georgia for offshore drilling of natural gas and oil."

"Finally, we are introducing a new OTC event this year -d5 - focused on uncovering 'The Next Big Thing' to move the offshore energy industry forward."

MARINE PLATFORMS

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Continuously promoting Nigerian Content.

While developing capacity in asset and personnel, MPL has grown to become a major player in the subsea industry, an area formerly dominated by internationals.

As a company born out of the Nigerian content initiative, we have continuously promoted the philosophy through genuine and sustainable human and material capacity building.

After successfully training over thirty Remotely Operated Vehicle (ROV) Pilot/ Technicians and continually recruiting fresh Nigerian engineering graduates who undergo a robust training program with our ROV manufacturer; Perry Slingsby UK, we were inspired to replicate this human capacity building in our marine segment through the training of Engine Cadets and Officers at the site of our subsea vessel builder, Havyard Shipyard in Leirvik, Norway.

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Petro.t.ex Africa: addressing SA's challenges

AFRICA'S PETROLEUM AND petrochemical industry faces many challenges, including climate change issues, fuel security and the falling oil price. These will be addressed at the Petro.t.ex Conference and Exhibition, a major mid- and downstream event focused on showcasing products, services and business opportunities across sub-Saharan Africa. Petro.t.ex Africa is a component of the multi-sector South African Industry & Technology Fair, and will take place in Midrand 20-22 May 2015.

"The key focus of the conference are the updates for the liquid fuel and downstream industry," said organiser Bette McNaughton. "It also covers numerous current topics such as the overall status of the liquid fuel industry in South Africa, climate change, alternative fuels, and the revised Broad-Based Black Economic Empowerment (BBBEE) Codes for the retail fuel market."

About 95 per cent of South Africa's crude oil demand is met by imports from the Middle East and Africa. However, with estimated reserves of over nine billion barrels of oil beneath South Africa's coastlines, many drilling and business opportunities exist, which could also give the country some small measure of independence from imports.

Ghana hosts inaugural ECOWAS industries forum

ECOWAS HAS CONFIRMED Ghana as the host country of the first regional Mining and Petroleum Forum (ECOMOF).

The Abuja-headquartered regional bloc has scheduled the event for 6-8 October.

The ECOWAS Commission is organising the forum in collaboration with Ghana and an international business event organiser, AME Ltd under the theme "Valorizing West Africa's Mineral and Petroleum Resources through Regional Cooperation."

The regional body added that the forum will bring together high-ranking government delegations from the region.

It said key public and private sector decision makers in the regional mining and petroleum industries will also attend.

Eni orders GE equipment for OCTP

GE OIL & GAS has won an US$850mn contract to deliver turbomachinery and subsea elements for the Offshore Cape Three Points (OCTP) block, Ghana.

The subsea scope of the order was awarded by Eni Ghana and its partners Vitol Upstream Ghana and Ghana National Petroleum Corporation (GNPC).

A consortium of GE Oil & Gas and Oceaneering International will deliver the subsea production system.

The order includes three LM2500+G4 gas turbines for power generation and four centrifugal compressors electric motor driven suitable for an FPSO.

The order also covers subsea production and control system and umbilicals engineering, as well as project management, fabrication, transport and testing.

"The project will provide domestic gas supply to Ghana's thermal power plants for more than 15 years."

The turbomachinery scope of the contract was awarded by Yinson Production (West Africa), which is supplying the FPSO vessel.

GE solely will deliver the turbomachinery solutions scope, which features three LM2500+G4 gas turbines for power generation and four centrifugal compressors electric motor driven.

Located about 60km from the Ghanaian Western Region's coast, the OCTP project features oil and non-associated gas fields.

It will access about 41 bcm of gas and 500mn barrels of oil. First oil is expected in 2017 and initial gas in 2018, with peak production planned to be 80,000 boed in 2019.

Saipem enters joint venture with Dangote Group

SAIPEM HAS ENTERED into a joint venture (JV) with Dangote Group, one of Africa's leading companies, to create a new company named Saipem Dangote E&C.

Saipem Dangote E&C is a significant new player in the Nigerian and Central/West African market, with high technical and financial capabilities. It aims to secure complex engineering and construction projects and ensure a realisation capacity focused on efficiency, in terms of costs, timing and flexibility, in order to respond to different needs related to specific projects, to local content and to the country's context.

Saipem and Dangote Group have a track record of successful collaboration, drawing on the strengths and competences of both companies.

The new JV will benefit from Dangote's financial strength, expertise and standing in the sub–Saharan African market, where it has launched a significant oil and gas investment programme, complemented by Saipem's unique capabilities in E&C, to develop new business. This new partnership confirms the shared commitment of the two groups to both the Nigerian market and sub-Saharan Africa more widely.

Saipem has been conducting operations in Nigeria for more than 50 years. Saipem Contracting Nigeria Ltd operates principally as an Engineering, Procurement and Construction (EPC) contractor for the execution of turn-key projects including oil, gas and water pipelines, oil, gas and industrial plants, infrastructures, fabrication of offshore structures and maintenance services.

Saipem operates in the engineering, construction and drilling businesses, with a strong bias towards oil & gas-related activities in remote areas and deep-waters. Saipem is a leader in the provision of engineering, procurement, project management and construction services with distinctive capabilities in the design and execution of large-scale offshore and onshore projects, and technological competences such as gas monetisation and heavy oil exploitation.

Shell in US$737mn Nigeria block sale

SHELL PETROLEUM DEVELOPMENT Company of Nigeria Limited (SPDC) has completed the assignment of its 30 per cent interest in OML 18 and related facilities in the Eastern Niger Delta to Eroton Exploration & Production Company Ltd for US$737mn.

"This divestment is part of the strategic review of SPDC's onshore portfolio and is in line with the Federal Government of Nigeria's aim of developing Nigerian companies in the country's upstream oil and gas business," Shell said recently.

Despite the divestment, Shell said it remains committed to keeping a long-term presence in Nigeria.

OML 18, spread over an area of 1,035 sq km, includes the Alakiri, Cawthorne Channel, Krakama, and Buguma Creek fields and related facilities. The divested infrastructure includes flow stations together with associated gas infrastructure plus oil and gas pipelines within the OML. The divested fields produced on average around 14,000 boed (100 per cent) during 2014.

Total E&P Nigeria Limited and Nigerian Agip Oil Company Limited have also assigned their interests of 10 per cent and five per cent, respectively, in the lease, bringing Eroton Consortium's total interest in OML 18 to 45 per cent.


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Fugro opens new office in Ghana

FUGRO'S CONTINUED EXPANSION in Africa was marked with the recent establishment of Fugro Ghana Limited in Accra. This new base provides access to Fugro's comprehensive range of services and will support the promising market for oil and gas projects for its clients in the processes of exploration, construction and field development in Ghana.

Demonstrating its commitment to the Ghanaian market, as well as the implementation of the Local Content legislation, Fugro has established a partnership with Lima Oil Services Ltd in Accra. The partnership also ensures that Fugro is ready to comply when the Local Content Policy is extended to other market sectors, including mining, energy and infrastructure, as expected.

Kelvin Abdallah, director of Fugro Ghana Limited stated: "I am proud to be part of the process of integrating Fugro's experience and knowledge into the Ghanaian community. Our country is full of opportunities and the group's extensive expertise and state-of-the-art technology mean we are best placed to maximise them.

"Our plans include extensive training programmes which will benefit from close co-ordination with Fugro Academy, the initiative that facilitates staff training and development across the Fugro Group," he continued. "I am confident that with such support, Ghanaian resources can meet the requirements of the international oil and gas industry."

West Africa a big part of Chevron's plan

WEST AFRICA IS a major source of production growth and upside for Chevron.

The company is nearing completion on several medium- and large-scale upstream projects in Angola and the Republic of Congo.

Completing the Congo River Crossing Pipeline and turning the Angola LNG facility back on-line should help get Chevron back on track.

Chevron and its partners Sonangol EP, Total, and Eni sanctioned the Mafumeira Sul development in 2013. This is the second stage of development for the Mafumeira Field, which Chevron is the operator of, with a 39.2 per cent interest. The plan is to ramp up production at the Mafumeira Field from 40,000 bopd in 2013 to 110,000 bopd and 10,000 bpd of LPG by 2015. Some natural gas is produced as well. There is room for upside, as the facility will have the capacity to handle the production of 150,000 bpd and 350 mmcfd of natural gas.

Initially, Chevron saw the expansion coming online in 2015, which was pushed back to early 2016. As of now, the consortium has completed 60 per cent of the project. It will take roughly 18 months to two years for production to be ramped up to its peak rate. The Mafumeira Sul project is building off of the Mafumeira Norte project, which was the first development phase. Completed three months ahead of schedule in July 2009, the Mafumeria Norte project began production at the Mafumeria Field.

The plan is to ramp up production at the Mafumeira Field.

FMC and Technip form joint venture

FMC TECHNOLOGIES AND Technip have signed an agreement to form an exclusive alliance and to launch Forsys Subsea, a 50/50 joint venture to unite the skills and capabilities of two subsea industry leaders. The alliance could redefine the way subsea fields are designed, delivered and maintained.

Bringing the industry's most talented subsea professionals together early in the project concept phase, Forsys Subsea should have the technical capabilities, products and systems to significantly reduce the cost of subsea field development and provide the technology to maximise well performance over the life of the field.

By combining the industry-leading technologies of the parent companies, Forsys Subsea will reduce the interfaces of the subsea umbilical, riser and flowline systems (SURF) and subsea production and processing systems (SPS). It will also simplify the seabed layout, reducing complexity, accelerating time to first oil, and maximising sustainable peak production. This unique combination will drive a new, step-change approach to how equipment designs and installation methods converge in a new generation of subsea architecture. Forsys Subsea will focus on:

- Early involvement in the concept selection phase of front-end engineering and design, when the ability to influence cost is greatest.
- Integrated life-of-field well surveillance, monitoring, data interpretation and advisory services.
- Joint R&D to drive technological innovations to boost efficiency and further reduce development costs.

In addition, the alliance will be uniquely positioned to deliver and install a seamless subsea infrastructure from seabed to topside by eliminating interfaces and by integrating SPS with SURF, attaining the highest reliability and uptime and the lowest total ownership cost available in the industry, the company said.

Atlas wins Western Sahara contract

ATLAS DEVELOPMENT & SUPPORT Services Ltd has secured a support services deal for a European and North Africa-focused oil and gas company operating in Western Sahara.

Atlas said it will provide civil engineering supervisory, advanced life support, security and risk advisory services to the unnamed company. It did not provide any financial details on the contract.

"We have a streamlined business with a reputation for delivery. Being awarded this contract highlights the company's ability to execute new opportunities in additional jurisdictions and is testament to our ability to service our clients' requirements in a competitive market, whilst still demonstrating a robust margin model and profitable business framework," said Carl Esprey, chief executive of Atlas.

Shell agrees to terms for BG takeover

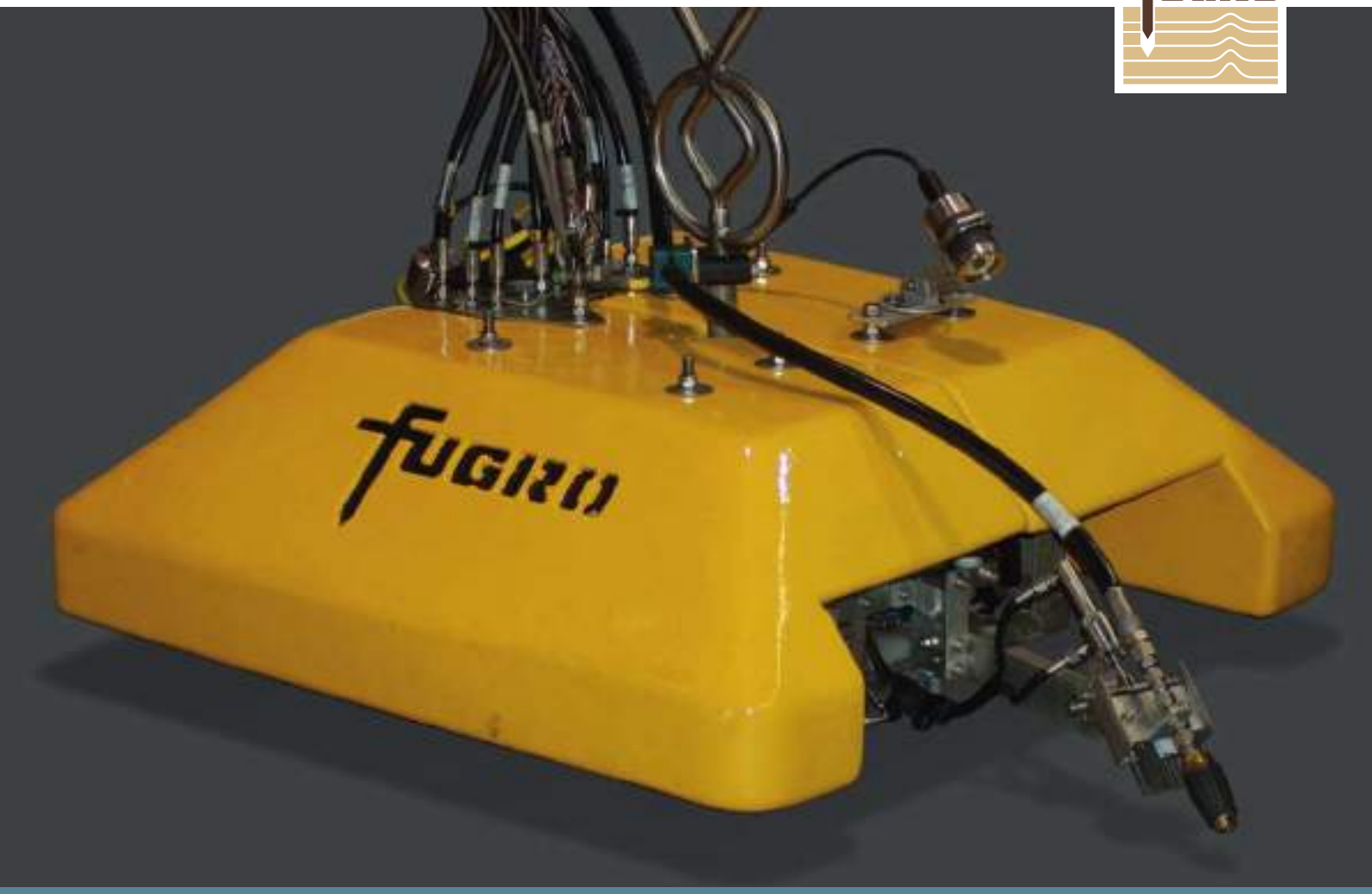
SHELL HAS OFFERED to acquire BG Group's entire share capital for US$69.7bn. The boards of both companies have recommended their respective shareholders to endorse the acquisition.

Shell says the combination would accelerate its growth in global LNG and deepwater E&P.

It would add around 25 per cent to Shell's proven oil and gas reserves and 20 per cent to its production, each on a 2014 basis.

Shell CEO Ben van Beurden said: "BG and Shell are a great fit. This transaction fits with our strategy and our read on the industry landscape around us. This transaction will be a springboard for a faster rate of portfolio change, particularly in exploration and other long-term plays."

BG CEO Helge Lund, who only recently joined from Statoil, said: "The offer from Shell has strong strategic logic. BG's deepwater positions and strengths in exploration, liquefaction, and LNG shipping and marketing will combine well with Shell's scale, development expertise and financial strength."



06

PROBLEM:
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Supply disruptions and OPEC's new strategy are confounding the oil experts. But demand for Africa's premium grades is on the rise.

A better tomorrow

OIL PRICES WERE heading up again by the end of February, but the International Energy Agency's medium-term Oil Market Report made disturbing reading for most African exporters nevertheless. "OPEC's share of global supply will inch up from recent lows but will not recover to the levels enjoyed before the surge in LTO supply," it said.

By 13 March the mood was lifting, following several encouraging world-economy forecasts. However, the Agency was still warning about a "tentative" situation, that "producer countries that depend on high oil prices and that do not enjoy large buffers will find it hard to balance their budget".

Asked a few days later, the chief executive of a European chemical major said little change is expected in crude prices this year. Most African grades are currently trading at a US$10 premium over WTI in the United States, where stocks are brimming.

Equally positive, the US-led light-tight "revolution" (the IEA's word) has made OPEC's own output more responsive to price swings, circumstances which are likely to set the stage for a "relatively swift recovery".

But on 4 March Saudi oil minister Ali al-Naimi said: "It is not the role of Saudi Arabia, or certain other OPEC nations, to subsidise higher-cost producers by ceding market share. Demand is gradually rising, global economic growth seems more robust and the oil price is stabilising. Saudi Arabia's quest for market share is simply an effort to satisfy rising customer demand."

It is established African exporters that stand to benefit from the general market tightening that is expected next year.

Maintaining this was the apparent objective of the output target set by OPEC last November. Details of just how this will be maintained through 2020 formed a substantial part of this year's MTOMR projections. More space was devoted to Iraq – harder hit than most by the price situation – than any other state. There "The drop in oil prices and worsening security situation ... pose daunting challenges, but have yet to cause a substantial slowdown in growth." This country alone is expected to account for nearly 90 per cent of OPEC's total increase in supply capacity through the IEA's forecast period.

Putting the brakes on supply

The latest medium-term report pointed out that the recent price "crash" (their term again) is "putting the brakes on supply, with both OPEC and non-OPEC producers scaling back investment." This is already underway in Angola, where cost cutting is taking place. The Maufumeira Sul and Cameia projects are being delayed, and a planned FPSO has been downsized. Nigeria's outlook has been clouded by the postponement of the presidential election; production there has been "set back in the medium term" the Agency said.

Libya still real trouble spot

But the real trouble spot continues to be Libya, where direct targeting of oil installations (especially the export-serving pipeline from Sarir) by militants, and many other operating difficulties, have led to the declaration of force majeure on the output of several individual fields in the east.

The result of all this locally, and more around the oil world, is that global capacity growth could slow to just 860 kbpd annually through 2020, compared to the healthy 1.8 mbpd predicted last year.

"OPEC has, for now, given up price support," the IEA pointed out. The USA's shale deposits with their short lead times are expected to remain the number-one source of crude supply growth; some individual products are already hitting supply bottlenecks.

The bottom line is that, in highly unstable circumstances like these (especially the security uncertainties in Iraq and Libya and the plans to increase output by these key suppliers by 2020) it is established African exporters that stand to benefit from the general market tightening that is expected next year. But that word "tentative" is more than likely to be used again.

"On the face of it, the oil price appears to be stabilising," the IEA said on 13 March. "Behind the façade of stability, the rebalancing triggered by the price collapse has yet to run its course."

So there's no doubt that the USA's shale bonanza has fundamentally changed a global market which is being left to rebalance itself. "What a precarious balance it is", the Agency pointed out. More chapters in the continuing story of oil are certain to come, but operators in other basins - such as the North Sea - find themselves facing a bleaker future than most in North and West Africa. ■

20' OST DRY VAN

Mfd. to DNV 2.7-1/ EN and BS 12079:2006. - 6058L x 2438W x 2591H
Max Payload Offshore: 10000kg • Tare: 3800kg • **Also available in 10'**

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10-TON OMS VACUUM MUD CUTTING SKIP

Mfd. to DNV 2.7-1 / EN and BS 12079:2006. • 2213L x 1852W x 1617H
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2900ℓ HELI-FUEL TANK

Mfd. to DNV 2.7-1 / EN12079 - 2150L x 1980W x 1331H
Max Filling Capacity: 2900ℓ • Payload: 3650kg

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Max Filling Capacity: 3800ℓ • Payload: 7600kg

10' - 7900ℓ 20 BAR PORTABLE TANK

Mfd.to CSC DNV 2.7-1 - Max Working Pressure: 20 bar
Nominal Capacity: 7900ℓ • Payload: 7600kg

SALES • RENTALS • CONVERSIONS

Container World is a South-Africa-based company that has been providing specialised container conversions to the African onshore market since 1983. In 2010 the company expanded its product range and is now able to offer a wide variety of offshore containers, baskets, skips, reefers and accommodation modules, all certified to DNV 2.7-1 and EN 12079. Strategically located in Cape Town and with most units available ex stock, Container World is well placed to be able to service demand from both East and West Africa, with short lead times and at competitive prices. The company's onshore division remains a leading supplier of converted containers to the African market, including accommodation, dining, kitchen, ablution and office units. With more than 31 years of experience servicing the African market, and with 10 strategically located branches, Container World is ideally positioned and experienced to handle any onshore or offshore container enquiry.

Lloyd's Register

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Angola's status as an expanding oil producer hinges on realising pre-salt potential. Moin Siddiqi reports.

All eyes on Angolan pre-salt potential

ABOUT 165MN YEARS ago before the break-up of the Gondwana super-continent, the west coast of Angola (along with Gabon and Namibia) and Brazil's eastern coast were adjoined. Geologists believe, and early drilling has indicated, that the geological structures found on both sides of the Atlantic are remarkably similar and before the continents drifted apart during the Early Cretaceous period, Brazil's prolific Campos and Santos Basins were just 100 km from Angola's Kwanza Basin.

The potential of Angola's offshore reserves was first recognised in 2006/07, when 10 to 20bn plus barrels of ultimate recoverable oil were found in deepwaters off the Brazilian coast in pre-salt formations. "When we made the first discovery in Brazil the idea was to look for the best spot in Africa where we could replicate the success," Didier Lluch, Repsol's regional exploration manager for West and East Africa, told London-based Petroleum Economist.

Spain's Repsol has had considerable successes in Brazil's pre-salt play, where it has a stake in the Sapinhoá and Carioca oil discoveries. The Santos Basin is viewed as among the most exciting exploration frontiers of recent times and given geological similarities between the two continents, geologists reckon Angola's pre-salt layers could well match formations found off the Brazilian coast.

If proved correct, that would mean significant new oil supplies from the west coast in Angola's Kwanza Basin, as well as Namibia's Namibe Basin and Gabon's Gabon Basin over coming decades. "Until recently, Angolan exploration was focused on shallow post-salt sediments, further north in the Lower Congo Basin. The large discoveries in Brazil have changed that and while it is difficult to quantify the pre-salt potential offshore in Angola, it is likely to be significant, noted Norway-based Petroleum Geo-Services.

High expectations

The country's oil production, mostly from known reserves, is expected to reach 2.5mn bpd by 2019. The UK-based energy consultancy Wood Mackenzie, wrote: "There is going to be a slow and steady rise, rather than a dramatic one, between now and the turn of the decade." Thereafter, output growth will be contingent on the development of ultra-deep pre-salt blocks. Should the latter prove as prospective as Brazil, bringing online some of Angola's new offshore blocks could potentially help to double production capacity to 3.5mn bpd over the medium term, according to industry experts.

BP's PSVM FPSO oil vessel, 180km off the coast of Angola. Image: Emily Gosden.

Political risk consultancy Eurasia Group commented: "The pre-salt exploration looks promising and could potentially catapult Angola to become Africa's largest oil producer. Angola is

Table 1: Upcoming Oil Projects in Angola

Project	Peak output (000 bpd)	Operator	Start-up date	Location	Notes	FID **
Mafumeira Sul	110	Chevron	2015	Block-zero offshore	Associated natgas will be sent to sole LNG plant in Soyo Additional 10,000 bpd of non-crude liquids will be produced.	Yes
Lianzi field	23	Chevron	2015	Block-14 deepwater	Located in a unitised offshore zone between Angola & Congo (Rep), the first cross-border development in the region Field will produce a total of 46,000 boed of crude oil, non-crude liquids and natural gas.	Yes
Kizomba Satellites						
Phase 11	59	ExxonMobil	2016	Block-15/06 deepwater	Combines the development of Kakocha, Bavuca & Mondo South fields. Further E&D phases are planned to start output from nearby discoveries.	Yes
Negage	75	Chevron	N/A	Block-14 deepwater	Close to Lianzi field, & the border with Congo (Rep)	No
Lucapa	100	Chevron	N/A	Block-14 deepwater	Close to Lianzi field, & the border with Congo (Rep)	No
East Hub project						
Cabaca Norte South East (SE)	80+	ENI	2016+	Block 15/06 deepwater	Additional E&D phases are planned to start production from nearby discoveries	N/A
B31 SE	200+	BP	2016+	Block-31 ultra deepwater	Discovery of Palas, Ceres, Juno, Astrea, Hebe, Urano, Titania Miranda, Cordelia Portia fields	N/A
Kaombo Project	200	Total	2017	Block-32 ultra deepwater	Feasibility studies are commissioned to decide whether to proceed with development	N/A
Chissonga	100	Maersk Oil	N/A	Block-16	Project was declared commercial in 2011.	No
Malange	50	Chevron	N/A	Block-zero	Project expected to supply a significant amount of natural gas to Angola LNG.	No
Cameia	100	Cobalt	N/A	Block-21 off-shore pre-salt	Cobalt expects to make a FID to develop Cameia by end-2015.	No

*** Final investment decision*
Source: US. Energy Information Administration based on company reports.

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And four fifths of the earth is under water

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increasingly more attractive to big oil industry investors than Nigeria, given Angola's greater stability, fewer regulatory uncertainties and security challenges." Concurrently, low geopolitical risk has helped Angola to attract 'colossal' foreign direct investment (FDI) from oil majors over years. BP plans to spend US$15bn in the coming decade, while Total's next mega-project (Kaombo) in Block-32 ultra-deepwater is estimated to cost US$16bn.

The country's first pre-salt discoveries were the Denden-1 well Block-9 (1983) and the Balela-1A well Block-20 (1996). The US-based Cobalt International Energy now operates both blocks. In early 2012, Cobalt made a landmark ultra deepwater find in the Lower Kwanza Basin estimated to hold 1.5-to-2.0bn barrels of crude. Many international oil companies (IOCs) are currently or planning to undertake exploration activity in pre-salt bearing blocks (see Table 2). The areas reputed to boost pre-salt deposits are Blocks 19-20; 22; 24-25; 35-40; and 46-48.

Technical challenges

Pre-salt layers off the Angolan coast between 2,000 and 5,000 metres below the seabed have a high potential for storing hydrocarbons. Flow-rates from pre-salt fields can be high, reflecting higher reservoir temperatures and - with the salt layer preventing the drifting of light hydrocarbons - hence the crude is of good quality. By contrast, Angola's deep-water reservoirs lie at relatively shallow depths below the seabed, so the oil is cool and of medium gravity. Drilling through underwater rock formations to extract pre-salt oil and gas is very expensive and difficult. Accordingly such wells are likely to cost far in excess of US$100mn to drill.

There are also uncertainties in seismic imaging through the salt layer, which in Brazil is about 2,000 metres thick and lies in fewer than 2,000 metres of rock; similar thickness are being reported in Angola. Substantial upfront capital spending and technical expertise to develop complex pre-salt fields imply that only big IOCs can participate in this new frontier of oil exploration.

Sophisticated seismic techniques have allowed pre-salt deposits to be better imaged. Wood Mackenzie explained: "While it's not the most straightforward of drilling, the technology and knowledge are improving all the time. Three or four years ago, it was absolutely at the limit of what could be done. Now, while it's not for every company, it's not by any means impossible." In mid-2012, Sonangol had gained access to Repsol's advanced seismic imaging technology, known as Kaleidoscope that proved highly effective in mapping out new oil discoveries in Brazil and the Gulf of Mexico. Sonangol engineers are using these subsurface imaging tools to pinpoint their whole sub-salt resources – especially targeting the Kwanza Basin, which is reputed to hold untapped hydrocarbons reserves.

In sum, Angola sits on the world's 17th largest oil reserves – conservatively estimated at 12.9bn barrels (third-biggest in Africa) – and could be twice that size according to some industry experts. Pedro Calixto of PricewaterhouseCoppers in Luanda, said: "The oil sector keeps growing because they're still finding new reserves." Ultimately, recoverable oil reserves and production could rise steeply over the coming decade if the most optimistic projections about Angola's pre-salt blocks prove correct.

The 'ultra-costly' pre-salt play offers high-risk and high-reward exploration hotspot for the world's bolder explorers. As Repsol's Mr Lluch put it: "The eyes of the industry are on the Angolan pre-salt."

Wood Mackenzie believes pre-salt's potential off Angolan acreage is undeniable but it's too early to draw definite conclusions. The downturn in oil markets could render most 'ultra-ultra-deep' Greenfield projects uneconomical at current prices. Analysts reckon US$80/barrel oil price is essential to justify the US$100bn investment to bring Angola's pre-salt prospects to fruition. ■

Table 2: Pre-salt Exploration in Angola

Blocks	Operators	Partners	Recent discoveries
Six	Petrobras	Sonangol, Falcon Oil	
Eight	Maersk	Sonangol P&P, Svenska Petroleum	
Nine	Cobalt	Sonangol P&P, Nazaki, Alper	
19	BP	Sonangol P&P, China Sonangol International	
20	Cobalt	Sonangol P&P, BP	Lontra-1
21	Cobalt	Sonangol P&P, Nazaki, Alper	Cameia 1&2, Mavinga1, Bicuar *
22	Repsol	Sonangol P&P, Statoil	
23	Maersk	Sonangol P&P, Svenska Petroleum	Azul 1*
24	BP	Sonangol P&P	
25	Total	Sonangol P&P, BP, Statoil	
26	Petrobras	BP	
35	ENI	Sonangol P&P, Repsol	
36	ConocoPhillips	Sonangol P&P, China Sonangol International	
37	ConocoPhillips	Sonangol P&P, Repsol	
38	Statoil	Sonangol P&P, China Sonangol International	
39	Statoil	Sonangol P&P, Total	
40	Total	Sonangol P&P, Statoil	

Pre-salt wells are ultra-ultra deep, Azul-1 was drilled to 5,334 metres total depth, while Cameia extended to 5,475 metres, equivalent to more than half the height of Mount Everest.

Source: Company reports and Sonangol.

The hydrocarbons profile

- The oil and oil derivatives industry, the bedrock of the Angolan economy, accounts for 45-50 per cent of gross domestic product (GDP), as well as 90-95 and 70-75 per cent of total exports and government revenues.
- The national oil company SONANGOL formed in 1976, oversees hydrocarbons development. It owns 17 subsidiaries that operate across the oil and gas sectors – undertaking exploration, production and marketing of oil, refined products and storage. Key subsidiaries include Sonangol Pesquisa e Producao responsible for E&P activities; Sonangas and Sonaref, which runs refining operations.
- Exploration history dates back to 1915, when the first exploration well, Dande-1, was drilled onshore. However, it took another 40 years before a commercial oil discovery was made in 1955 in the onshore Kwanza (Cuanza) basin. In the 1990s, Angola began exploring its deep waters, which proved a huge success in the Lower Congo and Kwanza Basins. Both also contain the bulk of 'proven' and 'probable' crude reserves.
- Oil production is concentrated in numerous onshore and offshore blocks. The latter are divided into "band A": Shallow water blocks zero-13; "band B": Deepwater blocks 14-30; and "band C": Ultra-deepwater blocks 31-34. There is potential for additional output from new blocks (46-50) now being designated in the ultra-deepwater offshore lower Congo basin, referred to as "ultra-ultra-deep" reaching depths of 2,500 metres.
- The majority of Angolan oil is heavy to medium crude (30-40° API), with low-sulphur content (0.12 to 0.14 per cent) – favoured by refiners. Output: 1.75mn bpd (February 2015), according to OPEC figures.
- Main export blends: Cabinda, Girassol, Hungo, Kuito, Xikomba and Nemba.
- Major oilfields: Takula, Nemba, Kokongo and Sanha [Block zero]; Pacassa and Cobo/Pambi [Block-3]; Kuito, Benguela and Belize [Block-14]; Kissanje, Dikanza, Hungo, Chocalho and Xikomba [Block-15]; Dalia, Girassol, Rosa, Tulipa [Block-17]; Galio, Cromio, Paladio, Plutonio and Cobalto [Block-18].
- The leading oil producers: Chevron, ExxonMobil, Total, BP, Italy's ENI, US-based ConocoPhillips, Cobalt International Energy and Marathon, Repsol of Spain, Tullow Oil (UK), Brazil's Petrobras, AP Moller-Maersk (Denmark), Norway's Statoil, China's Sinopec, China National Offshore Oil Corporation (CNOOC), and Oil National Gas Co (India), among others. 'Supermajors' (Chevron, Total, BP and ExxonMobil) between them account for the bulk of Angola's production as well as holding significant equity stakes in other blocks, both onshore and offshore. Angola also hosts leading service companies such as US-based Halliburton and Schlumberger.
- Major oil ports: Luanda, Malango (Cabinda), Palanca and Quinfuquena.
- Proved natural gas reserves (2014): 9.7 tcf – Oil Gas Journal estimates; Natural gas production (2013): 380 bcf (EIA data).

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The local workforce occupies an important place in the deep offshore CLOV development. 10 million hours of work was carried out on site by local companies and a considerable amount of equipment for the CLOV project was manufactured locally – hitherto unseen in Angola.

CLOV: making history

"CLOV HAS CHANGED the history of Angola's oil and gas industry in terms of construction," said José Luís Fernandes, tow and hook-up co-ordinator of CLOV FPSO at Total E&P Angola. "It has involved about 10 million man-hours of work in Angola, a figure never touched anywhere else inside the country in terms of oil and gas construction. It has also used 64,000 tonnes of equipment manufactured locally. That makes it a revolutionary project for Angola.

CLOV is the acronym for a cluster of four oilfields, Cravo, Lírio, Orquídea and Violeta in Block 17, a Total-led development and consists of 34 deep undersea wells which reach depths of between 1,100 and 1,400 metres.

Another reason why the CLOV project represents radical change for Angola is its greater visibility. The giant FPSO vessel was the first ever to put into an Angolan port, where it was also the first to have an Angolan-made processing module fitted.

The CLOV FPSO is a giant 119.00-tonne vessel, which can store 1.78mn barrels of oil and is able to process 160,000 bpd.

On stream, on schedule

Total's CLOV FPSO began production on 12 June 2014 after four tugs towed it out to its station some 140 km from Luanda. It came on stream on schedule four years after project construction started in 2010.

FPSO vessels are the major surface indicators of massive, sprawling undersea oil and gas production systems. At ocean depths of between 1,100 and 1,400 metres CLOV gathers an array of equipment; wellheads and pipeline systems spread over a 381 sq km area of seabed.

The giant FPSO vessel was the first ever to put into an Angolan port.

CLOV FPSO resembles the body of a giant octopus, with its long straggling tentacles connecting to the seabed machinery. These mechanical 'legs' contain anchors, control communication cables ('umbilicals') and pipelines which pump oil and gas aboard the vessel for processing, storage and then transfer to oil tankers.

Geneviève Mouillerat, the project director, described CLOV as "an underwater city of wells, manifolds, multiphase pumps, production lines....a universe of high technology."

On time, on budget

"CLOV is a flagship project for Total. It demonstrates the group's capacity to successfully start up a project on time and within budget while mastering cutting-edge deep offshore technologies and keeping safety and the environment top priorities," said Arnaud Breuillac, president of exploration and production at Total.

The French multinational is Angola's leading operator with about a third of the nation's current overall oil output from all sources. Total-led production with nearly 600,000 barrels of oil and gas at the end of 2013.

Block 17 is set to become Total's most prolific site as CLOV joins three other FPSOs in the concession area: Girassol, Dália and Pazflor.

CLOV is the final development pole in the block, which holds some five billion barrels of reserves. Its initial oil output is 160,000 bpd and will help BLock 17 reach maximum output of 700,000 bpd in 2015. CLOV's estimated reserves of 505mn barrels will be produced over 20 years.

Sonangol EP is the block concessionaire, while Total is operator with a 40 per cent interest. Total's partners are Statoil (23.33 per cent), Esso Exploration Angola (20 per cent) and BP (16.67 per cent).

Impact onshore

CLOV was the first FPSO to put into an Angolan dockside and also to have a locally-produced module fitted. The CLOV contract also represented a strategic commitment leading to yard upgrades. The Paenal yard [at Porto Amboim] was predicated on the CLOV contract.

One of CLOV's main goals was to increase local content, said Fernandes. As well as the foundation of Paenal, CLOV also stimulated expansion at Angola's Angoflex and Sonamet yards, producers of, respectively, umbilicals and fabricated steel structures.

Equipment packages were manufactured and assembled all along Angola's coast from Petromar (Soyo) and Sonils Base (Luanda) in Lobito province to Benguela (Angloflex and Sonamet). Angloflex produced 80 km of umbilicals and Sonamet 50 per cent of all production lines and water injection equipment used, including riser towers and the offloading buoy. Sonamet also manufactured seven of the eight manifolds, while Luanda's Sonils yard assembled and tested most of CLOV's 'Christmas tree' wellhead valve systems.

The highlight of the CLOV project was the installation of a complete locally made FPSO water treatment module at the Paenal shipyard.

"This event has significance fo the oil sector in Angola and the world in general. The manfuacturing and installation of the water treatment module on the CLOV FPSO is an example which demonstrates the development of advanced technology in Angola," said Sonangol oil engineer Geraldo André Raposo Ramos.

Preparation for the fitting of the topside unit involved assembling Africa's largest crane. Nicknamed 'Jamba' (elephant) by the Angolans, the 4,500-tonne heavyweight crane with 2,500-tonne lift capacity was inaugurated in July 2013.

The smoothly run CLOV FPSO operation has earned Angola kudos among the continent's oil-producing nations and also raised the percentage of locally manufactured content in the industry, a key

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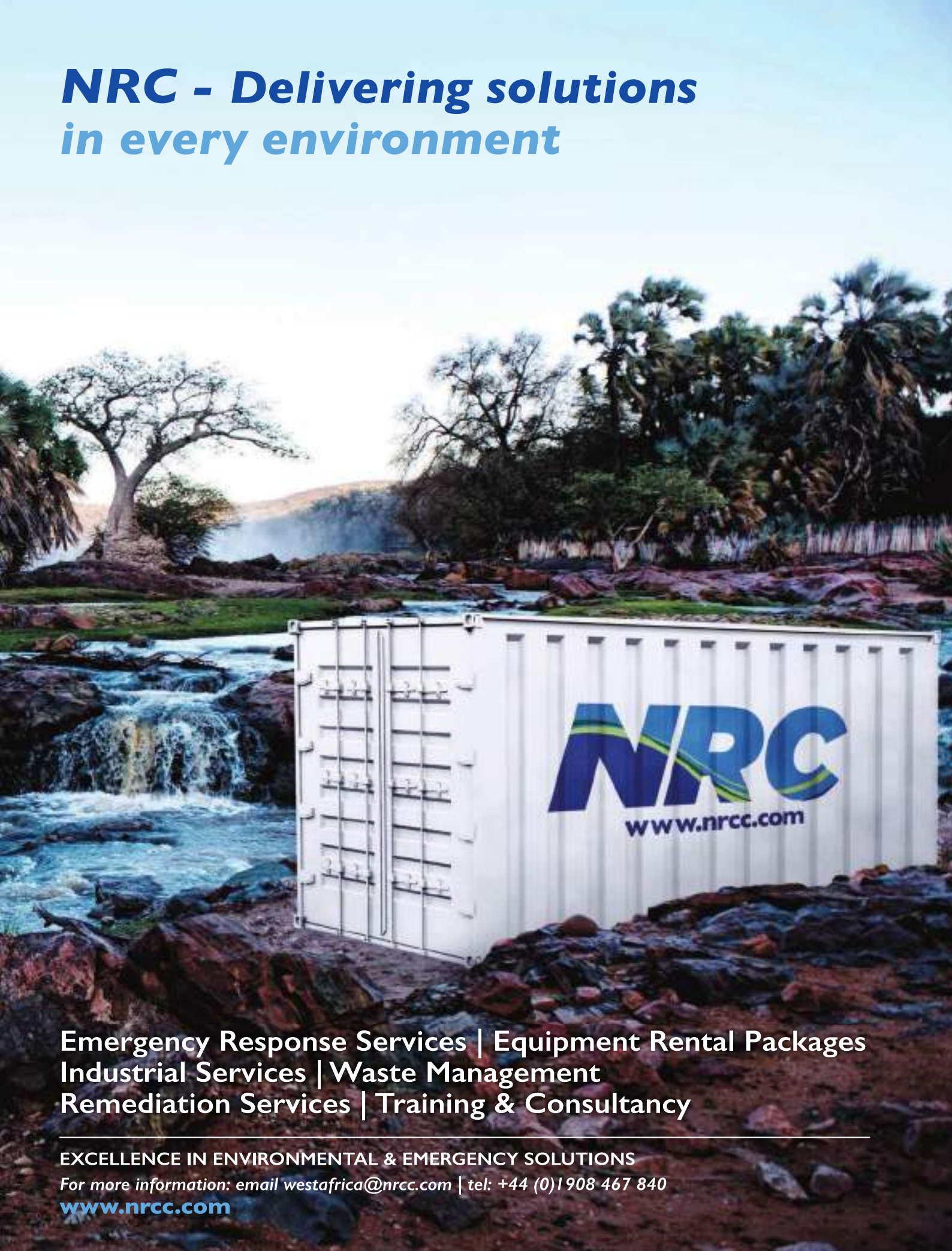

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Panoramic view of FPSO CLOV at the quayside of Paenal yard.

objective of the Angolan government.

"The project has contributed to the increase of local content in the areas of production,

Valuable experience and skills have been gained to apply to similar jobs on FPSOs in future.

engineering, management of projects, quality control, human resources, administration, finances and logistics as well as health and safety, and giving more job opportunities for Angolans, " added Ramos.

Angola's now proven capacity to undertake such a huge and complex task means valuable experience and skills have been gained to apply to similar jobs on FPSOs in future and serve the country's expanding deep-sea oil production.

According to Fernandes, all of Total's FPSOs in Block 17 have yielded many local benefits in terms of content manufacture, the broader economy, jobs, profits, training and technology transfer, allowing the acquisition of skills and experience.

Content with the locals

Total has a young, highly qualified workforce of 2,200, around two-thirds of which are under 35. As part of its Angolanisation process, currently 74 per cent of Total employees in the country are local, and the company aims to reach 80 per cent in 2016.

The French company has scored other major successes involving personnel in the CLOV project, which generated 1,000 jobs in Angola over a period of four years. The health and safety record for the project included 32mn work hours with no fatal accidents. Furthermore, Total awarded around 20 per cent of the value of all CLOV contracts in Angola - the first time such a level of local content has been reached - and 3,600 tonnes of equipment were integrated on the FPSO in country, a first again. ■

This article was originally published by Sonangol.

Paenal shipyard takes shape*

PAENAL IS THE first yard in West Africa with the capacity to facilitate mega FPSO vessels.

Porto Amboim Estaleiros Navais, known as Paenal, is a joint venture company between the state-owned national oil company Sonangol, SBM Offshore, and third partner DSME, which joined a year after the initiative began in 2007.

Within five years this former wild expanse of beach developed into a world-class fabrication and integration yard. The young shipyard has built a reputation with two FPSOs – destined for production offshore Angola – having berthed at its quay where module integration and the final stages of refurbishment took place.

Paenal was established to meet Angola's need to develop manufacturing technology and integration of modules in FPSOs. With its 2500-ton heavy lift crane (HLC), inaugurated last year, combined with a 490m purpose-built quayside, the yard is fully commissioned and can accommodate the installation of topsides into mega FPSOs. The yard is capable of producing up to 10,000-ton of modules per year, which represents approximately two million man-hours per annum.

In July 2014, the FPSO N'Goma sailed away to the Eni-operated Block 15/06, where mooring operations by the SBM Installer vessel have been completed and hook-up operations and acceptance testing is to follow.

Further cementing Paenal's position in the oil industry was its successful fabrication, lift and integration of a 1,836-ton module onto the CLOV FPSO followed by Angola's first naming ceremony at the yard. It was quite fitting that the French giant, which celebrated its 60th Anniversary in Angola, gave the young yard a foot in the industry door. The lift also made the record books as the first ever topside module integration performed in Africa, thanks to Paenal's heavy lift crane, Jamba.

Total's FPSO project was the first to put Paenal in the news when CLOV pulled up quayside in November 2013 and set a record for Paenal and Africa by being the first FPSO to berth at a West African quayside.

In addition to FPSO projects, the fabrication of two well-head platforms – at 3,200 metric tons each – is currently progressing at Paenal. Both are destined for the Mafumeira Sul field in Block 0 offshore Angola. Paenal, in consortium with DSME, was awarded the project by Chevron and work under the Angolan scope began in May 2013, with a first steel cutting ceremony.

With Angola being the newest player in pre-salt oil and gas exploration and looking to raise production from a current average of 1.75-2mn bpd next year – and sustain this until 2020 – the opportunities for Paenal are wide open.

Earlier last year, at the World Petroleum Congress, Angolan Petroleum Minister José Maria Botelho de Vasconcelos announced several initiatives, including offering deepwater and ultra-deep water blocks off the south of the country next year, as the African producer pushes for its target output.

In July, the minister attended the naming ceremony for N'Goma FPSO at Port Amboim saying: "Paenal is indeed a yard that closes a gap in terms of local content. For Angola, it represents an instrument that will allow and has already facilitated the transfer of knowledge and technology, while always focusing on training and the employment of more Angolans to contribute towards the sustainability of the oil industry related activities in Angola."

Paenal's people

The qualified and trained workers are the result of a long-term investment over the past eight years by partners SBM Offshore and Sonangol. A training school was set up in 2008 and has since trained

SBM workers at Paenal yard.

420 local people from the Port Amboim area. Previously unemployed or working as fishermen or farmers, they are now skilled welders and fabricators employed by the yard. The knock-on effect of a stable source of work for a vulnerable community has profoundly transformed not just the workers but the livelihood of entire families and local businesses that live to the rhythm of Paenal. The yard is the biggest employer in the region with a workforce of over 1,200 employees.

"The fact that Paenal is a fabrication shipyard with 85 per cent Angolan nationals employed represents a success story in the development of the country's facilities and infrastructure. We continue to strive to develop the yard's full potential and to grow its personnel," said Jean-Philippe Rodigues, SBM Offshore business development senior vice president in Angola.

In line with the partners' plan, the yard is becoming a thriving hub and is attracting other businesses and support services, which is also fostering growth for the community; in part by Paenal giving preferential consideration to local suppliers. Among the companies to set up operations in Port Amboim since the yard opened are Friedlander Angola, Conduril - Engenharia SA, Heerema Marine Contractors, Panalpina and PIC.

** SBM Offshore's Paula Farquharson-Blengino provides an inside look at the company's Angola shipyard, a joint venture between partners Sonangol and DSME.*

Vaalco Energy spuds offshore Kindele-1 well

US-BASED OIL production company Vaalco Energy has commenced drilling at Kindele-1 well in Block 5 offshore Angola. Drilling contractor Transocean's Celtic Sea semi-submersible rig is being used to drill the Kindele-1 well to a total depth of 2,250 metres, at a water depth of 100 metres.

Transocean´s Celtic Sea semi-submersible rig.

Steve Guidry, CEO of Vaalco Energy, said, "We are very pleased to announce this major step forward for our operations offshore Angola. After nearly nine years of continued commitment to our Block 5 license, we are embarking on an important phase in our efforts to explore for hydrocarbons from the country. "The company is also nearing finalisation of the seismic processing in the outboard part of Block 5, which was carried out to image pre-salt structures as potential targets for future exploration wells on the block." In October 2014, Vaalco Energy and natural gas production firm Sonangol entered into the subsequent exploration phase (SEP) on Block 5 offshore Angola. According to the SEP, both the companies have committed to drill a total of four exploration wells in the southern African country.

Eni begins operations in the West Hub

ENI HAS STARTED production of first oil from the West Hub Development Project in Block 15/06 in the Angolan Deep Offshore, approximately 350 km northwest of Luanda and 130 km west of Soyo in December 2014.

The field is currently producing 45,000 bopd through the N'Goma FPSO, with production ramp-up expected to reach a daily production of up to 100,000 bopd in the coming months. The start-up of the East Hub Development, expected in 2017, will raise overall production from Block 15/06 to 200,000 bpd.

Having won the international bid round in 2006, in Block 15/06 Eni drilled 24 exploration and appraisal wells, discovering over three billion barrels of oil in place and 850mn barrels of reserves.

The West Hub Development entails the sequential start-up of the Sangos, Cinguvu, Mpungi, Mpungi North Area, Vandumbu and Ochigufu fields.

Eni said it will also continue its exploration programme in Block 15/06. The recent discovery of Ochigufu has added 300mn barrels of oil in place which will be tied in to the N'Goma FPSO within the next two years.

Eni CEO Claudio Descalzi commented: "The start-up of the West Hub in Angola is a milestone in Eni's upstream activities. Starting from an extraordinary exploration success we have achieved an industry-leading time to market of only four years from the declaration of commercial discovery. This result reflects a new, modular, development model which adds value to our strategy of organic growth. The start up of the West Hub is also significant in terms of Eni's presence in Angola, where are again operator of a major producing project".

Angola is a key country in the strategy of organic growth of Eni, which has been present in the country since 1980 with a daily production in 2013 of 87,000 boe.

The West Africa Transform Margin offers some considerable opportunities and attractions. Samuel Ciszuk reports.

Strengthened prospects, greater uncertainty

THE FALL IN global oil prices during the second half of 2014 has started to fan the flames of cost cutting across the industry. The first three months of 2015 have been characterised by news of deferred projects, limited scopes and slashed ambitions, as companies try to adjust to the changed circumstances.

Since the markets by March remained with a sizeable oversupply and increasingly crowded inventories, few now seem to expect the low-price environment to clear within a six to nine month period. In fact, it seems market actors are starting to brace for further price weakness ahead of Q2.

For almost pure exploration plays like the offshore West African Transform Margin (WATM), in countries with none, or limited, upstream industries, this spells bad news. Opportunities may be there and without actual dry wells interest will never wane completely.

However, with low oil prices, the appetite for offshore projects, relatively far away from developed oil industry logistics and technology centres, is bound to take a hit. For Liberia and Côte d'Ivoire, the news is especially bad, since they are late comers in comparison to Ghana. Côte d'Ivoire has long-established oil production, but not in the WATM deepwater zone, where effectively all its future potential lies.

Furthermore, both countries are just emerging from tumultuous political pasts, with relatively weak institutions. Liberia, given its bloody and prolonged civil war, arguably starts from the weaker position of the two. Investment might be welcomed warmly now by governments looking to deliver growth, but given the two countries' track records, business has approached them somewhat cautiously, even in the former high oil price environment.

Yet, neither Liberia, nor Côte d'Ivoire should be discounted at this stage. IOCs cannot afford to completely halt their exploration activities and E&P portfolios need to be kept diversified. The WATM offers some considerable opportunities and attractions. For being deepwater, the play has so far come up as not particularly complex. Production costs have also been very favourable, particularly judging from the original sizeable discovery and first large oilfield in this play to come onstream, Ghana's Jubilee field.

Comparatively attractive terms

Terms are still comparatively attractive in these countries, as governments remain eager to draw in exploration spending commitments; and, given the regional inexperience with oil, local content laws are not leading to the same cost bubbles as in Angola, or across the Atlantic, in Brazil.

Côte d'Ivoire has long-established oil production - the Gazelle well offshore Côte d'Ivoire.

Of course, a broader exploration push by IOCs in the waters west of Ghana would, if results were positive, very easily lead to overheating local economies and start fuelling project cost inflation. The relative proximity to Ghana and even more so Nigeria, could however be used to mitigate this, if oil companies planned accordingly.

Nigeria has, in the past decade, developed more of a national supply sector. With the country's own investment climate problems and falling offshore activity, its infrastructure could be utilised at least as a launch pad in the beginning of a development cycle even as far away as Liberia.

The opportunities for synergies should be there, even though the industry's track record for organising its supplies and logistics in such a way would suggest this opportunity could well be overlooked.

Also, this opportunity could easily be wrecked by governments wanting to cash in on upstream projects from a job creation perspective far too early, as to some extent has happened in Ghana, pushing up project costs unnecessarily and jeopardising further project growth.

The WATM offers some considerable opportunities and attractions.

Exploration momentum must not be lost

Those are, however, speculations about possible routes to minimise cost inflation in the future. For now, it is paramount for the countries that exploration momentum is not lost.

Total's discovery in Ivorean deepwater during the first half of last year needs to be followed up by more drilling commitments.

A hopeful sign that a drilling slump does not have to come as a result of the low oil prices was news in early March that RAK Petroleum subsidiary Foxtrot International had made a discovery with its Marlin North-1 well on Block CI-27. The well was said to have flowed relatively light oil, condensates and associated gas from two pay zones totalling around 33 metres, although naturally it was too early to pronounce on the discovery's eventual commerciality. Norwegian-Emirati RAK Petroleum is one of the main shareholders in Foxtrot, which operates Block CI-27, while SECI and Ivorean state-owned company Petroci are partners.

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Côte d'Ivoire and Ghana have been in a political dispute over the delineation of their respective maritime borders since 2013.

Liberia's licensing round

For Liberia, key will be to follow up on last year's reportedly relatively strong show of market interest for its offshore acreage licensing round. The licensing round has so far, however, only resulted in one awarded block, out of four on offer, although bid evaluation is said to continue. Meanwhile, Liberian NOC NOCAL, according to its website, has opened the country's remaining offshore acreage up for open bidding on a first-come-first-serve basis.

Naturally, last year's Ebola epidemic hit investor confidence hard. It even made shippers wary of chartering cargo vessels to the region, for fears over crew safety and lengthy quarantines. Liberia's legislature, however, took the opportunity to improve contract frameworks and work on upstream investor attractiveness in the interim, which could prove valuable for the future.

Nevertheless, Liberia needs all the good upstream PR it might get, in order to catch explorers' imagination. More Ivorean discoveries are probably what really could give the Liberian oil patch some momentum. It is therefore a great concern that both countries' oil industries could suffer from the recent flare-up of maritime border demarcation issues between Côte d'Ivoire and Ghana.

The Ivorean government recently took the step to request that the special chamber of the International Tribunal of the Law of the Sea (ITLOS) in Hamburg, Germany, to suspend all development activity taking place in the border waters of the two states, where Tullow's US$4.5bn TEN project is being pursued.

The two countries have been in a political dispute over the delineation of their respective maritime borders since 2013, when Côte d'Ivoire accused Ghana's TEN project of encroaching on the Ivorian maritime zone. Ghana replied by submitting the maritime border for demarcation to ITLOS the following year and its claim is widely regarded as strong.

> The handling of the crisis on the Ivorian side raises significant concerns.

RAK Petroleum is one of the main shareholders in Foxtrot, which operates Block CI-27.

Côte d'Ivoire's efforts to halt an ongoing upstream project, with all the costs that would entail to Tullow, which ironically is involved in exploration in both countries, were seen as surprising and undermining the growing sense of political stability in the region. Given how fragile continued exploration offshore Côte d'Ivoire and Liberia is in the current low oil price environment, the handling of the crisis on the Ivorian side raises significant concerns.

The escalation of the dispute threatens to pull a wet blanket over further investment for the foreseeable future. If the request by the Ivorian government to halt the TEN development is withdrawn, or if the tribunal should throw it out, exploration speed might start to recover. As Liberia and Côte d'Ivoire emerge from under the whole region's Ebola epidemic, they could start portraying themselves as a relatively cheap deepwater play. That would allow IOC's to take and hold E&P portfolio positions in a new and relatively cheap exploration play, for being deepwater.

Whether the political will and power to focus on the necessary promotion of the play and further improvement of investment terms will materialise, or whether the Ivorian leadership will find it easier to engage in populist border issues, remains to be seen. For Liberia this issue might actually become more damaging than for Ghana, as Liberia still awaits its first proper commercial discovery and therefore relies on success in the waters off its eastern neighbour to start spilling over into its waters. ■

If Africa's oil and gas industry is to be truly sustainable in the long run, then education and skills training must become top priority for all concerned.

Back to school

Oil and gas maintenance training. Image: Cegelec.

WITH AFRICA'S ENERGY sector growing fast, there is an increased need for skills and vocational training to equip local people with the expertise to take on work covering anything from offshore safety through to cryogenics and liquefied natural gas (LNG).

Host governments understandably want to see greater local content in projects, not just via indigenous firms securing contracts or upstream concessions, but in the filtering of work and jobs through to ordinary people.

For this to happen on a mass scale there is an urgent need to bridge the skills gap.

It's already taking place to a large extent, and has been happening for years.

Big companies like Shell and Total have long been committed to developing the local skills base and bolstering employment opportunities.

That's easy enough when it comes to simple tasks like manual labour, but far more challenging for some of the highly skilled and more highly paid jobs in the oil industry.

Partnership approach

At a recent oil and gas education and training event in Tanzania, politicians and industry players all seemed supportive of the idea.

The Pan-African Conference on Oil and Gas Vocational Training Initiative took place in Dar es Salaam in March and was supported by big upstream operators working offshore including BG Group and Statoil.

These and other international firms are likely to become key employers of the future as Tanzania's deep-water sector expands in the years ahead.

The country's vice president, Dr Mohammed Gharib Billal, said his government is currently working to establish clear local content rules so the development of the nascent industry will benefit all the country.

And, crucially, this means investing in human resources.

"Local content policies alone will not suffice," he told conference delegates. "We must ensure that Tanzania can deliver a locally-born workforce, equipment and supply chains - and this can only be attained through training of our people."

Local talent

While eastern Africa's energy sector is only starting to emerge, West Africa has for decades grappled with these same challenges.

The importance of local content and skills training has become increasingly more prominent across the region.

That's certainly true in the big, established producer states such as Nigeria and Angola.

It also means new producers like Ghana are learning earlier how to spread the benefits of the oil industry more equitably among the people.

It's evident on current projects like the development of the Offshore Cape Three Points block, which is being led by Italian energy giant Eni, Vitol and the Ghana National Petroleum Corporation (GNPC).

One of the lead contractors involved, GE Oil & Gas, which is supplying US$850mn worth of equipment to the project, has set up a joint venture with an indigenous company to underpin its commitment to the country.

There is an increased need for skills and vocational training.

It is also funding the development of a local capacity and skills development programme, with GNPC and Ghana's Ashesi University.

Together, these investments will help GE grow its employee count in Ghana by 65 per cent and support the training and development of local oil and gas professionals over the next few years.

GE Oil & Gas boss Lorenzo Simonelli said it showed the group's commitment to developing local partnerships and to capacity building.

"We are committed to partnering with Ghana to help support and build critical skills and infrastructure development for the country's future growth," he commented.

It's a similar theme in other energy industry areas with GE creating as many as 6,000 jobs in Egypt as it rolls out the delivery of 2.6 gigawatts (GW) of new power facilities throughout 2015.

Expatriate skills

There's still a long way to go, however: in a 2013 PriceWaterhouseCoopers survey on oil and gas trends in Africa the number of expatriates working in the industry had actually gone up.

It said this was, in part, due to a greater percentage of respondents being from the new developing markets of Uganda, Ghana and Tanzania where there is a distinct shortage of skills.

Service companies, in particular, reported a higher than average proportion of expatriates among their workforces.

"The high percentage of expatriates is a concern for businesses throughout the oil and gas value chain," the report noted.

All of these new and emerging producers - Tanzania, Ghana, Uganda and Mozambique - either have policies in place, or are drafting policies, in which localisation requirements will compel upstream firms to employ and train significantly more local staff.

This localisation drive is usually stipulated in either specific legislation or in the upstream production sharing agreements themselves.

Centre of excellence

South Africa, the continent's most advanced economy, has emerged as something of a centre of excellence for the regional energy sector, even though its own oil and gas output is comparatively small.

Indeed, according to the PWC survey, it was the only country with expatriate figures below the 10 per cent level in all categories.

The importance of local content and skills training has become increasingly more prominent in countries such as Nigeria. Image: Scruple Resource Ltd.

With its highly advanced infrastructure and manufacturing sector, South Africa has become an important skills and resources base for the industry.

The Offshore Skills Training Centre (OSTRAC) in Cape Town is one of a number of important training providers for the rest of the sub-Saharan Africa region.

A subsidiary of the Krew group, it was originally established to satisfy a demand for high quality remotely operated vehicles (ROV) technician training.

Its courses now span all areas of the upstream chain from geology to drilling and well construction and the maritime sector.

Like most other areas of the oil and gas chain, the advance of skills training for local workers - especially in high tech areas like ROV operation - requires a truly collaborative approach.

Training services by Proactive Solutions in Tanzania.

A university education

International partnerships between top universities and colleges have become integral in developing Africa's pool of future talent.

Nigeria's Petroleum Technology Development Fund supports undergraduates to attend universities in Europe and North America, with 25 recently heading out to Jacksonville University in the USA for studies ranging from chemistry to geology.

It's a big investment - the fund is paying about US$375,000 per semester for the students' tuition - but the hope is that they will one day guide Nigeria's oil industry of the future.

In the UK, Aberdeen University will help to train Tanzania's future industry professionals in collaboration with Dar es Salaam University after being awarded a recent US$2.2mn grant by the European Union.

The two sides will work on a three year programme to promote learning, research and knowledge sharing and introduce engineering, geo-sciences, business and law.

John Scrimgeour, executive director of the Aberdeen Institute of Energy, which has links to the university, said the Tanzanian government understandably wants to develop its own home-grown expertise in order to develop a sustainable oil and gas industry.

"However, to do so it needs to create capacity in the universities to develop geologists, engineers, chemists, lawyers and economists."

He added: "Our approach will combine practical training for academic staff and businesses in the oil and gas sector in Tanzania, but in a sustainable way so that the country develops the expertise that will help it respond to its own needs in the future." ■

Chris Shennan* looks at the key people issues on the agenda of industry executives and how they should respond during a time of low oil prices.

People challenges in 2015 and how to tackle them

FROM ITS RECENT peak of US$115 a barrel, the Brent crude oil price had collapsed to a level below the US$50 mark by late January. Much has already been said about the causes and effects of such a price fall, and much more will be said before the price recovers. My question is though – in an environment where prices may continue to fall further in the first half of 2015 before potentially starting to move (slowly) up in the second half of 2015 – What are the key people issues on the agenda of industry executives and how should they respond?

Of course, pay and engagement are always on the list and times of intense price pressure bring unique challenges to these areas. But there are two areas that are climbing the list of priorities and these are whether and how to restructure and whether mergers and acquisitions are on the horizon. Here I will look at both in a little more detail.

A healthy organisation

Inevitably in such times, organisations look to re-assess their structures. Too often, we see decisions made on gut instinct resulting in across the board reductions. The more rational approach is to assess where efficiencies and effectiveness gains are possible through precise surgery.

In times of high oil prices, organisations allow a greater focus on maintaining talent structures than the needs of pure efficiency. This relaxed tendency shows itself in a number of ways.

1. The average span of people control for managers in the organisation reduces, meaning more managers are needed (adding cost) and more layers are required (slowing the speed of communication). Our efficiency models show that in an organisation of 200 frontline supervisors, increasing the average managerial reporting line from four to six reports per manager can remove a level of management and decrease management headcount from 68 to 41.
2. Then there is the issue of who's reporting into whom in the first place. Here, people and roles tend to merge. Having defined what the boss is accountable for, organisations have to assess the relative contribution of their direct reports. You can divide responsibilities narrowly amongst many or broadly among few. The key is to avoid replicating the same skills and experience that exists in the boss, in his subordinates.
3. Finally, it's essential that decision-making responsibilities are clearly defined and absolutely clear. People need to understand when they should make decisions and have the freedom to do so. Matrix structures can aid the decision-making process but too often we see badly designed ones building in cost without clarity, a dangerous combination.

The urge to merge

A collapse in oil prices in the early 1980's and again in the late 1990's generated a wave of industry consolidation. BP acquired Amoco, Exxon merged with Mobil and Chevron purchased Texaco. Data from the USA in January 2015 indicated 1,800 active oil and gas rigs, the lowest in over a year and a clear indication of falling producer confidence. The conditions are in place again for another round. December's acquisition of Baker Hughes by Haliburton for US$34.6bn is a spectacular example of this, as was Technip's offer to purchase CGG in the same month.

In times of high oil prices, organisations allow a greater focus on maintaining talent structures than the needs of pure efficiency.

Most 90-day deal implementation plans aim to achieve quick wins by integrating 'hardwiring' – the tangible assets such as IT, financial systems and property portfolios. Yet as history shows, most of these acquisitions will fail to achieve their original objectives, often because parties tend to underplay or not fully understand the intangible assets of people, culture, structure and capability. Aligning intangible capital or 'soft wiring' can be the biggest challenge. Our research has identified two factors that really make the difference.

1. Aligning and integrating tangible and intangible assets.

Intangibles include:

- organisational capital – culture, agility, structure, communication and team working,
- relational capital – brand, client loyalty and internal as well as external networks, and
- human capital - leadership capability, workforce engagement and productivity.

2. The impact of leadership

- When the parties review leadership capability and put in place a new top team quickly, mergers run more smoothly.

We work with clients on several key steps to make sure they're not neglecting the intangibles. We help them:

- Build an enhanced operating model and organisational structure aligned to new strategic objectives
- Understand desired new culture and what this means in terms of changes to core people processes
- Clarify accountabilities, promote coherence across functions
- Understand how changes to structure translate into new role relativities and assess reward implications
- Assess leadership capability and quickly identify best fit for key roles

In such a turbulent environment, oil and gas companies face a range of complex people challenges. Facing lower revenue, it can be tempting to simply slash costs wherever possible and batten the hatches until things become more comfortable. But it is those who take a more measured, focused approach to these challenges who will not only survive the dip but also be in a position to grasp opportunities with both hands when they emerge. ■

Chris Shennan is global management consultancy Hay Group's global oil and gas sector leader. Hay Group are Gold Partners of the Managing Talent In Oil & Gas Conference, 17 – 19 May, Abu Dhabi. www.managing-talent.net

Total's Young Graduate Programme

TOTAL FOUNDED THE Young Graduate Programme in April 2014 – an innovative initiative aimed at young graduates from more than 40 of the countries in Africa and the Middle East in which the company operates. The programme is an opportunity for them to discover working life through a genuine hands-on professional experience and gain an insight into how an international company operates over an 18-month period.

"This programme is visible and powerful evidence of our commitment in Africa and the Middle East, and of our willingness to tackle the concerns of these countries, as well as meet the expectations of young people living in them. For them, unlike young people living in Europe, finding an internship can be extremely complex – even if they have excellent university degrees. By giving them their first professional experience and their first taste of life in an international company, we are giving them a leg up the ladder and providing them with valuable support in establishing themselves on the marketplace", said Momar Nguer, senior vice president Africa/Middle East for Total Marketing & Services.

The Total Young Graduate Programme is a

structured pathway that recent graduates follow over a period of 18 months. It includes two key phases. First of all, the young people are hired on short-term contracts and receive training in finance, business or operations for six months at a Total subsidiary in Africa or the Middle East. Their performance is then assessed and if they meet the required standards, they are then sent to another Total subsidiary in the same region where they work for a period of 12 months. This way the Total group is able to ensure that each of the countries in Africa and the Middle East in which it operates is able to benefit from the expertise and experience that these young recruits have acquired in their own countries.

"So far, more than 100 talented young people have joined the programme, and around 20 are already in their second post, in a different country. The first months have been very positive and the programme is proving tremendously successful – we have received nearly 10,000 applications. The programme is set to be a long-term initiative; between now and 2017, more than 500 young people will have been able to benefit from this opportunity", said Christophe Mouret, Total M&S's vice president human resources for Africa and the Middle East.

Riad Mannan looks at the challenges and benefits of big data, which has the potential to transform the oil and gas industry.

The rise and rise of big data

OIL AND GAS companies have traditionally generated lots of data, in all parts of the business, but are now routinely generating extreme volumes of data at an exponential rate.

In an era of dropping oil prices, big data analytics present opportunities to establish more efficient oil production, reduce costs and risks, improve safety, enhance regulatory compliance and foster overall better decision making.

Exploiting big data analytics in the oil and gas sector is becoming a high priority, not just for technology experts, but business leaders too. However, many critical obstacles remain that have to be overcome when planning to develop and implement big data strategies.

With technology driving data growth at an exponential rate, the need to gather data into a format for analysis is one of the biggest infrastructure problems the oil and gas industry faces.

Overcoming challenges

More and more oil and gas companies are finding out that big data is not defined by how much data they have, but how they analyse and use it. According to Dr Satyam Priyadarshy, chief data scientist from Halliburton: "In order to generate the highest value from big data, companies need to leverage emerging technologies and remove data silos." Oil and gas organisations have to follow other industry verticals which have "torn down their data silos, both at organisational and technology levels" he added.

Ali Rebaie, big data and analytics industry analyst and consultant at Rebaie Analytics Group agreed, saying: "Current platforms are mostly siloed with limited or restricted access to raw data across the business and that needs to change to enable new data modelling, integration and governance approaches."

If removing data silos is a prerequisite to gaining value, then the issue of security, data collection and data sharing are other areas of concern.

Asfar Zaidi, principal consultant for Huawei Middle East highlighted the importance of data security, but said: "Having an increased volume of collected data does not necessarily have to result in high levels of data vulnerability. If the right technology framework is in place, oil and gas organisations can stay protected regardless of how much data they collect."

With the oil price dropping in recent months, a lot of organisations have made cutbacks in people and projects. However, it is interesting to note recent comments by the CFO of Baker Hughes, Kimberly Ross who is reported to have said: "We have tried to be surgical with our cuts. [However,] we are making sure we aren't cutting investment in technology."

> The benefits of utilising big data technology seem to outweigh the cost of investing in it.

The benefits of utilising big data technology seem to outweigh the cost of investing in it. The emerging opportunities to increase E&P output, reduce costs and make faster and better decisions are perhaps the more understood benefits. In particular, the capability to analyse in real time and react to data coming in is one of the key advantages. As Zaidi remarked: "The ability to track, analyse and extract value from data allows companies to identify opportunities and highlight issues in real time, increasing productivity and efficiency."

Big data and analytics can also support the development of digital oilfields, integrating operational technologies with information technology to improve decision making and enhance operational and business performance. Looking at it holistically, adding empirical analytics to existing physical-based diagnostics can take the industry to a new level of business improvement.

"Big Data solutions are part of developing the digital oilfield, aligned to enhance business operations for operators to share real-time information, remain constantly connected, monitored and in-control, mitigating risks in a safer work environment," Zaidi added.

Return on innovation

Dr Priyadarshy pointed to other benefits: "Big data will expose the hidden inefficiencies across the board for oil and gas, including drilling operations, equipment performance, supply chain, consumer spend on the downstream side, talent, productivity, etc."

Looking forward, he said: "Faster and better decisions can be made as big data and diagnostic services advance to the next level due to implementation of machine learning and artificial intelligence. The new patterns that emerge from data could lead to new business strategies for improved operational efficiency."

Delivering and implementing big data strategies which capture the highest value may require a new mindset, suggested Dr Priyadarshy. "Traditionally, ROI is defined as the return on investment which is a great metric to measure in a traditional business model. However, with the proven case of big data analytics, the correct metric to measure is Return on Innovation. Understanding the difference in investment and innovation requires a futuristic mindset, a paradigm shift from the current thinking process for growing the business."

With the potential for big data analytics to transform the oil and gas industry, it is no wonder that technology and business leaders are seeking a new understanding of not only what big data is, but what applications are possible, what return on investment and innovation can be expected and

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what technology upgrades will be needed. Ultimately, the value in big data is from gaining the insights from it – insights that can only come through analytics. Delivering the promise of big data analytics will come when companies proactively bring big data technologies into the mainstream of their business.

Faster and better decisions can be made as big data and diagnostic services advance to the next level.

As the oil prices continue fluctuating, big data analytics can help companies reduce costs and expenses. Leading companies are already demonstrating this and increasing oil production at a lower cost and it is only a matter of time before big data analytics is at the core of the oil and gas industry. ■

Dr Satyam Priyadarshy, chief data scientist, Halliburton.

Ali Rebaie, big data and analytics industry analyst and consultant, Rebaie Analystics Group.

Dr Satyam Priyadarshy and Ali Rebai are speaking at the Big Data Analytics for Oil & Gas Conference, 19 – 21 April 2015 in Abu Dhabi. This timely event will provide a space for thought leadership, networking and engagement between buyers and sellers. Riad Mannan is conference director of the event. For more information on the event www.oilandgasbigdata.com

Yokogawa and Cisco deliver cybersecurity solutions for Shell

YOKOGAWA ELECTRIC CORPORATION has announced a collaboration with Cisco Systems to deliver Shell's Secure Plant initiative at Shell. SecurePlant is a comprehensive security management solution for plant control systems that was jointly developed as an initiative between Cisco, a leader in the IT industry, Yokogawa, a leader in mission-critical plant automation systems, and Shell. The three companies have agreed to proceed over the next three years with the implementation of SecurePlant at around 50 Shell plants globally.

Industrial producers around the world face a wide range of operational challenges in areas such as cybersecurity that pose a pervasive threat to safety and availability. Most companies with global operations, however, still take a relatively simplistic plant-by-plant approach, such as implementing operating system security patches and anti-virus pattern file updates. As a result, security levels tend to vary at each plant.

In the general practice of control system security management, individual control system vendors extensively validate security patches and anti-virus pattern files to confirm that they do not interfere with system operation, and then report the results to their customers for implementation. Since plants tend to use a variety of control systems and equipment from different vendors, occasionally with multi-generation platforms from a single vendor, this process is often complicated. For this reason, plants increasingly have the need for plant-wide integrated services that take a more holistic and efficient approach to the management of system security.

With the aim of standardising security practices at Shell plants around the world and minimising control system vulnerability, Yokogawa and Cisco collaborated on the design of the SecurePlant service and will jointly provide deployment and operational services. The SecurePlant solution is designed as a standard solution that consists of the delivery of OS patches and anti-virus pattern files for control systems and the provision of real time and proactive monitoring of solution delivery, as well as a help desk operation to manage this solution.

Supplier-certified Windows security patches and virus signature files are distributed from a SecureCenter to the SecureSite at each plant via Shell's existing global network. The real time and proactive monitoring capabilities enable the centralised management of plant security. A customer help desk operated jointly by Yokogawa and Cisco is available 24/7/365 to manage solution-related incidents.

Moving forward, Yokogawa and Cisco will continue to offer comprehensive security solutions involving the deployment, operation and monitoring of control system environments. These services are applicable to plants of all sizes in a wide variety of industries, including facilities spread out over a large geographic area. In addition, both companies will leverage their technologies and experience to develop deep industrial automation (IA) solutions such as remote system maintenance, remote plant asset management and Big Data on the top of a secure remote access platform to help companies in making faster decisions, reducing total cost of ownership (TCO), and achieving operational excellence.

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ION expands West African 2D data library

ION GEOPHYSICAL CORPORATION has announced completion of the seismic acquisition stage of the company's NamibiaSPAN programme, which extends the full length of Namibia's offshore continental margin. Acquisition was conducted in co-operation with BGP.

With an estimated 100bn barrels of oil remaining to be discovered and produced in Africa's offshore waters, NamibiaSPAN plays a critical role in establishing a contiguous dataset for the full West Africa margin extending from Mossel Bay to the Bight of Benin. NamibiaSPAN comprises over 10,000 km of 2D multi-client data and represents the newest addition to ION's BasinSPAN library, which encompasses approximately 500,000 km of 2D basin-scale data in E&P hotspots around the world including NigeriaSPAN, EquatorSPAN and CongoSPAN in West Africa.

"Namibia is positioned to help define future exploration and production activity across a wide region that extends beyond our borders," Immanuel Mulunga, petroleum commissioner for Namibia's Ministry of Mines and Energy, noted. "Our goal is to achieve the fullest understanding of Namibia's offshore potential."

Mubadala signs geological study agreement with Morocco

MUBADALA PETROLEUM SIGNED an agreement with Morocco's Office National des Hydrocarbures et des Mines (ONHYM) to carry out an evaluation of the hydrocarbon potential of a large area offshore Morocco's Mediterranean coast, according to the Abu Dhabi-based firm.

Under the agreement, Mubadala Petroleum will hold an exclusive reconnaissance license to carry out detailed geological evaluation of the hydrocarbon potential of an area designated as Mediterranée Ouest, which covered an area of 3,433 sq km offshore Morocco. Mubadala Petroleum will provide ONHYM with the results of its evaluation on completion.

The agreement was signed in Casablanca, Morocco by Mubadala's Energy CEO Dr Sultan Al Jaber on behalf of Mubadala Petroleum and Amina Benkhadra, general director, ONHYM.

"We very much hope this agreement will pave the way for further co-operation with ONHYM both on the more detailed exploration of the Mediterranee Ouest area and in other projects," Mubadala Petroleum CEO Musabbeh Al Kaabi said.

3D seismic offshore Madagascar

STERLING ENERGY AND its partner Pura Vida Mauritius expect to complete acquisition of a 3D seismic survey offshore Madagascar during 2Q 2015.

CGG will acquire 1,250 sq km of 3D data over an area of the Ambilobe block deemed prospective at Cretaceous and Tertiary levels following a review of vintage 2D data. The partners have secured the required permits for the new programme.

Resultant processed time-migrated data should be available for interpretation at the end of this year, followed by depth-migrated data in early 2016. The results will influence the "drill-or-drop" decision required by July 2016.

Sterling is a partner to ExxonMobil in the Ampasindava block in the Majunga basin offshore Madagascar, where the production-sharing contract is in the third phase of the exploration period.

The remaining minimum work commitment is for one exploration well. However, the partnership has decided that the well on the Sifaka prospect at this stage carries too high a technical and commercial risk, with a strong chance of poor reservoir quality and an increased phase risk for gas over oil.

They have therefore engaged with state regulator OMNIS to review their next steps.

Fugro introduces high accuracy G2+ service

FUGRO HAS INTRODUCED a further advance in the field of GNSS augmentation with its high accuracy G2+ service, designed to benefit offshore operators around the globe who require positioning and measurement accuracy at centimetre level.

G2+ is an enhancement of Fugro's highly regarded G2 service (based on GPS and GLONASS) and utilises highly advanced GNSS augmentation algorithms developed in-house by its leading GNSS augmentation experts. The code and carrier-phase signals transmitted by GPS and GLONASS satellites are monitored globally by Fugro's worldwide network of reference stations. These observations are processed centrally in real-time using the company's proprietary algorithms to generate precise corrections which are used to augment the standard signals broadcast by GPS and GLONASS satellites. Customers receive corrections via seven high-powered communications satellites, providing at least two independent G2+ data sources.

Fugro's new satellite positioning service will be particularly beneficial when seeking to measure latitude, longitude, elevation and speed with high accuracy in real-time. Applications include offshore construction, survey services, vessel monitoring and structural monitoring. Its ultra-high accuracy enables the real-time correction of tidal changes - which impact the accuracy of seabed mapping - as well as the real-time monitoring of the motion of floating and fixed structures. The 3D accuracies of the system approach those of GNSS RTK (Real Time Kinematic) systems whilst avoiding the need for an RTK base station or local transmission link, overcoming the logistical challenges and range limitations associated with coastal RTK systems.

The launch of G2+ follows the recent launch of Fugro's G4 satellite correction service, which is the first to take advantage of all four global navigation satellite systems: GPS, GLONASS, BeiDou and Galileo.

Broadband data opens up new frontiers to seismic reservoir characterisation. Lucia Levato, CGG, discusses its merits.

The value of broadband seismic data for reservoir characterisation

ULTRASOUND IMAGING IN medicine is the most common and simple analogy for explaining the technique of seismic exploration. Seismic data recorded from sonic waves are used to visualise what lies under the Earth's surface.

The accurate image of the subsurface provided is crucial for positioning wells and reaching the geological structures which, due to their geometry and position, are most likely to hold hydrocarbon deposits. Combining seismic data with measurements made in drilled wells brings additional insight into the types of subsurface fluids present, whether oil, gas or water. It also facilitates identification of the rocks, or lithologies, having the properties most likely to allow the flow and accumulation of hydrocarbons away from the wells.

In short, seismic data are also used to characterise hydrocarbon reservoirs and help to position development wells based on the subsurface's estimated rock properties.

Imaging near-surface and deeper targets with broadband data

After decades of intensive exploration, hydrocarbons are now often sought in environments that are too challenging for conventional techniques to deliver high-quality seismic images. Common examples are exploration in very deep water and the imaging of subsalt structures. A large proportion of the recent innovations in the seismic industry have aimed to address this challenge. Broadband seismic acquisition is a good example of a leading technology emerging over the last decade: in addition to providing higher-quality images it delivers real value to reservoir characterisation, as demonstrated by recent studies. A key feature of current industry broadband solutions is the extremely large frequency bandwidth of the recorded signal which, in the case of CGG's proprietary BroadSeis solution, can span from high frequencies of 200 Hz down to very low frequencies of about 2 Hz, with a high signal-to-noise ratio, as opposed to the 10 Hz to 80 Hz bandwidth generally achieved by conventional acquisition. This large frequency bandwidth offers imaging of both near-surface and deeper targets. The seismic section shown in Figure 1, imaged by CGG offshore Angola, is a typical example of the high-quality imaging achievable with BroadSeis.

Seismic reservoir characterisation

The estimation of the seismic wavelet, a mathematical representation of the source signal, is of critical importance in seismic reservoir characterisation. In very simple terms, the signal recorded at the Earth's surface as seismic data, depends both on the wavelet and on the ability of the subsurface geology to reflect the signal back to the surface. This characteristic of the subsurface, known as the reflectivity, allows geoscientists to derive rock properties useful to reservoir engineers for creating field development plans.

Therefore the influence of the wavelet must be estimated and removed, in order to extract the reflectivity from the seismic data, and ultimately compute accurate reservoir properties. This process is called seismic inversion and allows the transformation of the seismic image into a model of elastic rock properties.

As the reflectivity spans all frequencies, the ability to make quantitative predictions from seismic data ideally requires a signal with a frequency bandwidth down to zero. As seismic data are generally frequency-band-limited, the gap needs to be filled for the low frequencies that are not recorded. To do this, a priori low-frequency information derived from other sources, such as well logs, is used.

Broadband seismic acquisition is a good example of a leading technology emerging over the last decade to image challenging environments.

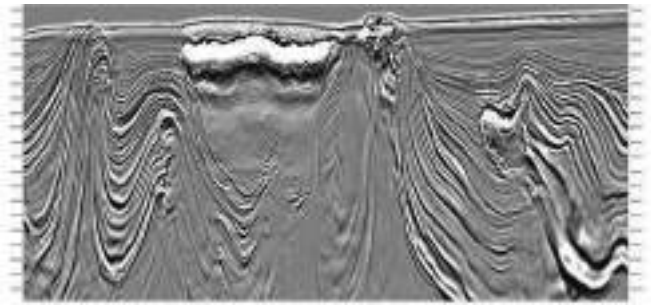

Figure 1. Complex salt structures imaged in CGG´s Angola Block 22 BroadSeis data set (courtesy of CGG Data Library).

Broadband seismic is able to record very low frequencies, and reduces the need to resort to such external data for determining the low-frequency information required for inversion. Hence broadband data opens up new frontiers to seismic reservoir characterisation while requiring the development of new workflows to fully benefit from the additional information brought by the low frequencies. As an example, a technical paper authored by Menne D Schakel and Peter R Mesdag, and presented at the 2014 SEG Convention in Denver, as well as "Lunch and Learn" seminars given at PETEX London and at CGG's office in The Hague in 2014, have all illustrated how broadband seismic inversion can be performed successfully with the Jason and Hampson-Russell software platforms from CGG GeoSoftware.

Impact of low-frequency content on seismic inversion

The value of broadband seismic inversion compared to inversion performed with conventional data is supported by various studies. Here we compare inversions performed using conventional data versus inversions performed on CGG's BroadSeis broadband data, presented by Ekaterina Kneller at the Brazilian Geophysical Society conference in Rio in 2013. The data were recorded over a Brazilian offshore field in the Santos basin, analogous to the Kwanza Basin off Angola, as discussed later. In this study, two wells, X and Y, are considered. Figure 2 shows that the reservoir boundaries are more sharply defined by the BroadSeis inversion than by the conventional one. Moreover, the reflectivity predicted by the BroadSeis inversion at the location of well Y in Figure 2 is much closer to the actual value recorded in the well. This result is particularly important, as the low-frequency data from well Y were not used in the inversion ("blind well") and therefore the good prediction by the inversion at well Y validates the BroadSeis inversion. Indeed, the blind well test is the most rigorous way of comparing the inversion results from two different sets of data. Finally, analysis of the lithology and hydrocarbon classification showed greater uncertainty for the conventional inversion at both wells X and Y. Ultimately, the inversion results from the BroadSeis volume allow a more reliable estimation of the pay zone.

BroadSeis data offshore Angola

The Kwanza basin offshore Angola, on the other side of the central segment of the South Atlantic, and the Santos basin form one of the pairs of analog basins

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Figure 2a

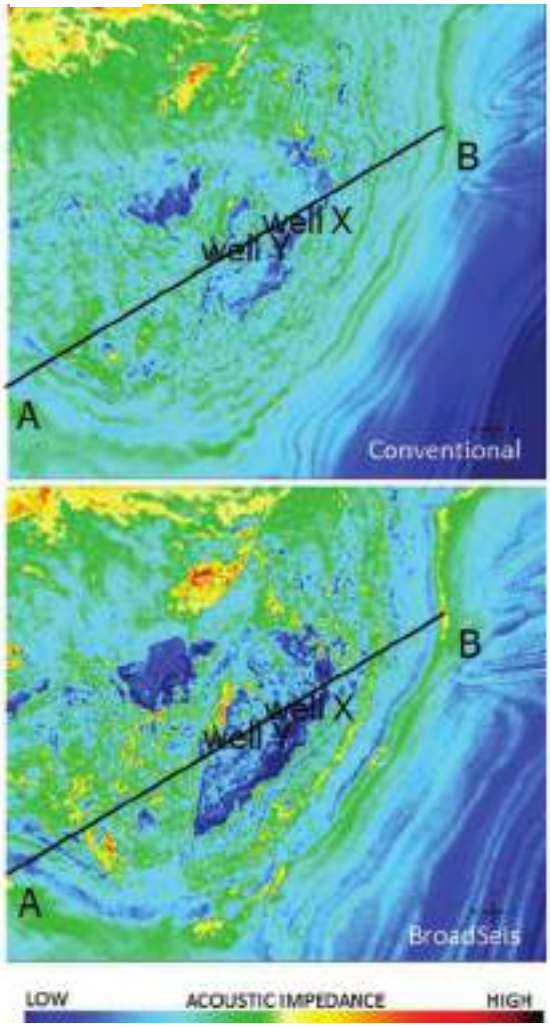

Figure 2b

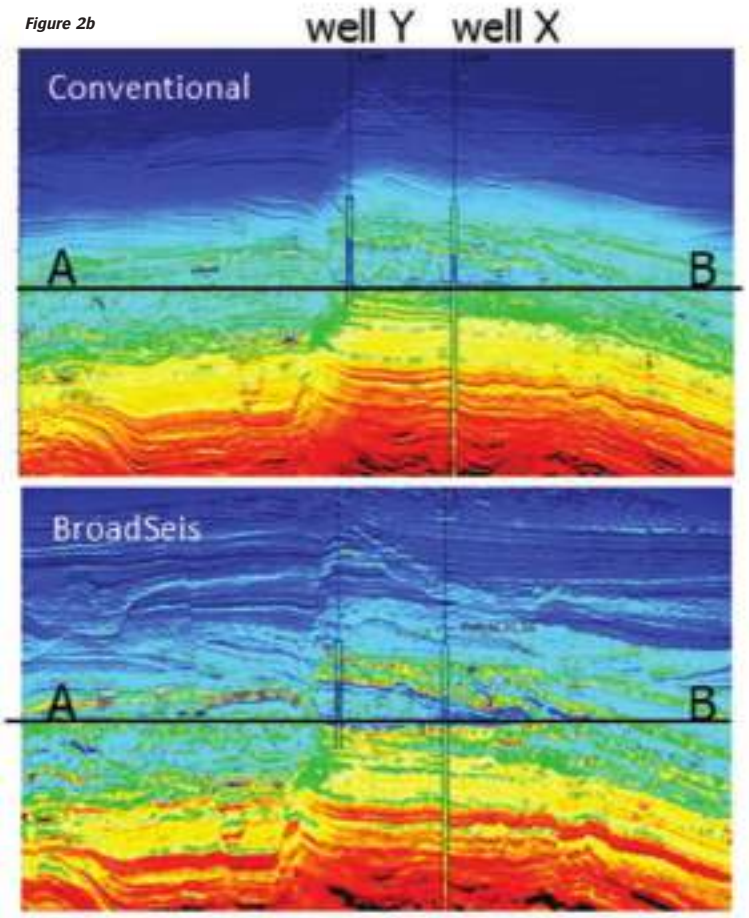

Figure 2. a) Horizontal slices through the acoustic impedance volume at the oil-water contact; b) Vertical sections through the acoustic impedance volume. The acoustic impedance is the rock property which drives the reflectivity discussed in the text. Data courtesy of CGG Data Library.

which can be traced along the entire length of the conjugate African and South American margins, formed by the separation of the two continents which started about 140 M years ago (Early Cretaceous period). These basins contain organic-rich rocks, a source of hydrocarbons, which during the depositional history were overlaid by carbonate-dominated sediments and by salt layers resulting from high evaporation rates, which act as a regionally extensive seal blocking the migration of the hydrocarbons towards the surface.

The carbonate-dominated layers have been successfully explored in the Santos and Campos basins of Brazil and form some of the pre-salt reservoir targets in the West African basins. Younger turbiditic sands were deposited after the salt formation and constitute the main reservoir targets within the "post-salt" deposition section on both the east and west margins of the South-Atlantic.

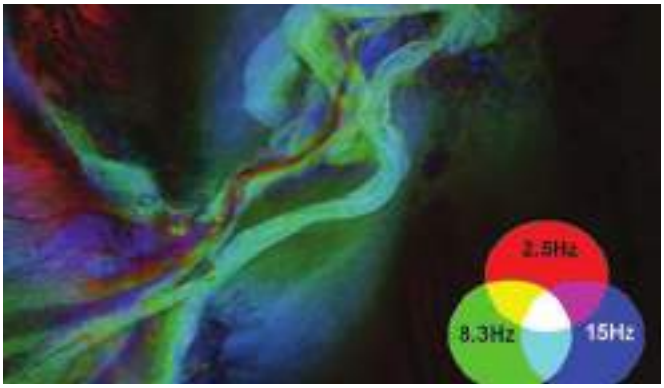

Figure 3. Colour blend 3D visualisation of 2.5 Hz, 8 Hz and 15 Hz dominant frequencies in a horizontal slice of a BroadSeis volume in the Kwanza basin. Without the ultra-low frequencies the turbiditic channel in red, a main reservoir target, would not be visible. Data courtesy of CGG Data Library.

Consequently, accurate tracking of turbidite channels in the seismic images of the Kwanza basin is of particular interest. By looking at a map view after frequency decomposition of the BroadSeis seismic data, a turbidite channel is clearly visible in red. This would not have been possible without the recording of the very low frequencies (2.5 Hz). Additional information about the physical properties, or facies, of the channel can further be extracted by seismic inversion for accurate reservoir modeling.

Broadband seismic is increasingly proving its value at all stages of the exploration and production cycle. By enabling accurate interpretation and easier identification of stratigraphic packages, it strongly contributes to reducing exploration risk. Ultra-low frequencies deliver more detailed facies discrimination, more data-driven quantitative seismic inversion results and therefore more reliable lithology predictions away from existing wells. This leads to more accurate reservoir models and better development plans to maximise hydrocarbon recovery. ■

Acknowledgements

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BP's second major gas find offshore Egypt

BP EGYPT HAS discovered gas in the deepwater Atoll structure in the North Damietta Offshore concession in the East Nile Delta.
To date the Atoll-1 well, drilled by the sixth-generation semi-submersible Maersk Discoverer, has reached a depth of 6,400 metres, penetrating around 50 metres of gas pay in good-quality Oligocene sandstones.
Drilling will continue another one kilometre in order to test the same reservoir section that proved to be gas bearing in the company's 2013 Salamat discovery, 15 km to the south. Atoll-1 will therefore likely be Egypt's deepest well to date, BP added.
Bob Dudley, group CEO, said the estimated potential in the concession now exceeds five tcf, a positive starting point for what could be the company's major development in Egypt after the West Nile Delta project.
Atoll-1 is being drilled in 923 metres of water, around 80 km north of Damietta city, and 45 km northwest of the Temsah offshore facilities. BP has a 100 per cent interest in the discovery.

Eni makes 'significant' discovery offshore Libya

ITALY'S ENI HAS reported making a "significant discovery of gas and condensates" offshore Libya at the Bahr Essalam South exploration prospect in Area D, some 80 km from the coast of the country.

The discovery was made through the B1-16/4 well, drilled at a water depth of 150 metres, which encountered gas and condensates of Eocene age in the Metlaoui Formation. During a production test, the well produced 29mn cfd of natural gas and more than 600 bpd of condensate. Eni said that the well could deliver in excess of 50mn cfd of gas and 1,000 bpd in condensate in a production configuration.

The company said that the new field could be developed quickly due to its proximity to the already-producing Bahr Essalam field.

Eni also announced that it has completed post-drilling studies on the Merakes-1 gas discovery, located in the Indonesian deep offshore East Sepinggan block. The studies indicate "significant upside gas potential", with gas estimated to be in place at Merakes increased from 1.3 tcf to 2 tcf.

Shell hits four new large sands in Gbaran Deep

SHELL NIGERIA IS on location at Gbaran-26, in OML 28, one full year after the well was spud. But the patience is paying off. The country's largest onshore operator has encountered four new gas sands, two of them below 4,900 metres true vertical depth.

"They are very good reservoirs, thick and highly permeable sands", sources at the Department of Petroleum Resources have said. "And when the well is completed, it will simply be hooked up to the nearby central processing facility", which has the capacity to produce one billion scfd.

The Gbaran CPF supplies gas to the Nigerian Liquefied Natural Gas (NLNG) trains at Bonny. It is also scheduled to deliver over 70 mmscfd of gas to the Gbaran Power Plant in Bayelsa State.

Shell has been battling overpressure since it reached around 4,600 metres over six months ago. After encountering two sands between 4,800 and 5,000 metres, it ran a 18 cm liner all the way to the surface to stabilise the hole. Then it hit another set of sands below 5,000 metres. The current section of the hole, drilling at about 5,200 metres TVD, is quite slim; 14 cm. The equivalent circulating density (ECD), an important parameter in avoiding kicks, is close to 0.9, which is a high.

This is contrary to the experience by Conoil on the two Ango wells in OML 59, which also encountered deeper pool pays. Here the pressure was hydrostatic (normal) even as deep as 4,800 metres. Conoil deployed the Majestic, managed by Depthwize, the Nigerian rig operator. For Gbaran-26, Shell is using the Chinese-built High Pressure, High Temperature (HPHT) Hilong 27 rig.

"The geology gets interesting", the DPR sources said; "they've gone from coastal plain, been through the margin of the delta and they are going to proto delta slope facies".

Shell has been touting the success of Gbaran-26, located in OML 28, for some time now, even as it encountered tough drilling conditions, but the company never gave details.

At the Africa Oil Week conference in Cape Town last November, Allistair Milne, the company's vice president, sub-Saharan African Exploration, presented a seismic profile showing the Gbaran-26 prospect. He spoke of growth potential in Nigeria, "particularly in onshore gas for domestic use and export".

Statoil in Tanzania gas find

STATOIL HAS ANNOUNCED that the Mdalasini-1 exploration well has resulted in a new natural gas discovery offshore Tanzania.
The discovery of an additional 1.0-1.8 tcf of natural gas in place in the Mdalasini-1 well, brings the total of in-place volumes up to approximately 22 tcf in Block 2. The new gas discovery has been made in tertiary and cretaceous sandstones.
"The Mdalasini-1 discovery marks the completion of the first phase of an efficient and successful multi-well exploration programme offshore Tanzania," said Nick Maden, senior vice president for Statoil's exploration activities in the Western Hemisphere.
"Since the start of the programme in February 2012, we have drilled 13 wells and made eight discoveries, including Mdalasini-1. We still see prospectivity in the area, but after appraising the Tangawizi-1 high-impact discovery, which was made in March 2013, there will be a pause in the drilling to evaluate the next steps and to mature new prospects," added Maden.
Statoil has drilled the Mdalasini-1 well with a 100 per cent working interest.
Previously Statoil and co-venturer ExxonMobil have made seven discoveries in Block 2, including the five high-impact gas discoveries Zafarani-1, Lavani-1, Tangawizi-1, Mronge-1 and Piri-1, as well as the discoveries in Lavani-2 and Gilligiliani-1.
Statoil operates the licence on Block 2 on behalf of Tanzania Petroleum Development Corporation (TPDC) and has a 65 per cent working interest. ExxonMobil Exploration and Production Tanzania Limited holds the remaining 35 per cent. TPDC has the right to a 10 per cent working interest in case of a development phase.
Statoil has been in Tanzania since 2007, when it was awarded the operatorship for Block 2.

The Mdalasini-1 discovery is located at a 2,296-metre water depth at the southernmost edge of the block. Image: Statoil.

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Nicholas Newman discusses the impact of the American shale revolution on Nigeria and Angola and outlines some wider repercussions.

How is the American shale revolution affecting Africa?

THE BOOM IN America's shale-oil and gas production has caused a serious loss of dollar earnings for those African energy-exporting states which produce high-quality crude, similar in character to that now coming from the new shale-oil fields of North Dakota, Bakken and Eagle Ford. According to the Overseas Development Institute report, the development implications of the fracking revolution (April 2014), African oil and gas exporters have lost US$32bn-worth of energy exports to the US since 2007. Of African exporters, Nigeria, which produces a light, sweet crude which once commanded premium prices, was the hardest hit, losing US$14bn in oil exports to the US whilst Angola and Algeria lost US$6bn and US$5bn respectively.

Similarly surging US shale gas production since 2008 has led to a collapse in the country's LNG imports, from a peak of 451,957 million cubic feet (mmcf) in 2009 to 96,859 mmcf in 2013 – a fall of almost 79 per cent, virtually extinguishing Egyptian and Nigerian LNG exports to the US. Egypt, the main African supplier of LNG to the US, saw its exports fall from a peak of 160,435 mmcf in 2009 to zero in 2013 from a combination of rising domestic demand and falling US demand. Additionally, Nigeria's LNG exports fell from a peak of 41,733 mmcf in 2010 to zero in 2012 recovering only marginally to 2,590 mmcf in 2013. The explosion in shale gas output has transformed North America's energy profile from a LNG importer into a prospectively significant LNG exporter, the repercussions of which will be felt by both existing and future African LNG exporters in third markets in years to come.

Nigerian crude sales were diverted to new customers in China, India, Japan and South Korea.

The turning point for three African oil exporters came in 2010-2011 when US oil imports from Africa fell dramatically as can be seen in Table 1. Algeria was relatively hardest hit with a 91 per cent decline or nearly 110,000 barrels between 2010-13. Angola was not so badly hit with a fall of 47.5 per cent or 66,291 barrels owing to the fact that it produces heavier grades suitable for blending with US shale crude. Nigeria's oil exports fell the most by 271,521 barrels or 75 per cent. In 2014 Nigeria's fortunes continued to decline with zero exports to the US in July 2014 and only sporadic negligible amounts in the autumn months. The impact of US shale oil production on African exporters to the US is unprecedented in terms of its speed and the scale of its collapse.

Table 1: US total crude oil imports from selected African countries 2008-2013 in thousand barrels

Country	2008	2009	2010	2011	2012	2013
Algeria	114,112	102,559	119,579	64,816	43,791	10,461
Angola	184,460	163,604	139,736	122,210	81,206	73,445
Libya	24,791	22,354	15,608	3,328	20,358	15,864
Nigeria	337,359	283,091	358,924	280,079	148,482	87,403

Source: U.S. Energy Information Administration

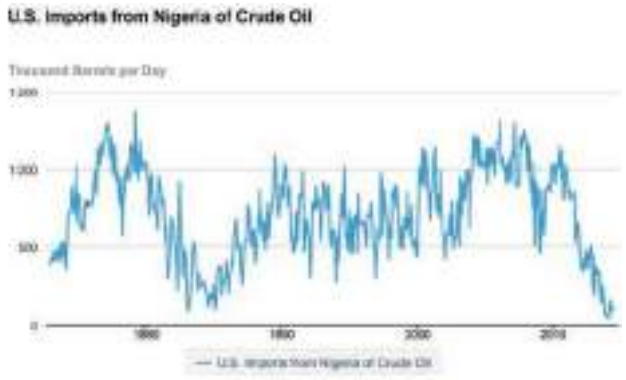
This feature will focus on the impact of the American shale revolution on Nigeria and Angola and will outline some wider repercussions.

Japan is the largest importer of Nigerian LNG.

Nigeria oil and gas

As recently as 2007, Nigeria exported 1.2mn bpd out of a total production of 1.mn bpd to the US, roughly equivalent to one super tanker a day leaving Port Harcourt for New Orleans. In 2012, Nigeria was one of the top five suppliers of oil to the US which accounted for 18 per cent of her crude exports. Subsequently it was downhill all the way.

According to Platts, US imports of Nigerian crude fell to an average of 64,000 bpd in the first few months of 2014 falling to zero in July. To compensate, Nigerian crude sales were diverted to new customers in China, India, Japan and South Korea. Sales to these markets have risen more than 40 per cent in 2014 and accounted for over 42 per cent of Nigerian crude oil exports, says Platts. Also, Nigerian oil exports to Europe increased by more than 40 per cent in both 2011 and 2012 and were 626,000 bpd and 889,000 bpd respectively. Europe remains by a whisker, the largest regional importer of Nigerian oil accounting for 44 per cent of Nigeria's crude oil and condensate exports. Nevertheless, Nigeria's future cannot depend on oil alone.



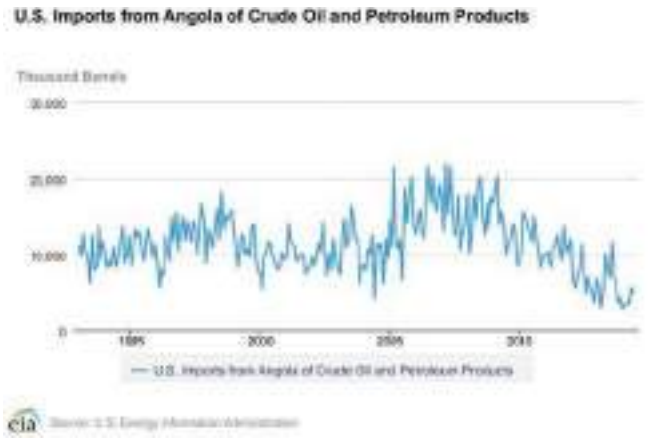
Source: http://blogs.ft.com/beyond-brics/files/2014/10/Nigeria-crude2.png

With 187 tcf of natural gas reserves, Nigeria is the largest holder of proven reserves in Africa and was ranked 4th in global LNG trade in 2012. Japan is the largest importer of Nigerian LNG receiving 24 per cent of the total in 2012, followed by Spain (19 per cent), France (12 per cent), South Korea (nine per cent) and India (seven per cent). For Nigeria, the US gas market was always of minor importance. According to the IGU World LNG Report 2014 edition, out of Nigeria's total LNG exports amounting to 16.9mn tonnes per annum (mtpa) in 2013 just 1.27 mtpa went to the US. Even so, the tripling of US shale gas output since 2009 has mattered. Nigerian exports of LNG to the US fell precipitously from 41,733 mmcf in 2010 to zero in 2012 recovering marginally to only 2,590 mmcf throughout 2013 and falling to zero between April and September 2014.

Angola oil and gas

Angola is the second largest oil producer in West Africa behind Nigeria and in 2012 the US imported 13 per cent of its oil output. Unlike Nigeria, Angola's exports to the US have fallen only moderately to around 116,000 bpd of oil in 2014, being cushioned by its production of heavier grades of crude which blend well with US shale and meets the US demand for heavy refined products and feed stocks. As with Nigeria, Angolan crude exports have been switched towards Asian markets so that China consumes nearly half its current output. "Emerging markets like India and China have been growing, and they have absorbed a large part of Angolan exports," said Angola's oil minister Botelho de Vasconcelos.

It is a different picture for Angola's LNG exports to which she was a latecomer, having only completed her first LNG export plant in 2013. Designed for a maximum capacity of 5.2mn tonnes of LNG and natural gas liquids a year destined for re-gasification facilities in Pascagoula, Mississippi, Angola has completely lost out to the US shale boom and has had to find alternative markets in Asia, Europe and Brazil.



Source: http://www.ventures-africa.com/wp-content/uploads/2014/09/chart.png

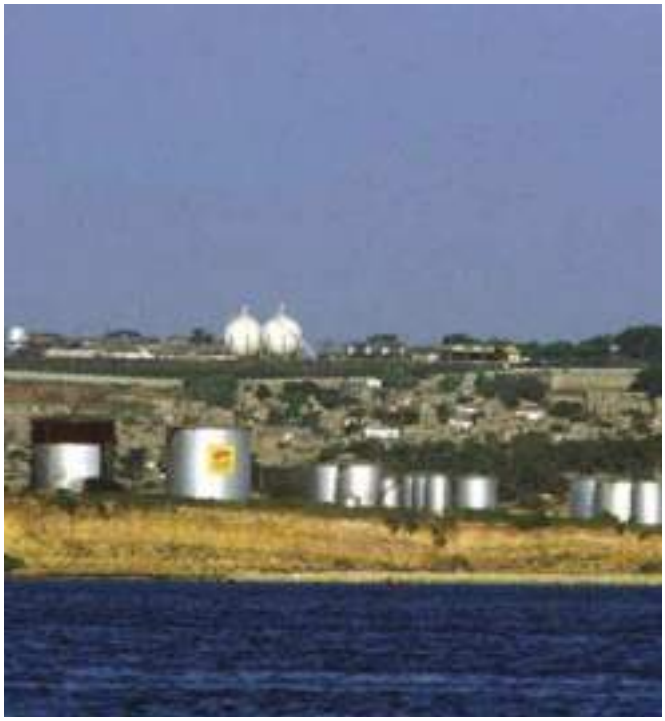
Wider repercussions

"The shale revolution in the US has had a substantial impact on Africa in particular, where there will be some significant challenges ahead" wrote Darren Rowan, business development manager, Air Energi in an e-mail. With new suppliers of both oil and gas entering world markets in coming years it is imperative for African countries to diversify their economies and add value to their oil. A possible path of development would be for Nigeria and Angola to diversify into more downstream activities such as refining crude oil into petrol, kerosene, jet fuel and diesel oil. Similarly for gas, African producers need to invest in the infrastructure needed to supply gas for electric power generation and turn gas into feedstock for plastics and chemicals. The current investment by the Dangote Group into an oil refinery, petrochemical and fertiliser project, due for completion in 2017, could transform Nigeria's energy sector by slashing fuel imports and adding value by increasing refined oil exports is a good example.

Unless there is a collapse of US shale gas output, the US is destined to become an exporter of LNG. Currently under construction, the Sabine Pass LNG export plant with capacity of 18 MTPA is due to come on-stream in 2018, potentially competing with Nigerian and Angolan LNG exports in Asia, Europe and Latin America.

> It is the impact of the low price of oil on government revenues that is of real concern for African oil producers.

The US shale oil boom, together with a slow down in demand, has added to a worldwide supply glut which has caused oil prices to fall by around 46 per cent in six months from US$115 per barrel to just under US$60 per barrel in December 2014. This vertiginous collapse in oil prices has sharply reduced the share valuation of energy companies causing a re-evaluation of their capital expenditure plans and boosting mergers and acquisitions to cut costs by cutting duplication of overheads. Already as Chris Bredenhann, PwC Africa oil & gas advisory leader, observed, "Some key players have delayed or cancelled projects" and with fears of further declines in oil prices the commercial viability of some projects such as the offshore Angola pre-salt fields and deep water fields off Morocco could be at risk. Transocean has announced the sale of three of its offshore rigs operating in West Africa. Tullow Oil, operating in East Africa, has announced cutbacks whilst Afren, the British oil and gas group, has received a preliminary takeover approach from Nigeria's Seplat.



Oil and gas facillities in Angola. Image: Alan Gignoux, Impact Photos.

However, it is the impact of the low price of oil on government revenues that is of real concern for African oil producers. According to figures from Reuters and Bloomberg, Africa's petro states require high oil prices to balance their budgets. For example: Algeria needs oil at US$119 per barrel; Angola at US$94 and Nigeria at US$124 per barrel.

With oil prices already well below these levels the determination of Saudi Arabia to maintain its market share can mean only one thing for the high-cost producers of West Africa and the US shale-oil fields. For them the future is not bright, whilst existing and prospective African LNG producers, such as Mozambique and Tanzania, can expect to face fierce competition from US LNG in Asia. ■

Seme's first oil hoped for August 2015

NIGERIAN INDEPENDENT SAPETRO is active on the third of three wells planned for draining the remaining oil in the Seme field, offshore Benin Republic. Results have been mixed; while the company has finalised drilling of two wells, only one can be completed as it is. SAPETRO will update its reservoir model on conclusion of the third well. Still, the understanding with the Beninois authorities remains that first oil is possible by August 2015.

"Installation of engineering facilities is ongoing even as they are dealing with subsurface challenges", Benin oil and gas officials explained.

SAPETRO commenced the three well Seme field drilling and completion campaign for the field's redevelopment in October 2013. But the rig Paragon L783 (formerly Noble Tommy Craighead) has thrown up its own difficult set of challenges, in effect dragging the project.

Seme was abandoned in 1997, after 14 years of production by a succession of companies, including Saga Petroleum, Pan Ocean and Ashland. It produced more than 21mn barrels and was delivering over several times more water than it was producing oil at the time of field dismantlement. Seme produced 7,627 bopd at its peak in 1984. At the lowest in 1997, just before abandonment, it was delivering only 1,207 bopd.

SAPETRO took over the block in 2004, acquired three dimensional seismic data and conducted extensive interpretation, reservoir characterisation and modeling. Peak production was planned to be around 6,000bopd, with the field drained optimally for 16 years. This optimistic prognosis will be reviewed with the data in hand.

Eni Ghana to utilise Maersk drillship

DANISH RIG OPERATOR Maersk Drilling has been awarded a US$545mn contract by Eni Ghana Exploration and Production to use its new drillship Maersk Voyager for offshore exploration.

According to the contract, Eni Ghana can utilise the drillshop for three-and-a-half years, with an option to extend it by a year. The contract also includes mobilisation and escalation.

Claus V Hemmingsen, CEO of Maersk Drilling, said, "We are very pleased to be chosen by Eni and its partners Vitol and GNPC for this project offshore Ghana and we look forward to working together with the OCTP JV over the next three-and-a-half years. West Africa has been a strategic focus area for Maersk Drilling, since we embarked on our deepwater expansion, and with this contract we expand our presence in the promising West African deepwater market."

The Maersk Voyager features dual derrick and large subsea work and storage areas, which allows for efficient well construction and field development activities through offline activities. With an advanced positioning control system, the ships automatically maintain a fixed position in severe weather conditions with waves of up to 11 metres and wind speeds of up to 26 metres per second.

The ship is also equipped to ensure safety of crew onboard. Equipped with Multi Machine Control on the drill floor, the high degree of automation ensures safe operation and consistent performance. Higher speeds of transit and increased capacity is also expected to reduce overall logistics costs for oil companies.

Eland to drill more wells onshore Nigeria

NIGERIA-FOCUSED JUNIOR producer Eland Oil & Gas has reported that it remains on track to start development drilling on its Opuama field during the third quarter of this year. The Opuama field is currently producing 3,100 bopd, including 1,395 bopd that goes to Eland's joint venture company Elcrest Exploration and Production Nigeria.

In Q3 2015, Eland plans to start a drilling programme that will consist of seven wells. The firm said that these wells are "commercially robust" at an oil price of US$50 per barrel.

Eland CEO George Maxwell commented in a company statement:

"We are incredibly pleased that we have begun this year so strongly, with very high consistency of production from Opuama. Our operational focus has given us this success and provides a consistent revenue stream and the basis for the company to deliver its 2015 work programme.

Lukoil closes offshore Cameroon deal

RUSSIA'S LUKOIL HAS closed a deal that will see it take part in the development of the Etinde block in the Gulf of Guinea, offshore the Republic of Cameroon.

The deal was originally agreed in June last year and since then Lukoil has obtained approval from the Cameroon Ministry of Mines and Energy and received a Presidential Decree giving the go-ahead for the transaction.

The Etinde project is being executed under a production-sharing agreement signed in December 2008. The project partners include operator New Age (African Global Energy), Lukoil, Bowleven and Société Nationale des Hydrocarbures.

EG ratifies ExxonMobil exploration agreement

THE MINISTRY OF Mines, Industry and Energy of Equatorial Guinea has announced the ratification of Production Sharing Contract for Block EG-06. The contract was signed on 16 January 2015 between ExxonMobil Exploration and Production Equatorial Guinea (Offshore) Ltd, GEPetrol and the Government of the Republic of Equatorial Guinea, represented by the Ministry of Mines, Industry and Energy.

Block EG-06 is located offshore Bioko Island, immediately north of Block R (operated by Ophir Energy) and adjacent to the international border with Nigeria. Block EG-06 is composed of the areas previously known as D-8, D-9, a portion of C-10, a portion of C-11, B-10, and a portion of B-11.

US energy giant ExxonMobil has been active in Equatorial Guinea since 1995 as operator of offshore Block B, near Bioko Island. ExxonMobil holds a participating interest of 71.25 per cent, GEPetrol has 23.75 per cent and the Equatorial Guinea government holds the remaining five per cent. The accumulated oil production of the Zafiro Field recently exceeded one billion barrels in December of 2014.

The Ratification instrument marks the commencement of the term of the PSC for Block EG-06 and therefore its enforceability and the start of operations. As part of the minimum work obligations for this PSC, ExxonMobil has committed to acquire 750 sq km of new 3D seismic data and drill at least two wells during the five-year exploration period.

African Petroleum upgraded prospective resources in Sierra Leone

AFRICAN PETROLEUM HAS announced an update to its prospective oil resources at its 100 per cent-owned and operated Licence Blocks SL-03 and SL-4A-10 in Sierra Leone. The company engaged the independent petroleum consultant, ERC Equipoise Ltd, to prepare an updated assessment of prospective oil resources attributable to the company's Sierra Leone licences.

The ERCE letter, in conjunction with the upgrades to Senegal, The Gambia, Liberia and Côte d'Ivoire announced during Q1 2015, independently assesses African Petroleum's total net unrisked mean prospective oil resources across its ten licences at 12,534mn barrels.

PFL
Engineering
Services Limited

WHO WE ARE

PFL Engineering Services Limited is a wholly indigenous company with focus on Access, Inspection and Maintenance (AIM), Emergency Response Services, Technical Manpower and Training Services.

We are certified members of IRATA (Industrial Rope Access Trade Association) as Operators and Trainers, LEEA (Lifting Equipments Engineers Association) as Operators and Trainers.
We also have international reputable certifications in ISO 9001:2008, 14001:2004 and OHSAS 18001:2007 reference standards.

What we do

- Rope Access
- Scaffolding
- Tension Netting
- NDT Inspection
- Lifting Equipment Inspection
- Fabrication
- Blasting and Painting
- Emergency Response
- Technical Manpower Supply
- Training

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irata international

LEEA
Full Member

British Safety Council Member

Corporate Partner

NACE

Total's divestments hit US$1bn

TOTAL HAS COMPLETED the divestment of its stake in onshore OML 29 to Aiteo Eastern E&P, a Nigerian company, for US$569mn. Together with the recently completed divestments of OML 24 and OML 18, Total's share of sale proceeds from these three onshore Nigerian blocks amounts to over US$1bn.

"The sale of these non-operated onshore blocks in Nigeria is yet another example of our strategy of dynamic portfolio management, achieved at attractive valuations," said Patrick de La Chevardiere, chief financial officer at Total.

"These transactions also reduce our exposure to non-operated blocks onshore Nigeria, and allow us to focus on our core operated developments, such as the Egina project."

Total holds a 10 per cent stake in several onshore blocks in Nigeria via the Shell Petroleum Development Company (SPDC) Joint Venture alongside the Nigerian National Petroleum Corporation (55 per cent), SPDC (30 per cent, operator) and Nigerian Agip Oil Company Limited (five per cent). Since 2010, Total has divested its interests in 11 onshore blocks to Nigerian companies, in line with the Nigerian government's aim of developing Nigerian companies in the sector.

Deep offshore developments are one of Total's main growth avenues in Nigeria, where the group operates the Akpo field in OML 130 and launched the development of the Egina field in the same lease in 2013.

Offshore production also comes from OMLs 99, 100 and 102, which are operated by the Group as part of a joint-venture with NNPC.

The main fields in these leases are Amenam-Kpono, Edikan and Ofon. On Ofon, Total completed the flare-out in January 2015 which will allow for the gradual increase of production towards the 90,000 boepd production target.

Sonatrach discovers three oil fields

ALGERIAN GOVERNMENT-OWNED Sonatrach has discovered one new gas and two new oil fields since the start of 2015.

The first oil field was located in the Touggourt region, with the second in Ghardaia, and the gas discovery made in El Bayadh, according to Sonatrach CEO Said Sahnoun.

The finds, which Sahnoun described as "of extremely important quality", are flowing at rates of 3,000-4,000 bpd.

The revelations were made at a ceremony in Oran to mark the 40th anniversary of the nationalisation of the Algerian hydrocarbon industry.

No estimate of the potential size of the discoveries was given, but Sahnoun said the reserves were being evaluated, with an appraisal programme due to begin soon.

The Infield Systems Ltd. Rig Count tracks industry-wide offshore rigs engaged in drilling and related operations, which include drilling, logging, cementing, coring, well testing, waiting on weather, running casing and blowout preventer (BOP) testing.

JUNE 2015 - OFFSHORE

	MARCH 15	FEBRUARY 15	VARIANCE	MARCH 14	FEBRUARY 14	VARIANCE
Country	Offshore	Offshore	From Last Month	Offshore	Offshore	From Last Month
ANGOLA	19	20	-1	21	20	1
NIGERIA	15	15	0	14	16	-2
GABON	4	5	-1	6	5	1
CONGO (BRAZZAVILLE)	5	4	1	3	3	0
MOZAMBIQUE	1	1	0	2	2	0
GHANA	1	2	-1	1	1	0
CAMEROON	1	1	0	6	5	1
EGYPT	14	15	-1	17	15	2
TUNISIA	2	2	0	1	1	0
SOUTH AFRICA	1	1	0	1	1	0
TANZANIA	1	1	0	2	1	1
EQUATORIAL GUINEA	1	1	0	0	0	0
NAMIBIA	0	0	0	0	1	-1
LIBERIA	0	0	0	2	1	1
LIBYA	1	2	-1	1	1	0
COTE D'IVOIRE	1	1	0	1	1	0
SENEGAL	0	0	0	0	0	0
BENIN	1	1	0	2	2	0
KENYA	0	0	0	0	1	-1
MOROCCO	0	1	-1	1	1	0
MAURITANIA	1	0	1	1	1	0
TOTAL	69	73	-4	86	79	3

Source: Infield Systems Ltd.

WorleyParsons lands deal for Ophir's Fortuna project in Equatorial Guinea

WORLEY PARSONS HAS disclosed the award by Ophir of the provision of engineering and project management services for their Equatorial Guinea Block R Project (The Fortuna Project). Also awarded by Ophir Holdings is a master services agreement to provide engineering support to any of Ophir's worldwide assets.

Block R is a gas development located offshore Equatorial Guinea 140 km southwest of Bioko Island and covers an area of 2,450 sq km with water depths ranging from 1,400 to 1,900 metres. Ophir and its partners are planning to develop the gas reserves through phased installation of a 20 well subsea production system supplying dry gas to a locally moored FLNG facility with a capacity of three million tons per annum.

The scope of engineering and project management services provided by WorleyParsons and its specialist deepwater division, INTECSEA, includes overseeing the front end engineering and design scopes and tendering and evaluation of related engineering, procurement, construction, installation and commissioning packages. Work has commenced in INTECSEA's UK office.

Commenting on the award, WorleyParsons CEO, Andrew Wood, said: "We are pleased to be selected for this innovative project bringing remote gas economically to market and to be providing support to Ophir's facilities around the world."

Douglas-Westwood sees big deepwater spending increase to 2019

DEEPWATER EXPENDITURE IS expected to increase by 69 per cent, compared to the preceding five-year period, totaling US$210bn from 2015 to 2019.

Douglas-Westwood, in its commentary, has noted that as production from mature basins onshore and in shallow water declines, development of deepwater reserves has become increasingly vital, particularly to oil majors. However, the recent oil price decline has intensified pressure on budgets causing numerous operators to defer sanctioning of capital intensive developments. Africa, Latin America, and North America will continue to dominate deepwater capex, with US$173bn set to be spent over the next five years, of which Africa has been forecast to experience the greatest growth.

In addition to low oil prices, building oversupply and the lack of rig demand will impact capex growth over the forecast period. In recent years, record deepwater rig demand has resulted in unprecedented levels of rig orders. Douglas-Westwood has identified a trough in global expenditure in 2015 and 2016 primarily driven by delays to delivery of FPS units in Latin America.

Building capacities in Nigeria to support increased investment in the Oil and Gas Industry

The Nigerian Oil and Gas Industry Content Development (NOGICD) Act 2010 was signed into law by His Excellency, President Goodluck Ebele Jonathan, on 22nd April, 2010.

This piece of legislation established the Nigerian Content Development and Monitoring Board to superintend over the implementation of the provisions of the Act.

In almost five years since its inception, the Board has achieved several feats under the leadership of Mrs. Diezani Alison-Madueke (OON), the Chairperson of the Governing Council and Honourable Minister for Petroleum Resources.

The following are some of the notable achievements of the Board:

1. The formation of the Nigerian Oil and Gas Industry Content Joint Qualification System (NOGICJQS), an electronic platform that currently captures more than 16,000 entries of individuals and professionals and their skills and capacities;
2. Attraction of over $5 billion investment into the Nigerian economy through various infrastructure development and facility upgrades;
3. Ensuring that Nigerian Content philosophy is fully entrenched in the procurement of Operators and Service Companies;
4. Creating of employment and training opportunities for Nigerians on the back of projects and initiatives.

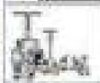
In the next three years, the Board will consolidate on its drive to attract and domicile activities in country through:

1. The Nigerian Oil and Gas Industrial Parks (NOGaPs) scheme to promote manufacturing and create jobs, shop floors and stimulate the development of linkage sectors;
2. The Liquefied Petroleum Gas cylinder Manufacturing Initiative which will amongst other things create jobs and boost exports to the sub-region;
3. The setting up of Training Centres of Excellence to impact Human Capacity Development across the linked sectors to buttress the Board's drive to use Local Content to ramp up Nigeria's industrial development.

Summary of NCDMB's Performance between 2013 and 3rd Quarter of 2014

1. **Nigerian Content Compliance:** Nigerian Content commitment in 2013 was 81.4% as compared to 94.82% in the Q3 2014 while Nigerian content level was 63.37% in 2013 as compared to 60.4% in Q3 2014

2. **Human Capital Development:** Project based training man hours of 509,000 and 457,400 were achieved in 2013 and 3rd Quarter of 2014 respectively 48 trainees completed a 6-month ... training and 35 have been assigned on the projects. 250 trainees concluded first phase of Environmental Remediation(OSMERT)



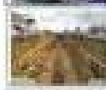
3. **Equipment Component Manufacturing Initiative (ECMI)** – A total of 810 NCECs were issued in 2013 while investment commitment of $2bn were made by vendors. Continuous monitoring of investment commitment were made in 2014 while the ECMI guideline has b being reviewed to achieve greater impact

4. **PipeMill Pilot Scheme:** 10 Hectares of land acquired at Polaku, Bayelsa State for PipeMill project. Dredging and sand-filling of the site has been completed. Mainland PipeMill has committed to invest over $200 million to set up LSAW PipeMill. Shell have awarded the engineering design contract for the jetty. Registration of project with Ministry of Environment for EIA studies has commenced

5. **Nigerian Content Development Fund:** Operating model for NCDF has been approved consisting of (1) Commercial Interventions -70% of the fund already being accessed buy industry –**Weltek Nigeria Limited, Vandrezzer Energy Services, Starz investment company limited** (2) Capacity Development Intervention- 30% for direct capacity development projects by the Board – infrastructure development, Training, PipeMill scheme etc

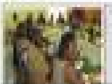
6. **Marine Vessel Categorisation & Utilisation Scheme:** 40.5% and 89.2% of marine vessels that were captured by the Board in 2013 and third quarter of 2014 respectively were category A vessels ie vessels built in Nigerian (class AAA) or vessels owned by Nigerians . This has translated to revenue retention (estimated at $3 billion in-country) and greater investor interest in ship building and maintenance services

7. **Offshore Rig Acquisition Strategy (ORAS):** Nigerian companies (Dando and Bell Oil & Gas) acquired swamp rigs. Ladol yard was certified for rig repairs. The Board has also put in place enablers to stimulate growth in Nigerian part ownership of offshore rigs- Shell drilling, Indigo have both taken equity stakes in deep water rigs



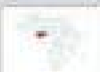
8. **Infrastructure Development & Facility Upgrade:** construction works for integration yard at Ladol has commenced, the initiative to upgrade Nexans Kabelmetal Nigeria (NKN) to manufacture Low Voltage (LV) Electrical Cable is ongoing. FMC, Aveon , Dormanlong, Saipem yards are among yards upgraded for high tonnage and more complex fabrication

9. **Nigeria Oil & Gas Park Scheme (NOGaPS):** Scheme conceived to develop physical infrastructure and create enablers for manufacturing of equipment components and allied products for the oil and gas industry. Project will be located in 9 oil producing states. blueprint has been developed, 3 locations identified in Imo, Cross River (CRAS) and Bayelsa State, concept design completed , Detailed architectural design and RFP for construction works will be done in Q4 2014



10. **Nigerian Content Consultative Forum:** Ten (10) Sectorial Committees have been inaugurated to serve as Think Tank for the industry on Nigerian content development. Sectoral groups meet monthly

11. **NCDMB Offices and HQ Building:** A new office has been rented to cater for the Board's increased activities and staff strength. The Board is also constructing a 17-storey office complex in Yenagoa to serve as its headquarters. Temporary fencing and sand filling is ongoing. Award of consultancy service and construction works will be in Q4 2014



12. **Nigerian Content Implementation is becoming a model for other countries to emulate-Kenya, Ghana, Congo Oman World Bank, Local content council (UK) have benchmarked the Nigerian content model**

The Board has two broad mandates .....to develop local capacity and enforce compliance with provisions of the NOGICD Act 2010

NCDMB is the sole Agency of the Federal Government vested with the mandate to implement Nigerian Content in the oil and gas industry .

Key functions of the Board (Section 70 of the Act)

1. To review, assess and approve Nigerian Content plans developed by operators
2. To set guidelines and minimum content levels for project related activities across the oil and gas value chain.
3. To engage in targeted capacity building interventions that would deepen indigenous capabilities- Human Capital Development, Infrastructure & Facilities, Manufactured Materials & Local Supplier Development.
4. To grow and mange the Nigerian Content Development Fund
5. To establish, maintain and operate the Joint Qualification System (NJQS) in conjunction with industry stakeholders and to operate the e-marketplace.
6. To monitor Nigerian content compliance by operators and service providers. This will be in terms of cumulative spending, employment created and sources of local goods & services materials utilized on projects and operations.
7. To award certificate of authorization for projects that comply with Nigerian content provisions.
8. To conduct studies, research, investigation, workshops and trainings aimed at advancing the development of Nigerian Content.

NCDMB *...Building a new Nigerian Oil & Gas Industry and Using Nigerian Content Development as an Instrument for the Industrialization of Nigeria.*

Building capacities in Nigeria to support increased investment in the Oil and Gas Industry

NCDMB operates from Yenagoa Bayelsa State; with 5 zonal offices and liaison office in Abuja...The Board is also constructing a 17-storey office complex as its permanent HQ building

NCDMB offices and HQ Building Project

2013 Achievements

- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

PROPOSED NCDMB HEAD QUARTER BUILDING

2014 Achievements

- [illegible] offices and Directors relocated to the new office complex
- Office improvement is ongoing at the new office complex to take more staff
- Concluded tender process for consultancy services for HQ building project; obtained BPP approval
- Concluded tender process for construction of HQ building project
- Completed construction of Portacabin at HQ building site
- Sand filling of permanent HQ building site has commenced
- [illegible]

Between 2013 and the 3rd Quarter of 2014, Nigerian Content level on project monitored was 63.3% and 60.6% respectively

Nigerian Content Compliance entails:

1) Reviewing Nigerian content plans of operators and issuing Certificate of Authorization
2) Participating in tender evaluation and issuing Nigerian Content Compliance Certificate (NCCC) and
3) Compliance monitoring of ongoing contracts

2013 Achievements

- Issued [illegible] Certificates of Authorization (COA)
- Issued 158 commercial reports and 27 NCCCs for concluded tenders
- Nigerian Content commitment on evaluated bids was [illegible]
- Nigerian Content level on contracts monitored was 63.3%

2014 Achievements

- Issued [illegible] Certificates of Authorization
- Issued 60 commercial reports
- Nigerian content level commitment on bids evaluated was [illegible]
- Nigerian Content level on contracts monitored was 60.6%
- Board is participating in technical evaluation of various EPC packages for the SNEPCO Bonga South West/Aparo (SWAA) project
- The Board is also participating in the Nigerian Content performance workshops for Egina EPC project

Project based training man hours of 509,000 and 457,400 were achieved in 2013 and Q3 2014 respectively. During the same 1 ½ year period, 50 trainees successfully completed a 4-month Geo-science training

Human Capital Development

NCDMB is involved in developing critical skills for the Oil & Gas Industry and youth empowerment in oil producing communities

Community based training - OSMERT pilot – 250

NCDMB's HCD Initiative

Human Capital Development for Growth

NCDMB led training: Classroom graduation ceremony for geosciences trainees

2013 Achievements

- Achieved 509,000 man hours on project based training
- Concluded Training Needs Analysis (TNA) project
- Completed the framework for the pilot phase of NCDMB-PETAN, which involved internship scheme for 100 trainees in PETAN companies
- Launched 4-month Geosciences training for 50 trainees
- Completed planning activities (pilot phase) for Environmental Remediation training to train 250 youths
- Completed selection of 4 trainers for constituency project to train youths from Ahoada Federal constituency
- Mainland PipeMill concluded plan to train 20 youths on Pipemill processing in China
- Board is supporting developmental needs of Fabrication Training Centre, in Lagos

2014 Achievements

- 48 Geosciences trainees received certificate of completion and 35 are already on attachment
- Concluded planning activities for training 92 artisans/ craftsmen that will join the construction workforce for the NCDMB HQ building project-contracting process concluded. Training facility at FUO is ready. Practical training centre at Patako is also ready
- Commenced pilot phase of Oil Spill Management and Environmental Remediation Training (OSMERT) for 250 youths
- Achieved 457,400 training man-hours for project based training
- Issued contract award letters to trainers for the constituency project
- Finalized framework for machinist training for 15 candidates

A total of 810 Nigerian Content Equipment Certificates (NCECs) were issued in 2013. In addition, investment commitments of over $2bn made by vendors are being monitored

Equipment Component Manufacturing Initiative (ECMI)

NCDMB seeks to grow the proportion of aggregate spend on procurement of equipment retained in the Nigerian economy through domiciliation of manufacturing in-country

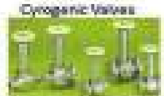
Needle Valves

Ball & Plug Valves

Check & Relief Valves

Integral Block & Bleed Valves

Cryogenic Valves



The above valves are assembled by Hy-Lok Nigeria at their factory in Obuaku Industrial Layout, Abia State- a product of ECMI

Situation

- Procurement element of a typical Oil & Gas EPCI contract accounts for between 50% - 60% of total spend.
- Currently, most of the materials and equipment used in Oil & gas projects are imported due to low in-country manufacturing activities
- Capital flight associated with imported equipment is estimated at about $3 - $5 billion per annum

NCDMB Initiative

- ECMI was initiated in 2011 to inculcate manufacturing culture in local supply chain, by mandating equipment suppliers to obtain Nigerian Content Equipment Certificate (NCEC) as requirement for participation in tenders involving supply of equipment or deployment of equipment in the oil and gas industry
- The NCEC guideline requires vendors to show how they intend to start manufacturing equipment components and spare parts and/or assemble equipment in Nigeria

Achievement

2013

- Issued 810 NCECs
- $2.085 Billion investment commitment were made by vendors as part of requirement for obtaining NCEC

2014

- Concluded revision of NCEC issuance procedure
- Commenced monitoring of investment commitments made by OEM representatives that were issued NCEC in 2013
- Major investments achieved such as Hy-lok valve assembly facility in Abia State

NCDMB *...Building a new Nigerian Oil & Gas Industry and Using Nigerian Content Development as an Instrument for the Industrialization of Nigeria.*

Tanzania gas pipeline built but not ready to start

A PIPELINE CONNECTING offshore natural gas fields to Tanzania's commercial capital Dar es Salaam is complete, but technical setbacks will keep it from going online until November, according to officials.

Tanzania estimates it has at least 53.28 tcf of recoverable natural gas reserves off its southern coastline. Discoveries offshore of Tanzania and Mozambique waters have led to predictions the region could become the world's third-largest exporter of natural gas.

The 532 km pipeline and gas processing plants, financed by a US$1.225bn Chinese loan, were initially expected to be completed last year.

"Construction of the pipeline is 100 per cent complete," Badra Masoud, spokeswoman for the energy and minerals ministry, told Reuters. "There is some additional work that remains to be done as a result of pre-commissioning inspection tests on the pipeline." Masoud said construction of two gas processing plants that are part of the pipeline's infrastructure was 96 per cent complete.

Construction of the land and marine pipeline was expected to cost US$875.7mn while the processing plants were being built at a cost of US$349.6mn, according to Tanzanian government figures.

"It was initially thought that the pipeline would be ready to deliver gas in July, but we think that the commissioning will now be done in November," said Masoud.

She said the government hopes to save around US$1bn a year in oil imports for electricity generation after the completion of the pipeline by switching to gas-fired power plants.

Ethiopia plans US$5bn refinery in 10 years

ETHIOPIA's PRIVATE OIL MARKETER plans to spend US$5bn to build a refinery in the country within the next 10 years to meet a growing demand in the horn of Africa country that has had one of the highest growth rates over the last decade, according to Reuters.

Tadesse Tilahun, the chief executive of National Oil Ethiopia, said a decision to build a refinery that could produce between 200,000 to 300,000 bpd was in the pipeline.

"It is a firm plan because oil demand is growing in Ethiopia... about 10 per cent each year from the annual consumption of three million cubic meters and in the next 10 years we expect that to double," Tilahun told Reuters at an African oil refining conference in Cape Town. "I would assume in the next 10 years we should have the refinery on the ground."

According to Forbes, National Oil's shareholders include Saudi billionaire Mohammed Hussein Al Amoudi, whose investment portfolio in construction, gold, hotels and energy has helped amass an estimated fortune of over US$10bn.

If brought online, Ethiopia's refinery will jostle for space in the African market with imports from India and the Gulf and would help other east African countries that have over the last few years discovered large deposits of hydrocarbons extract value from these finds.

Eastern Africa is the latest frontier in the global hydrocarbon hunt after gas discoveries off Tanzania and Mozambique and oil finds in Uganda and Kenya.

Dangote to raise Nigerian refinery capacity

MANUFACTURING CONGLOMERATE DANGOTE Group has announced its plans to increase the proposed Nigerian refinery capacity to 650,000 bpd from the initial 450,000 bpd.

Alhaji Aliko Dangote, president of Dangote Group, said that the refinery will be located in Lagos. "When completed in 2017, the plan will see Nigeria listed as having the largest petroleum refinery in the world," he added.

According to him, Nigeria, as a leading producer of crude oil, should be credited with a local refining capacity.

Mansur Ahmed, executive director in charge of stakeholder management and corporate communications, said, "The refinery is being designed to process Nigerian crude mix and produce products conforming to Euro V fuel specifications, as fuel demands across the continent are forecast to rise rapidly with many countries enjoying strong economic growth.

"Poor infrastructure, competitive global markets and financial constraints have traditionally held back Africa's refining capacity, while fuel subsidies in Nigeria are also an issue."

In September 2013, Dangote Group had agreed on a US$3.3bn loan with 12 Nigerian and foreign lenders to build the refinery as well as a petrochemical and fertiliser complex costing a total of US$9bn.

Alhaji Aliko Dangote, president of Dangote Group.

Dangote Group said that it will use equity and debt to pay for the refinery. The company also plans to utilise two underwater pipelines and large vessels to deliver crude to the facility.

GE delivers mobile gas turbines for PH refinery

GENERAL ELECTRIC HAS completed the supply and installation of three 25-MW, trailer-mounted, TM2500+ aeroderivative gas turbines to generate uninterrupted power at the 210,000 bpd capacity Port Harcourt refinery in Nigeria's Rivers State. The supply was made through Genesis Electricity Limited, an independent power producer.

"The installation of the mobile gas turbines will ensure that Nigeria's largest oil refinery has the power it needs to overcome grid outages and return to full capacity for refining", GE said. "Before now outages have reduced the refinery's output to 30 per cent of its total maximum capacity".

The journey to the installation began when NNPC signed a 20-year power purchase agreement with Genesis in November 2013 for the installation of GE's TM2500+ units at refinery. The TM2500+ gas turbines will provide both the base load and back-up power to support refinery operations. The agreement also includes the future modernisation of Nigeria's other two refineries.

GE said that it acted as a catalyst for the project, "taking it to financial closure by working with all stakeholders and partners to structure the project's equity. This is the first-ever non-recourse project financing for power plants in Nigeria". GE also said that it is training local engineers to operate and manage the refinery's TM2500+ units. George Njenga, the company's distributed power leader for sub-Saharan Africa, said that GE also has an in-country service and maintenance workshop to service the units. The company maintains that the TM2500+ technology's high-power density and compact footprint make it the perfect solution to address Port Harcourt Refining Company's fast ramp-up, on-site power requirements while also ensuring the refinery's long-term viability."

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The west coast floating production market is still going strong, as eastern Africa's longer-term potential emerges.

Floating production still going strong

MUCH OF WEST Africa's production growth during the past decade or so can be attributed to the increasing move offshore, notably in the deepwater off Nigeria and Angola, but also in new territories such as Ghana.

Floating production systems (FPS) have become an ingrained feature of this industry, enabling oil and gas to be produced safely and reliably - and without fail - often in locations many miles from the shoreline.

With the potential for deepwater production off the coast of eastern Africa emerging too, there's good reason to believe that this highly specialist and capital-intensive niche will continue to grow in the region.

Other new and emerging basins outside of Africa, such as Brazil's pre-salt and ultra-deepwater and the US Gulf of Mexico, point to a similar trend elsewhere.

Industry experts, Infield Systems, predicts the global FPS market over the next few years will continue to record strong growth, with Africa playing its part.

In terms of actual installations, it anticipates a 49 per cent increase through to 2018 ahead of previous years.

Key drivers, it says, include the movement into deeper, more remote waters and the increased demand for floating liquefied natural gas (FLNG) technology.

This is one area where operators in West Africa have long expressed an interest, but have been checked in their progress because of technology constraints and tight economics.

As one of the most capital-intensive development areas of the offshore market, floating production projects can be acutely vulnerable to wider industry changes, including oil price fluctuations.

A sustained low oil price environment has the potential to derail any big offshore project because of the huge costs involved, although this is something that all operators the world over are now facing up to.

However, West Africa - a place where floating production storage and offloading (FPSO) vessels have triumphed in recent decades - seems ready to buck the trend.

Douglas-Westwood industry analyst Damilola Odufuwa again cites Nigeria and Angola as strong drivers for future growth despite current industry uncertainties.

"Over the next five-years, deepwater projects in the 'golden triangle' of Latin America, US Gulf of Mexico and West Africa, are expected to account for more than 60 per cent of FPS expenditure," he said.

Operators in West Africa have long expressed an interest in FLNG - SBM Offshore's twin hull.

"Chevron, ExxonMobil and Eni all have major deepwater projects in Angola, collectively adding a peak capacity of approximately one million barrels per day. Total also has a number of FPS projects in development – examples include the Eastern Hub FPSO in Angola and the Egina FPSO in Nigeria."

New projects

The emergence of new production areas like Ghana also bodes well for the region.

In one major project announced this year, Malaysia's Yinson Group was awarded a 15-year FPSO deal by Eni to process oil and gas from Ghana's Offshore Cape Three Points block in the Tano Basin.

The field sits approximately 60 km off the Ghanaian coast with first oil due in mid 2017, first gas in 2018 and then peak production of around 80,000 boepd in 2019.

> Nigeria and Angola [have been quoted] as strong drivers for future growth despite current industry uncertainties.

Eni's OCTP project will provide domestic gas supply to Ghana's thermal power plants for more than 15 years.

Yinson's chief executive Chern Yuan Lim called it a "game changer" for the the group.

He said: "This is by far our largest contract to date, brings us into the top tier of FPSO players, and demonstrates the excellent strategic value of our 2013 acquisition of Fred Olsen Production."

The company will work alongside a local partner Oil Marine Agencies Ghana Ltd to deliver any required local content input.

The FPSO itself will be based on the conversion of a recently acquired VLCC tanker, the Yinson Genesis.

It will have storage capacity of 1.7mn barrels, with an oil-processing capacity of 58,000 bpd, plus a gas injection capacity of 150 mmscfd and a maximum future gas-export capacity of 210 mmscfd.

The FPSO will be spread-moored in an average water depth of 1,000 metres with a total topsides weight of almost 15,000 tonnes.

However, it is not only the flagship new projects that are keeping the market busy.

The bulk of the work for FPS facilities that are now operating off western Africa comes from existing fields, which can be in service for many decades.

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Malaysia´s Yinson Group was awarded a 15-year FPSO deal by Eni to process oil and gas from Ghana´s Offshore Cape Three Points block in the Tano Basin.

Big FPSO contractors like BW Offshore are engaged in mature offshore fields, as well as being brought in to open up new state-of-the-art deepwater projects.

The company has a fleet of 14 FPSOs and one FSO working around the globe.

BW Offshore recently signed an agreement for a two-year extension for the Abo FPSO with Eni subsidiary Agip for work off Nigeria, until the end of 2016, with options for an additional seven years (through to 2023).

The many hazards of floating production were also brought into stark focus this year with the explosion on another BW Offshore vessel, the Cidade de São Mateus FPSO, which was being operated for Petrobras, resulting in nine fatalities.

The FPSO, which has now been shut down, was operating on the Camarupim and Camarupim Norte fields in Espirito Santo littoral approximately 120 km from the Brazilian coast.

Floating production is another high technology area that critically depends on the global network of energy industry specialists.

Industry expertise

Like all parts of the offshore business, floating production is another high technology area that critically depends on the global network of energy industry specialists.

On a grand level, this could mean multi-billion dollar contracts, like Saipem's US$4bn-plus deal to kit out, operate and maintain FPSOs on behalf of Total for work in Angola.

The project, announced last year, includes engineering, procurement, installation and commissioning of two converted turret-moored FPSOs for the Kaombo field in Block 32.

The two converted FPSO units each have an oil-treating capacity of 115,000 bpd and a storage capacity of 1.7mn barrels of oil.

Again, reflecting the global natutre of the industry, the topsides fabrication is being done in Saipem's Karimun Island yard in Indonesia, while the actual tanker conversion and topsides modules integration is being done at another shipyard in the Far East.

The sheer scale of these giant offshore projects means there is always plenty of opportunity too for other niche suppliers.

Swedish heat transfer, centrifugal separation and fluid-handling firm Alfa Laval recently announced a US$31mn pumping systems order for work in Angola.

The order comprises offshore pumping systems for two FPSOs to be moored off the Angola coast.

In another recent project win, Singapore's Dyna-Mac Holdings secured a US$48mn deal from Malaysia's Armada Cabaca for facilities on FPSO topsides that will also eventually be deployed off Angola.

The work is for an FPSO vessel that will be sited on Eni's Block 15/06 East Hub field, 349 km northeast of Luanda.

With appetite for West Africa's deepwater still seemingly as robust as ever, there is plenty to look forward to the FPS space.

And, going forward, the prospect of opening up deepwater eastern Africa as a future gas export province bodes well that the continent can maintain its place as a magnet for more investment in this area of the industry. ■

Bumi Armada has announced the signing of a contract with Eni Angola for the chartering, operations and maintenance of a FPSO vessel for deployment at the Block 15-06, East Hub field.

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John Spain, director of business development at Quickflange, looks at piping challenges in Africa.

The Quickflange subsea pipeline repair solution is seeing significant interest in Africa.

Tackling piping and pipeline integrity in Africa - Challenges and solutions

WHETHER TOPSIDE OR subsea, onshore or offshore, African operators today face a variety of challenges when it comes to their piping and pipeline applications. This can include everything from permanent or temporary pipe repairs through to the capping of redundant lines, tie-ins, pipeline construction, decommissioning, or Emergency Pipeline Repair Systems (EPRS).

One such challenge, for example, is the need to deploy piping solutions on older and often complex upstream infrastructures with some characterised by ageing piping installations, an increased risk of corrosion and leaks, and a need to carry out modifications without jeopardising production.

Nigeria, for example, has a number of brownfields with some onshore fields beginning production as far back as the 1950's but yet to reach optimal production. Total has also recently initiated a brownfield development programme on a number of its Angolan blocks.

Complex offshore African operations

Furthermore, such is the complexity of many offshore African operations today that piping repairs, construction, modification and tie-ins must take place around interdependent infrastructures where repairs on one platform or FPSO can have a significant impact on other areas within the production lifecycle.

The need to reduce piping and pipeline-related maintenance costs in African fields is also important - particularly against the current backdrop of low oil prices. The days of production shutting down for a few days is simply not economically feasible in today's cost-conscious climate. There is a need for low impact and cost-effective solutions that have a minimal impact on existing operations.

Finally, another key challenge in African oil and gas operations today is the crowded subsea infrastructures and HP/HT offshore environments.

In such cases, there is a need to develop robust and effective subsea connection methods, reduce subsea intervention costs through easy connections and low maintenance requirements, and, in the case of already populated subsea assets, operate around existing infrastructure. Unscheduled subsea interventions must be avoided at all costs with a single subsea intervention having the potential to cost hundreds of thousands of dollars.

In summary, piping and pipeline integrity are crucial to African operators today, but there remains a variety of challenges to delivering on such integrity. This applies to the subsea pipelines that transport hydrocarbons from subsea tiebacks to onshore hubs and the complex network of piping on offshore and onshore platforms. So how are today's technologies addressing these integrity challenges?

A key challenge is the crowded subsea infrastructure and HP/HT offshore environments.

The technologies on offer

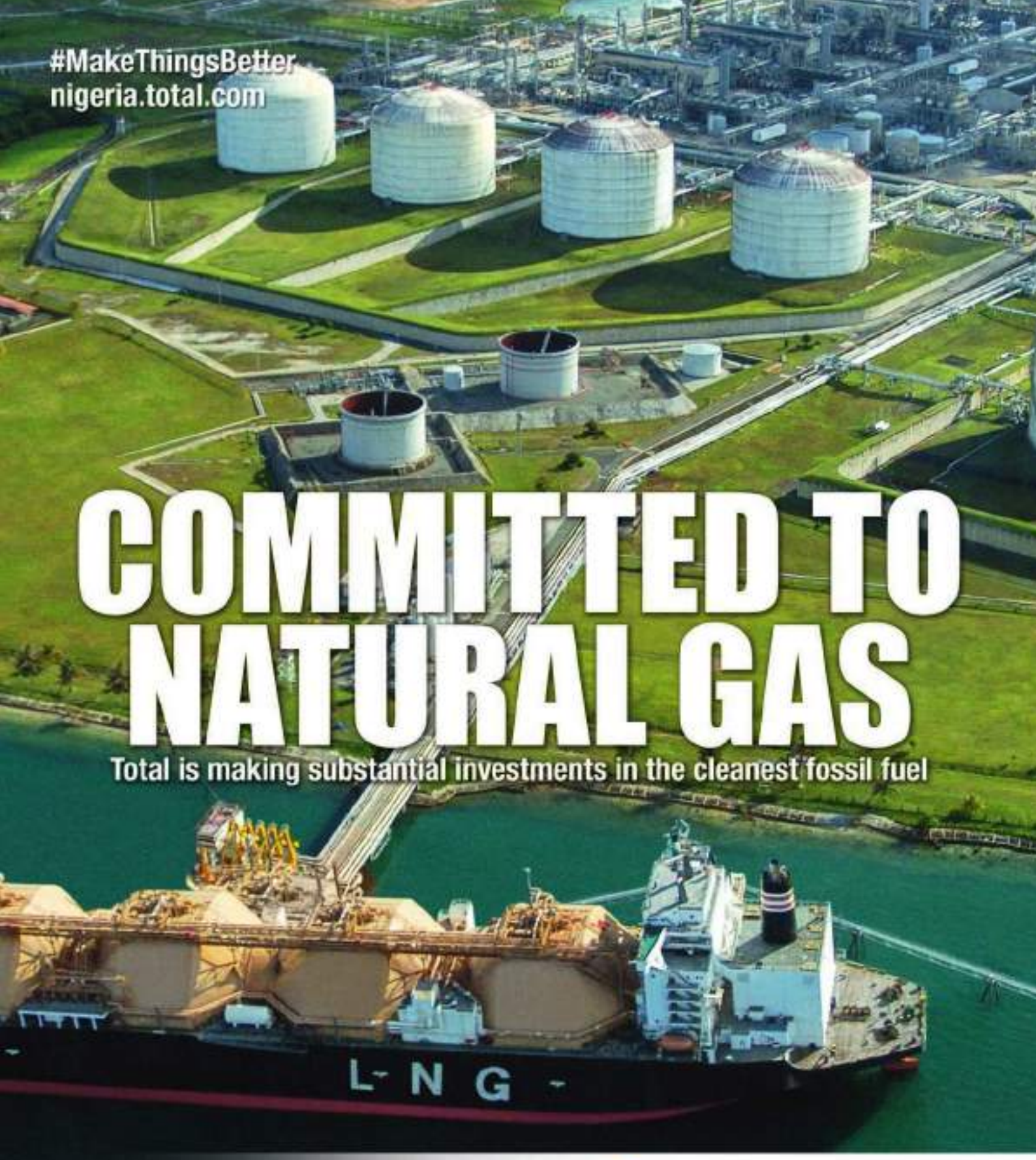
One of the more crucial areas in African piping and pipeline integrity today remains connections and the attachment of piping to flanges. Such piping connectors play a key role in areas such as permanent or temporary pipe repair, the capping of redundant lines, tie-ins, other modifications and pipeline construction.

Yet, despite the growing operator demand for such connections to be low impact, flexible and take place around existing production operations, traditional solutions, such as welding, too often fail to meet this criteria.

Welding, for example, often necessitates production being shut down if one can't isolate the line while the platform is in operation. The intrusive nature of welding also means that it doesn't easily navigate around congested platforms or subsea equipment and comes with significant logistical requirements in regard to planning, permits and personnel mobilisation. This can lead to cost and availability issues and is often ill suited to short-term repairs and unplanned deployments.

There are also safety implications to welding due to the need to access heat sources. Welding requires access to gases, ignition sources and flames with the operator needing to regularly test for flammable gases, source adequate ventilation and isolate areas of operation.

There are also similar limitations to mechanical connectors, particularly subsea, where it can often be a lengthy, cumbersome and expensive process with significant support costs and availability issues.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The Quickflange pipe connection system addresses many of Africa´s pipe connection and maintenance challenges.

The emergence of cold-work solutions

It's against this context that cold-work solutions - such as those provided by Quickflange - are becoming increasingly popular.

Cold-work solutions dispense completely with the ignition sources, flames and hot work, associated with welding and instead deliver a leak-free mechanical and pressure-tight connection. Benefits include increased safety with no spark or heat generated during the activation process; no impact on production with cold-work activities taking place in a confined area; increased simplicity, speed and flexibility; and lower costs.

In the case of the Quickflange cold-work solution, the Quickflange consists of a modified weld neck flange, with patented internal grooves machined in such a way that the flange can easily slide onto the pipe. A simple hydraulic tool is then used to fit the flange onto the pipe through a process that flares the pipe into the Quickflange grooves.

The assembled joint is stronger than the flange itself and is energised by the natural relaxation 'springback' of the deformed pipe material forced into the groove modification in the flanges. Furthermore, the fact that the flange has no moving parts, grips or other components, ensures that less can go wrong.

To date, the Quickflange has had over 4,000 installations worldwide with global customers including Amerada Hess, Apache, BP, BG, BHP Billiton, Chevron, ConocoPhillips, Exxon, Maesk, Petrobras, Shell, Statoil and Total.

Quickflange recently conducted a trial installation of the Quickflange for the ADNOC Group of Companies on the Upper Zakum field in Abu Dhabi. In this case, one of the world's largest fields and now 40 years old, the Quickflanges were installed on the discharge line of the fire water jockey pump on the accommodation platform.

In addition, cold-work solutions are also seeing increased take-up in Africa with a recent topside deployment on a major development, offshore Angola facilitated by local Angolan-based Quickflange engineers.

Going subsea

Many of the key elements of the topside Quickflange connection solution can also be seen in the Quickflange subsea pipeline repair solution that is seeing significant interest in Africa.

Here, there is a growing interest in cold-work solutions being deployed for high criticality subsea applications and for pipelines of different sizes. This also reflects a growing subsea market in Africa despite the recent oil price fall. Infield Systems, for example, predicts that the global subsea market will grow by 11 per cent between 2015 and 2019 if oil prices start to recover, with Africa taking a substantial slice of this.

As well as the topside benefits of the Quickflange already highlighted in this article, there are a number of benefits specific to subsea operations.

Firstly, there is its flexibility. The activation tool can be used on multiple pipe ranges with the installation being fully retrievable and reusable, thereby making it ideal for Emergency Pipeline Repair Systems (EPRS). The gripping and sealing system can also be integrated into different terminations making it ideal for multiple subsea operations.

The broad application range of the subsea version can also be utilised in a number of subsea scenarios, such as pipe lay, decommissioning, pipe work and new spool tie-ins, the replacement of existing flanges, subsea repairs such as for emergency spools, or for repair contingency purposes.

Cold-work solutions are also seeing increased take-up in Africa.

Secondly, there is its reliability and robustness with no moving parts and the machining taking place from a standard, off-the-shelf ANSI flange. As part of the new technology, pipe tolerance effects are also minimised as the pipe is made to fit the connector during installation

The Quickflange subsea is also currently expanding from standard flange applications to custom-made connectors that can accommodate higher pressures and larger pipeline sizes. This makes the solution increasingly suitable for critical subsea hydrocarbon applications.

Thirdly, the issue of cost is also important with a cost-effective deployment within weeks for the Quickflange subsea anywhere in the world. The simple design allows for manufacture in-country, the solution comes with minimal parts resulting in reduced CAPEX, and less time is also required for deployment.

Furthermore, as it is up to 60 per cent shorter than other pipe-end connectors, the Quickflange subsea is easier to handle with straightforward diver operations and less pipe preparation, such as coating removal and deburial. It is these issues as well as limited personal requirement that can lead to significant cost savings.

The result is a highly flexible and cost-effective but secure solution with a simple design and simple installation and which meets many of the challenges described in this article.

A growth in high criticality

Africa is currently seeing a growth in high criticality and larger pipe work applications as it seeks to meet the challenges of brownfield sites, complex infrastructures and HP/HT fields.

What is clear is that - both topside and subsea - a number of piping connection challenges are rising to the challenge with cold-work solutions leading the way. ■

Paul Brickman of Crestchic Limited explains how the thriving genset market is boosting sales of packaged transformers on a local and international level.

The full package: building transformers to last

THE RECENT GLOBAL Power Rental Market 2012–2016 report from Technavio forecasts the industry to grow at a compound annual growth rate of 17 per cent over that period. It also states that one of the key factors in this market growth is the increasing demand for electricity.

Originally built upon a niche market, the global temporary power industry is still relatively new and a good proportion of the general power industry is still unaware of the flexibility that it offers to the wider marketplace. Although Crestchic is well established in the power generation arena for the manufacture of loadbanks, temporary power is an area that still shows great potential and it is important that the industry keeps abreast of the benefits of products like multi-tap transformers in order to revolutionise power generation.

We are seeing the regional and international temporary power business as the main driver behind the sales of our step-up transformers, mostly where companies require a multi megawatt (MW) temporary power station at short notice. These can be provided by rental operators supplying reciprocating high-speed diesel and gas generators. Initially, industry leaders were tapping into areas where local energy providers were unable to supply power of the scale required or even at all, for example natural disasters.

Where is the demand?

Take, for example, Africa, where there is an insatiable and unstoppable demand for power. The continent contains some of the fastest-growing economies, and yet transmission and distribution generation capacity is generally under-developed and under-invested. Building multi-MW power stations can take years to design, build and commission – the type of power that temporary rental power stations can provide in less than eight weeks. There is a vast growth in population but this is not married with the pace of utility infrastructure development.

Another area creating demand for packaged portable transformers is the mining industry, usually located in remote areas and away from the main electricity grid. It is an industry that is built upon commodity prices and is very energy intensive. There is an urgency to get mines up and running due to the fluctuation in commodity prices which is why there is so much demand for temporary power companies which can get the sites online quickly.

Emergency breakdowns are also a growing market area, where typical failure of old installed sub-stations may occur and especially in the extractive and refining oil and gas industries where plants need to be up and running quickly again to avoid costly downtime.

With all these applications and demands, packaged portable step-up transformers are a complementary product for customers renting high or low speed generators. Crestchic's packaged offering includes both cast resin and oil filled transformers designed and built to specification by a number of major European transformer manufacturers.

Built of steel

Crestchic's oil-filled transformers are built with significant strengthening in the oil tanks and are more robust for the punishing environments of the portable rental market. This could be anywhere from Africa and the Middle East to offshore oil and gas.

Customers in this marketplace have significant demands and the packaged transformers need to be highly robust due to the harsh rental environment. However, along with this they need to be easily transportable. It is extremely common for old shipping containers to be re-used for this purpose, as they are readily available at low cost. However, recycled shipping containers are not necessarily the most robust solution, because cutting holes in the existing containers weakens the steel and general structural integrity. By manufacturing containers that are bespoke in design and engineered to be portable, Crestchic ensures that they are as strong and safe as possible. Using cross-sectioned steel and additional steel in the build process ensures a minimum lifespan of 10 years. Furthermore the structural integrity is recognised by the Lloyds Register Quality Assurance (LRQA).

In Africa there is an insatiable, unstoppable demand for power. Crestchic´s containerised transformers.

The veins of the packaged transformer

The sole reason for packaging portable transformers is to ensure accessibility and flexibility. This means no time is wasted dealing with several suppliers to obtain the various components such as the transformer itself, switchgear, ancillary electrical items and enclosures. There are also no costs for on-site assembly and little to no civil engineering is required.

If an organisation is generating electricity between 400 – 480 Volts (V) at 50 to 60 Hertz (Hz), transformers step-up from this to a range of voltages typically anywhere between 3.3kV V and 36kV with multiple voltage taps available at a range of voltages in between, depending on the customer's location in the world. Essentially this creates the capability of generating significant amounts of electricity at a low voltage and which is then easily introduced onto medium/high voltage grid systems.

Inside the container sit various components such as the input isolators, cooling fans and extraction, voltage tap selection and medium/low voltage switchgear arrangement. Everything is kept in separate compartments to accommodate the main transformer and ABB Safe Plus medium voltage switchgear, another important feature of the packaged transformer. Crestchic operates from two to four MVA in a 10-foot container and up to eight MVA in a 20-foot container. The voltage range covers a multitude of international standard grids and industrial applications at relevant frequencies – they have to be global because customers use them all over the world which allows them to work in a broad spectrum of countries. Some people refer to them as packaged substations.

It is important that the general power market is able to differentiate between packaged transformers and traditional transformers. The most obvious benefit being that it is a flexible distribution of power that can go anywhere and, all in all, we are seeing this solution become more common across the globe. ■

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As the oil price stays stubbornly low, companies involved in all aspects of production are looking for ways to cut costs. Could some aspects of oil and gas communication be better managed? Here Vaughan O'Grady looks at two in particular: knowledge sharing and satellite communications.

Joined-up solutions

THERE'S NO DOUBT that even had the price of oil remained at or near the US$100 a barrel mark, technology companies would still be queuing up to offer products and services likely to improve communications efficiencies and cut costs: faster browsing over satellite, workflow acceleration, employee tracking, new and more efficient floating fibre to name but a few.

And then there are the apps: apps for weather measurement, for remote SCADA monitoring, for remote access to real-time well data, for enhancing the efficiency of fieldwork, for workflow optimisation and for looking at ship movements, to name only a few. The number of apps is relatively small so far but it will grow quickly as oil and gas is targeted more specifically.

Advances in communications technology will also improve performance in other areas. It might be helpful, for example, if engineers off the west coast of Africa and the east coast of Scotland could see and share the same information on the same project.

You might think this is happening already. However, as Andy Brown, sales director, product design, of IHS (www.ihs.com), a provider of global market, industry and technical expertise, has said, after decades in which we moved from paper to personal computers to product lifecycle management, we are now dealing with a lot of information — in particular related to engineering — and the next revolution will be joining together that information. "There are information gaps across disparate teams located in many different areas," he said. "You can't pop to a desk and solve a problem."

But sharing knowledge isn't the only challenge. "About 50 per cent of the world's engineers are at or past retirement age," said Brown. "Think of all that knowledge leaving the business — and there are no mid-level engineers to step up into those expert roles. So it's those gaps in knowledge and expertise that we're looking to technology now to be able to fill."

Also, said Brown, "it takes eight years to take a graduate to that level of competency where he can make decisions without the help of a senior manager. There's nothing you can do to shorten that." What you can do, however, is offer tools that allow better access to information and to lessons learned in the past. These could reduce the need for senior managers to be available to answer questions.

Major cost savings

A lot of this knowledge sharing is being or will be enabled by the cloud: it can thus be put up on the web and easily accessed from various different servers via handheld devices. Brown explained: "The bigger the company the harder it is to deploy anything into the IT infrastructure. This is what's allowing such rapid development of these information-sharing platforms — because they're all going server side. You don't have to deploy anything in any of your offices worldwide." Assuming security protocols are adequate, all workers will have equal, secure access from anywhere. The result? "Our experience shows a saving of up to 30 per cent on the cost of a project by moving to the sort of systems I'm talking about."

Advances in communications technology will also improve performance in other areas.

The cost savings aren't just to do with sharing, either. "Knowledge workers generally spend about half their time looking for things," Brown pointed out. "If you can provide a joined-up solution that helps people get to answers quicker you can save a lot of time for these organisations and reduce costs."

A need for off-the-shelf systems

Getting answers quickly is especially relevant to the oil industry's move away from 'gold-plating' — a term referring to individual companies writing their own technical specs for equipment. The need, in more straitened times, is for off-the-shelf systems. The question then is, said Brown: "Is there a set of common information that we can all tap into as a group of companies in order to buy off the shelf and save ourselves that money throughout the supply chain?"

The ideal is to drive as much work as possible through a single platform — such as an engineering efficiency platform that allows people to collaborate on projects. Brown explained: "If I'm located in Africa and I've just solved a really complicated problem to do with an offshore drilling situation, how can someone sitting in the North Sea get access to that solution and just take that and reuse it — rather than recreating it themselves?"

Of course the average oil operation has terabytes of information in its systems; structuring and indexing it will be necessary. This wasn't such a pressing need when the oil price was high. Now it's an essential part of bringing together exploration and production, oil service companies, seismic vessels — different people in different places working with different machinery — and giving them the information they need quickly and conveniently.

To make all of this happen many oil and gas companies are looking elsewhere for guidance — in some cases to the aerospace and defence industry, which, ironically, was forced by the high oil price to cut back and make communication efficiencies. Now it is oil and gas that needs to respond — and if it hasn't yet, it's going to do so soon. As for any institutional barriers or attitudes entrenched against change, as Brown said, "The oil price is bringing down a lot of those." ■

The satcoms situation*

REGULAR READERS MAY be assuming that the price of satellite communications connectivity is being driven down in Africa in particular. And they would be right. Fibre and cellular growth has dramatically affected such pricing over Africa since 2011. But as Simon Bull, senior consultant with specialised satellite communications consultancy Comsys, says: "If you look offshore it would be a different story... offshore communications has always been at a premium price."

Which doesn't mean that the oil and gas industry, operating increasingly in remote areas that require satellite links, has no leverage when it comes to driving down prices at a time when its own profits are being squeezed. "It uses a lot of bandwidth and is a very important customer for the satellite companies," says Bull. But, he adds, its market strength is not necessarily equal to that of, for example, TV broadcasters, which may even control their own satellites, something the diffuse nature of oil exploration makes difficult. Buying transponder space for offshore Brazil is easier to justify than buying and launching a whole satellite for a small, isolated area. Similarly consumer broadband businesses will benefit from Ka-band satellite launches. Mission-critical oil and gas installations are likely to be more circumspect, especially in monsoon areas; Ka-band effectiveness in heavy rain is still not established.

As for fibre communications, where these can be used they have already been bought and paid for as part of the overall offshore package and are, in any case, a very long-term investment; fibre can be cost effective for production platforms which are often in place for decades in contrast to frequently moving drilling rigs. VSATs are a vital communications solution, but, as Bull points out, "Every oil and gas rig already has a VSAT on it."

Comsys discusses the offshore VSAT market in its new report* and the good news is that useable data rates have risen dramatically as core modem processing power has increased by orders of magnitude. This has effectively reduced hardware expense, but the savings this enables do not impact an operator's major cost, which is bandwidth. However, the price of stabilised antennas has fallen substantially and will continue to do so. "Demand in the maritime market has risen dramatically," says Bull. "The oil companies will benefit from the price reductions this volume has brought."

So for oil and gas there are going to be some savings, "but the obvious places to go have already been reached with [satellite] communications," suggests Bull. Except perhaps one. The very act of laying up a rig will have an effect. As Bull puts it, "There is a move within the oil and gas customer base to look at alternative [service providers] with a view to improving customer service and reducing cost, and due to the level of competition within the VSAT operator market it's the perfect time for them to do that" — even more so if rig operations have been suspended for a while.

For every rig there are also five or six active service vessels. When you have fewer operational rigs you have fewer operational OSVs. "That means," says Bull, "the OSV market has become a lot more competitive." This may not directly impact costs but it could impact services; real-time video, for example, is increasingly part of the package demanded by companies for their vessels.

In the short term, then, Ka band high throughput satellites are unlikely to overcome their immediate limitations for mission-critical communications and the crowded Ku and C bands will continue to serve most offshore operations. Until that changes, falling equipment costs and demands for improved service may be where offshore operations could save money and target efficiencies.

**The recently published Fourth Edition of the COMSYS Maritime VSAT Report looks at many of the issues discussed here as they impact rigs and vessels.*

Technology leads the way during FPSO tank cleaning projects

LEADING GLOBAL PEROVIDER of diversified environmental, industrial, and emergency response solutions, NRC, has spent the last 14 months working offshore Angola and Congo in support of FPSO phased decommissioning projects, through its industrial cleaning and waste management subsidiary, Sureclean Limited.

Over the course of these projects, NRC's subsidiary Sureclean safely completed a significant number of work scopes for their clients including its most demanding task: safe removal of crude oil and hydrocarbon sludge from FPSO cargo oil tanks and topside vessels. Other workscopes completed included NORM descaling of contaminated oil process systems using water jetting techniques and confined space entry to facilitate inspection of tanks.

The multinational industrial service contractor was tasked with the technical challenge to remove materials with a specific gravity (SG) of up to three over 30 metres vertically and 100 metres horizontally from the FPSO's deep tanks to skips located on the FPSO decks. Specifically designed vacuum transfer technology provided an innovative, safe and ergonomic solution for the controlled movement of a wide range of waste materials. When coupled with its vacuum filter units and continuous feed discharge hopper, a typical removal rate of 8-12cu m/h and a suction capacity up to 9,400cu m/h was reached.

Headquartered in Scotland, Sureclean has gained over 30 years' experience working globally within the oil and gas industry. Its vacuum transfer technology is ATEX certified for use in Zone II hazardous areas and minimises the need for entry into tanks or vessels to carry out cleaning and can significantly reduce the confined space man-hours.

Sureclean´s Vacuum Systems were engineered to safely remove sludges over 30m vertically and 100m horizontally from crude oil storage tanks.

Sureclean managing director John Barron commented: "This project was a significant achievement for the company allowing us to use specially engineered vacuum transfer solutions for the safe removal of wastes and sludges such as NORM, oily water and drilling muds at the site.

"We pride ourselves on our 'brain over brawn' philosophy, which proves that enhanced safety and productivity can be simultaneously achieved. Our vacuum transfer technologies facilitate tank and vessel cleaning remotely, with minimum man entry."

High performance liner hanger

HALLIBURTON'S VERSAFLEX XTREMEGRIP expandable liner hanger system - high-performance, advanced metal sealing technology - provides a fully compliant metal seal with a fully bonded resilient elastomeric seal to account for imperfections in the parent casing. Its ability to provide an ISO 14310 V0 tested, gas-tight seal on setting is surpassed only by its ability to provide enhanced hang-weight capabilities at temperatures above 177°C.

Ideal for use in deepwater and offshore applications and wherever long liners are deployed, the VersaFlex XtremeGrip system is designed to mitigate risks and maintain hang-weight capabilities at elevated temperatures. The system offers increased robustness associated with liners and liner deployment. The hanger and running tool are assembled together and form an intrinsic packoff which minimises downhole tool components and potential leak paths while cementing. The standard tool setup offers wash-down capabilities, rotation capabilities without bearings and simultaneously allows for reciprocation of the liner. Once the cement has been placed and the tool actuates the expansion process, the hanger is set to offer bi-directional load capabilities and provide a gas-tight, liner-top seal which eliminates remedial liner-top squeeze jobs after setting.

The unique body profile of the VersaFlex XtremeGrip system utilises engineered extrusion limiter rings to provide metal-to-metal seal and full bi-directional anchoring capability in all casing grades at elevated temperatures.

PTC solves completions integrity risk

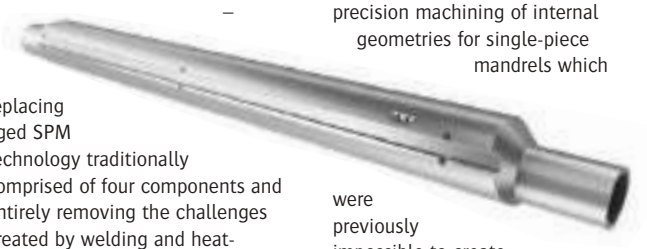
OILFIELD TECHNOLOGY SPECIALIST Petroleum Technology Company (PTC) has launched the first single-piece, un-welded Side Pocket Mandrel (SPM) for the upstream oil and gas industry – removing an integrity risk dating back more than 30 years.

The NexLift side pocket mandrel is machined from one solid steel bar – replacing aged SPM technology traditionally comprised of four components and entirely removing the challenges created by welding and heat-treatment.

Until now, achieving consistently high-quality manufacturing of traditional SPM technology has left the industry susceptible to the complete failure of the mandrel, or issues associated with operations to replace valves in SPMs, the latter being a common problem.

The industry's lengthy experience of collapsed and parted mandrels prompted PTC to develop a solution which would be more robust, reducing the potential for non-productive time on assets caused by failed mandrels.

PTC's advanced in-house engineering and manufacturing design capabilities now allow for precision machining of internal geometries for single-piece mandrels which were previously impossible to create using conventional techniques.



Rolf Haaland, CEO at PTC, said: "NexLift SPM enhances the robustness of the completion string and is the best choice for challenging well applications in which superior structural integrity and enhanced pressure capabilities are required."

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Breakthrough in 3D meshing for offshore engineers

WITH ENERGY PRICES under pressure, the oil and gas industry is looking for new ways to improve engineering efficiency. DNV GL's new Sesam GeniE 7 release saves significant time and cost with its new meshing capabilities, a breakthrough in engineering software for offshore and ship structures.

When engineers use the finite element method (FEM) to calculate the strength needed for offshore and ship structures to withstand forces such as wind and waves, optimal results are dependent on creating an accurate mesh representation in a 3D model. This has been a time-consuming operation when implementing design changes. With the new Sesam GeniE, engineers can save significant time and gain accuracy in their results using partial meshing.

The new meshing features of Sesam GeniE can be used on floating and fixed structures for all types of linear analysis. "This will help users save significant meshing time during re-meshing after a change in structure or mesh settings," said Ole Jan Nekstad, Sesam product director at DNV GL - Software, who is currently training Sesam users all over the world to use the new features.

Engineers now have control of the mesh, and are able to gain high precision by manually changing it and refining the grid. They can edit node positions while moving, collapsing or deleting elements, while continuously getting feedback on the mesh quality. For analysis of jackets and topsides, partial meshing leads to a constant finite element numbering system that saves time for re-meshing. "The response out in the field has been great," said Nekstad. "When I show people what Sesam GeniE can do now, they're amazed."

In addition, the new Sesam GeniE 7 can make automatic reports that include pictures of the structure, the finite element model and results. The pictures are automatically generated using view angles chosen by the users. "Many man-hours can be saved since it is not necessary to manually cut and paste pictures into a report," said Nekstad. "Further savings will also be gained after a re-design because the report is automatically updated."

There are many other new timesaving features in Sesam GeniE 7, including one code check for multiple water depths for jackets and a new method for copying of large models that includes all structural components.

"At DNV GL - Software we are driving the industry forward with continuous innovation and development," said Are Føllesdal Tjønn, DNV GL - Software managing director. "With its unique capabilities across any type of structures, Sesam GeniE is established as the leading and most efficient solution for offshore engineering. We are very pleased to see that the Sesam user community is growing year by year. The new capabilities for automatic mesh refinement and mesh editing are unique in the market, and will save a lot of time and cost for structural engineers, whether for initial design, modifications and requalifications or structural integrity assessment," he said.

Fully dissolvable plug-and-perf system

SCHLUMBERGER HAS RELEASED the Infinity dissolvable plug-and-perf system. This unique solution uses fully degradable fracture balls and fully degradable seats instead of plugs to isolate zones during well stimulation.

Schlumberger's plug-and-perf system.

"Operators are continuously looking to streamline plug-and-perf operations without compromising productivity," said Olivier Le Peuch, president, completions, Schlumberger. "With the new Infinity system, the ball and the seat assemblies both fully dissolve on contact with common completion fluids. As a result, the well is left with fullbore access and enables customers to bring production online faster, more efficiently and more cost effectively."

The first-ever fullbore interventionless plug-and-perf system eliminates the need for milling operations and leaves nothing behind in the wellbore. As a result, no plug debris is produced to surface where it can potentially interfere with surface equipment. The technique eliminates lateral length restrictions, which maximises reservoir contact and estimated ultimate recovery, and it greatly reduces intervention-related risks and costs.

The Infinity system underwent extensive material science and laboratory validation and has been field tested in multiple unconventional reservoirs across the United States. Numerous wells were stimulated across five of the major plays in North America without any type of mechanical intervention required.

A customer in south Texas deployed the Infinity system in a seven-well project that began with partial wellbores and, after the early successes, moved on to full wellbore completions. The system was deployed under extreme conditions, with temperatures up to 160°C in laterals up to 2,500 metres. In these wells, more than 135 stages were completed without any stages skipped or any type of mechanical intervention required.

Underbuoy breakaway coupling range

GALL THOMSON HAS launched a range of Underbuoy Breakaway Couplings (UBCs) designed to protect Single Point Mooring (SPM) terminals from the potential consequences of vessel collision or extreme weather events.

The UBC is designed to activate when strain is placed on the Underbuoy hose transfer system. It will then close the flow of media and separate the hose string. UBC activation can be caused by vessel collision (eg, tanker or other vessel) or an extreme weather event such as tsunami or hurricane.

An unprotected SPM may by dragged beyond its working envelop and suffer ruptured underbuoy hoses, fractured PLEM (Pipeline End Manifold) or damaged submarine pipeline, all of which could result in a major offshore oil spill, injury to personnel, asset damage, clean-up costs, downtime and damaged reputation. The UBC range is available with Gall Thomson Petal or Flip-Flap Valve technology.

Thermoplastic composite pipe design guidelines

2H OFFSHORE, AN Acteon company, has developed a new design guideline for thermoplastic composite pipes (TCP) to advance the understanding and use of composite materials in the offshore oil and gas industry. The Joint Industry Project (JIP) by DNV GL began in October 2014 and will take a year to complete.

The proposed JIP will develop guidelines applicable to laying of rigid and flexible pipelines, umbilicals and cables. The work will build on an established Statoil guideline for rigid pipe, explore improved acceptance criteria for rigid pipes, and establish a similar guideline for flexible pipes, umbilicals and subsea power cables.

Tim Eyles, managing director, 2H Offshore, said: "Our involvement in this JIP underlines our commitment to supporting the use of composite materials within the offshore industry. Composite pipes have many advantages. Their good fatigue performance and reduced cross-sectional weight may help to overcome technical challenges in the industry, especially in deeper water and harsh environments.

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New well perforation safety technology

INTERTEK, A LEADING quality solutions provider to industries worldwide, has announced the launch of its upgraded stray voltage monitoring system, aiding heightened protection for oil and gas industry workers.

The PM305 stray voltage monitoring system offers updated critical well perforation protection by monitoring stray potentials of up to one volt, ground integrity and stray current. The PM305 also features increased accuracy for monitoring radio frequencies and stores the dates and times of events and alarms.

Safeguarding well perforation teams from the risk of serious and potentially life-changing injuries, the PM305 monitors and alarms for hazards that can cause perforation guns to misfire. The new model has two potential ranges that cause alarms to trigger depending upon the perforation gun used.

Tom Gooderham, instrumentation manager at Intertek Production and Integrity Assurance, said: "Stray signals can occur at any time and without warning - everyday objects such as an am/fm radio, ham radio, walkie-talkie, mobile phone or passing aeroplane can cause interference. While sub-surface misfire can be costly, a surface detonation poses a real danger to the perforation team. They want to have confidence and peace of mind to carry out their jobs safely. Monitoring changes in radio frequency alerts engineers to any potential hazards. The PM305 system also allows for data capture, recording all events and alarms which can then be downloaded for audit purposes.

The PM305 incorporates new features for radio frequency detection. Using an accompanying antenna, it is able to monitor signals as small as one nano watt. In addition, it identifies the band of frequency that has created the stray signal. This new method of detection aids the perforation team in identifying the device that has created the potential hazard.

InterMoor completes riser and mooring disconnection offshore Angola

INTERMOOR HAS SUCCESSFULLY completed offshore operations for the disconnection and laydown of risers and mooring lines on a major floating production, storage and offloading (FPSO) facility offshore Angola. InterMoor won the contract in March 2014 and completed the work on budget, on schedule and with zero incidents in December 2014.

The project had two phases: Phase 1 concluded with the disconnection of all 20 risers and umbilicals from the FPSO facility and their placement on the seabed in accordance with the laydown agreement; in Phase 2. InterMoor disconnected all 12 mooring lines and placed them on the seabed while the FPSO was held in place by station-keeping vessels. InterMoor provided the station-keeping procedure and Tow Masters onboard the FPSO.

The initial contract scope included project management, engineering and offshore execution. InterMoor devised multiple methods for disconnection, including the use of clamps to take the load off the risers using the offshore construction vessel (OCV) and either disconnecting or cutting the hang off on the FPSO to lower the

InterMoor worker gets a riser ready for disconnection.

risers. The subsea riser clamp design and fabrication were added to the contract once the project progressed. The clamps were designed by Houston-based Acteon company, 2H Offshore, and fabricated in InterMoor's facility in Morgan City, Louisiana.

João Ruiz, project manager, InterMoor, said: "The successful completion of this project underlines our global reach and demonstrates the specific skills we provide for operations offshore West Africa. InterMoor was selected as the ideal candidate for the project because of our leading position as a mooring, foundations and subsea services provider for rig moves and mooring services, our decommissioning experience and our ability to provide local support from our operations base in Angola."

Thermatel TA2 from Magnetrol

MAGNETROL HAS RELEASED for sales its Thermatel TA2 thermal mass flow meter with Foundation fieldbus digital output communications. This addition signifies the growth of the TA2 and the Magnetrol commitment to continued success in flow. The TA2 with Foundation fieldbus offers all of the advantages of the standard TA2, such as:

- Dual gas calibration with two unique curves (EX: propane and natural gas)
- Field adjustability to install in different gas types or adjust for different gas mixes
- Calibration verification procedure provides cost savings due to decreased process downtime and unnecessary recalibrations
- Internal resettable and non-resettable totalisers

- Strong signal at low flows and low pressures with high turndown
- ISO 17025 and NIST traceable calibrations

Thermatel TA2, in conjunction with the Eclipse Model 706 guided wave radar, E3 Modulevel and Orion Enhanced Jupiter magnetostrictive level transmitters, form the MAGNETROL fieldbus family.

Petrolog acquires diving support vessel

OIL SERVICING COMPANY Petrolog has acquired an ocean diving vessel DSV Vinnice to boost its operations in sub-Saharan Africa. According to the company, DSV Vinnice is valued at US$170mn and is equipped for shallow and deep-water operations and can be used for construction, repair and maintenance of oilwells and other offshore naval constructions.

"This is the largest indigenous-owned vessel in its class and is capable of providing diving, offshore construction and field support," added the company.

DSV Vinnice weighs around 3,200 tonnes. It is 85 metres long and has a beam of 22 metres.

The DSV Vinnice has fire-fighting equipment, including water mist for the interior of the vessel and a sea water deluge system for its exterior. Image source: Petrolog.

Vincent Ebuh, chairman of Petrolog, said, "Equipped with the latest dynamic positioning and mooring controls, the vessel has navigation equipment and communication equipment to keep the officers and operators in constant contact. The vessel also has an ample deck space, which will afford the placement of equipment tools and supplies on its deck."

Ernest Nwapa, executive secretary of Nigerian Content Development and Monitoring Board (NCDMB), noted that the acquisition was an affirmation that indigenous oil servicing companies have developed capacity to acquire and operate hi-tech assets and could participate in every segment of the oil and gas industry.

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Project Databank

Compiled by Data Media Systems

OIL, GAS AND PETROCHEMICAL PROJECTS

Project	Sector	Facility	Budget (US$)	Status	Start Date	Completion Date
MEW - Cambambe II Hydropower Plant	Power	Hydro Power Station	129,000,000	Construction	2013-Q1	2017-Q1
ENE - Lauca Dam	Power	Hydro Power Station	3,900,000	Construction		2017-Q4
ENE - Luachimo Dam	Power	Power Plant	183,000,000	Construction		2017-Q1
Statoil - Kwanza Block - Block 39	Oil	Exploration	700,000,000	Construction	2011-Q4	2019-Q4
Statoil - Kwanza Block - Block 38	Oil	Exploration	700,000,000	Construction	2011-Q4	2019-Q4
Congo River Crossing Pipeline Project	Pipeline	Gas	2,000,000,000	Engineering & Procurement	2009-Q1	2014-Q3
Maersk Oil - Block 8	Oil	Oil & Gas Field	157,000,000	Feasibility Study	2006-Q4	2016-Q4
Maersk Oil - Block 23	Oil	Exploration	500,000,000	Construction	2006-Q4	2016-Q4
CABGOC - Mafumeira Field Development	Oil	Oil & Gas Field	5,600,000,000	Construction	2009-Q1	2015-Q1
Block 14 Negage Field Development	Oil, Gas, Offshore	Oil & Gas Field	450,000,000	FEED ITB		2016-Q4
Block 14 Lucapa Field Development	Offshore	Oil Field	300,000,000	FEED	2006-Q1	2020-Q1
Maersk Oil - Chissonga Oil Feild	Oil	Oil Field Development	500,000,000	Engineering & Procurement		2017-Q4
SONANGOL EP/Total - Block 32 Field Development	Oil, Offshore	Oil Field Development	200,000,000	FEED		2018-Q2
Block 9 & Block 21 Development	Oil	Oil Field Development	700,000,000	Construction	2007-Q1	2015-Q1
Lianzi Development Project	Oil	Oil & Gas Field	1,900,000,000	Construction	2009-Q1	2015-Q4
Chevron - South Nemba Auxiliary (SNX) Platform	Offshore	Oil & Gas Field	510,000,000	Construction		2015-Q1
Sonangol - Chevron - Angola LNG Plant	Gas	Liquefied Natural Gas	10,000,000,000	On Hold	1999-Q4	2017-Q3
ExxonMobil - Kizomba Satellites Phase II	Oil	Oil Field Development	1,500,000,000	Construction		2015-Q2
Lobito Refinery	Oil, Refining	Refinery	8,000,000,000	Construction	1998-Q1	2018-Q3
Eni - SONANGOL - Block 15/06 Development	Oil	Oil & Gas Field	500,000,000	Construction	2006-Q4	2015-Q1
Vaalco Energy - Block 5	Oil	Oil	500,000,000	EPC ITB		2018-Q1
Ministry of Transport - Caio Litoral Port Phase 1	Infrastructure	Port	600,000,000	Construction	2010-Q2	2016-Q2
Greater Plutonio Offshore Oil & Gas Development (Block 18)	Oil, Gas, Pipeline, Offshore	Oil & Gas Field	4,000,000,000	Construction		2017-Q4
GAMEK - Caculo Cabaca Hydro Power Station	Power	Hydro Power Station	3,000,000	Engineering & Procurement		2020-Q1
Chevron - South N'Dola Field Development	Offshore	Offshore Platform	3,000,000,000	On Hold		2020-Q1

Project Summary

Project Name	ExxonMobil - Kizomba Satellites Phase II
Name of Client	ExxonMobil
Budget ($ US)	1,500,000,000
Award Date	2013-Q2
Facility Type	Oil Field Development

Status	Construction
End Date	2016-Q1
FEED	AMEC
Location	Block 15, Angola

Project Backgrounds

ExxonMobil Angola plan to develop Kizomba Satellites Phase II in Block 15.

Project Status

March 2015	FES International has been completed and installed two automatic Diverless Bend Stiffener Connector (DBSC) units at Kizomba Satellites Phase 2.

Project Databank

Compiled by Data Media Systems

Project Summary

Project Name	ENI - SONANGOL - Block 15/06 Development
Name of Client	ENI, Sonangol
Budget (US$)	500,000,000
Facility Type	Oil & Gas Field
Status	Construction
Start Date	Q4-2006
End Date	Q1-2017
Location	Block 15, Angola

Project Status

Feb 2015	Dyna-Mac has been awarded of approximately US$60mn for the construction of six units of FPSO topsides modules that will be deployed at Eni's Block 15/06 East Hub field.
Jan 2015	Eni requested a three-year extension from the Angolan authorities in order to complete the exploration activities already identified: the three-year plan envisages the drilling of three wells and 1,000 sq km of 3D seismic.
Jan 2015	SBM Offshore has received formal Production Readiness Notice (PRN) for N'Goma FPSO from its client Eni, operator of Block 15/06 to receive crude offshore Angola.
Dec 2014	FMC Technologies has been awarded a contract from Eni Angola to supply subsea production systems for its deepwater Block 15/06 East Hub development. The order has an estimated value of US$393mn in revenue.
Dec 2014	Eni has started production of first oil from the West Hub Development Project in Block 15/06 in the Angolan Deep Offshore, the start-up of the East Hub Development, expected in 2017.
Nov 2014	Eni expects to bring the deepwater block 15/06 West Hub project on stream by the end of December.
Nov 2014	Bumi Armada will supply FPSO for work at Block 15/06, East Hub in October 2016.
Oct 2014	Keppel has started work for Bumi Armada to convert an FPSO for block 15/06 East Hub project, the yard will perform upgrading of the living quarters to accommodate 100 personnel, and installing an external turret mooring system and topsides process modules.
Sep 2014	The tenth commercial oil discovery has already been made in Block 15/06, the Ochigufu 1 NFW well is located at 150 km off the coast and 9.8 km from the Ngoma FPSO (West Hub). The new discovery is estimated to contain 300mn barrels of oil in place.
Aug 2014	Bumi Armada has been awarded US$2.9bn contract for the charter, operation and maintenance of a floating production, storage and offloading vessel (FPSO) from Eni for Angola block 15/06.

Project Finance

The project is operated by Eni. The company has a 35 per cent working interest in the block. *The other shareholders are:*

Sonangol 15 per cent
SSI Fifteen 20 per cent
TEPA Total 15 per cent
Falcon Oil 5 per cent
Petrobras 5 per cent
Statoil Angola AS 5 per cent

Project Schedules

Q1-2017	Completed

Project Scope

Development of Block 15/06, about 350 km North of Luanda.

Block 15/06 is situated within the Lower Congo Basin, off the coast of Angola. It covers approximately 2,984 sq km in water depths ranging between 300 and 1,600 metres.

The development of four offshore deepwater fields (Sangos, Ngoma, Cinguvu & Nzanza) with a total of 18 wells (12 producers and 6 water/gas injectors wells). Oil exported through turret moored FPSO - 100 kbopd treatment capacity and 1.7mn bbls liquid storage.

Harris CapRock launches managed communications system

HARRIS CAPROCK COMMUNICATIONS has launched the industry's first unified, fully managed satellite, wireless and terrestrial connectivity service designed to reduce customers' voice, data and equipment management costs.

Harris CapRock One is an intelligent, highly-integrated, end-to-end service that transparently switches between the various transport mediums to optimise communications for customers around the globe.

Customers in the energy and cruise industry, for example, often struggle to obtain reliable, always-on communications when their vessels, drilling sites and ships change their global positions and communications needs. With Harris CapRock One, they can replace current single or dual-band communications support options with a multiple-medium solution that exceeds their needs by providing optimal connectivity at any given time.

"Harris CapRock is going to drastically change the way our clients experience managed communications services," said Tracey Haslam, president, Harris CapRock. "Harris CapRock One is the first commercial service of its kind to unify satellite, wireless and terrestrial connectivity into one platform. Customers want a solution that is flexible and optimises their operations no matter where they are located, or how mobile their assets are. Harris CapRock One delivers that and more."

Harris CapRock's unique service offering combines a multi-band antenna with an Intelligent Communications Director (ICD). The multi-band antenna allows for C-, Ku- and Ka-band connectivity with no additional moving parts, meaning that any satellite orbiting the Earth can be accessed with no technician intervention required. The ICD is a geographically aware smartbox that recognises where the multi-band antenna is around the world and carries a database of the network footprints available. The device is aware of the operator's traffic and can route traffic intelligently over the most

appropriate network path based on speed, latency, location and cost. By optimising the network traffic, the ICD enhances the end-to-end experience, completing an intelligent routing solution with end-to-end application performance management.

Energy and cruise industry businesses can invest in fewer radomes that support any signal and will self-configure for the scenario depending on where the vessel or site is in the world. Ships and oil and gas sites now have multiple communications choices in one technology solution, achieving the highest uptime in the industry at 99.999 per cent. Customers can receive this high availability solution for one simple price.

Other telecommunication services supported by Harris CapRock One include fibre, point-to-point and point-to-multi-point radio, WiMax, terrestrial Multi-Protocol Label Switching (MPLS), and private and carrier-based Long Term Evolution (LTE). Additionally, Harris CapRock can deploy hybrid networks that leverage multiple transport technologies, providing true "no touch roaming" services across an entire fleet.

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