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ISSUE 6 | MARCH 2013

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How hyper-realistic training methods could help prepare staff for challenging situations

+ EAST AFRICA'S NEW GAS FRONTIER

+ THE ARCTIC DEBATE CONTINUES

+ COULD THE FUTURE BE RIG-FREE?

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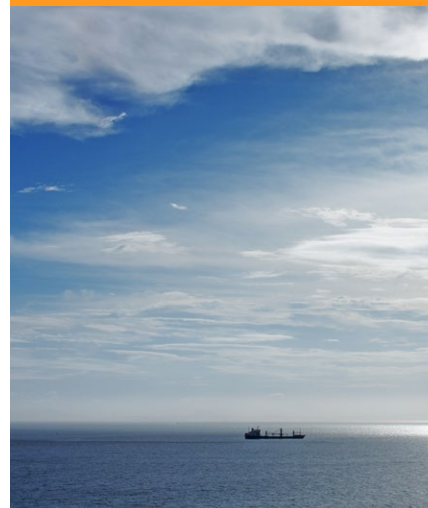
SECURITY TRAINING GETS REAL

As hyper-realistic and virtual training emerges, is offshore security training due for a shake-up?



LAW OF THE SEA

Why the UN treaty is crucial to the US' Arctic drilling plans



SPOTLIGHT ON MYANMAR

A controversial oil and gas industry on verge of rapid expansion



EAST AFRICA'S NEW FRONTIER

We profile a booming region with many challenges to overcome



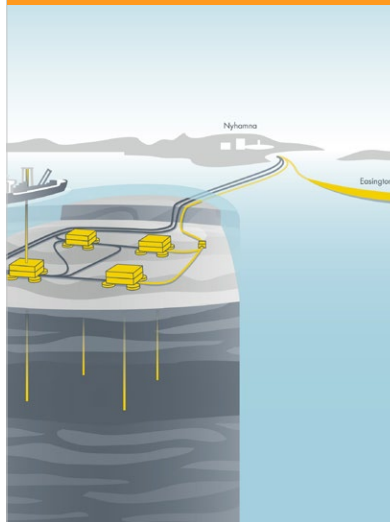
TIP OF THE ICEBERG

Shell's rig failure has fuelled renewed Arctic debate



BEYOND THE RIG

Subsea compression could remove then need for rigs



LIQUID ASSETS

How BP's reduced salinity water injection could boost production



FINDING NEW TALENT

Young talent must be cultivated to ensure the survival of the industry





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INDUSTRY NEWS

Sri Lanka to tender additional offshore exploration blocks

US prosecutors accuse BP and Transocean over Gulf spill

Tax breaks boost North Sea investment to 30-year high

Europe agrees on first offshore oil and gas safety law

African Petroleum finds oil at Bee Eater-1 well

UK approves Statoil's \$7bn Mariner field development plan

Statoil to develop floating production unit and terminal

Sri Lanka to tender additional offshore exploration blocks

27 February 2013

Sri Lanka's Government has announced it will invite companies to bid for licences related to 13 blocks in the Cauvery and Mannar Basins off the country's north-west coast.

The island nation, which spent nearly \$5.04bn on imports in 2012 and does not produce oil currently, aims to end its dependence on imported fuel with the start of oil and gas exploration domestically.

In the last offering, Cairn India was the only firm to buy a licence. This latest offering comes after the company started the second part of its exploration programme in the beginning of February 2013, reported Reuters.

In the upcoming round, five licenses are expected to be offered for bidding. Cairn already holds rights to drill in one of eight blocks in the offshore Mannar basin, while China and India have been offered one each, which they are yet to accept.





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SECURITY *TRAINING* GETS REAL

*Are the current methods of training offshore personnel in need of a shake-up? As hyper-realistic training emerges, **Chris Lo** asks Halo Corporation president Brad Barker about his vision for bringing immersive military training techniques to offshore security*

The open ocean can be a dangerous place: In hotspots such as Africa's east and west coasts, pirates and militants regularly attack ships in search of valuables and hostages. While such attacks are commonly aimed at merchant vessels, the geopolitical stakes are raised even higher for the offshore oil and gas industry. Attacks on major oil and gas infrastructure have the potential to destabilise the world's hydrocarbon-based energy supply.

A series of attacks on oil and gas facilities and vessels in Nigerian territory between 2006 and 2010 showed just how harmful these security breaches can be. It reportedly resulted in more than 200 foreign workers being taken hostage and reduced Nigeria's oil production by around 25%.

The growing profile of piracy and other offshore attacks has provoked a heightened onboard security presence and multilateral naval escort initiatives making most vessels and offshore installations a much tougher target for potential assailants. But the tragic outcome of the recent hostage situation at an onshore gas plant in Algeria highlights the strategic priority that militants assign to energy infrastructure. ►



▶ CHALLENGING THE STATUS QUO

▶ BRINGING REALISM TO TRAINING

▶ INTEL AND INTEROPERABILITY

CHALLENGING THE STATUS QUO

For Brad Barker, president of US-based security consultancy Halo Corporation, a major flashpoint like the hostage crisis in Algeria often serves to shake up the best practices for security training. "Why do you have to get punched in the face a few times before you learn how to block?" he asks.

Simple human nature and its tendency towards complacency might provide the answer to that question, but Barker makes a compelling argument that security training should always be looking to challenge the status quo.

In the case of offshore security training, the status quo in question is dominated by theoretical workshops followed by on-the-job training on an actual oil platform. "The overwhelming majority of training programmes go from a PowerPoint to an actual GOPLAT [gas and oil platform]," Barker says.

Halo, along with its training partner Strategic Operations, has introduced 'reality-based training' to US military forces, with Strategic Operations delivering its courses to more than 600,000 members of the US Army, Air Force, Navy and Marine Corps.

Reality-based or hyper-realistic training, emphasises practical training scenarios in faithful military environments, including the physical simulation of battlefield injuries and the provision of trained military role-players to act as the opposing force (OpFor).



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LAW OF THE SEA

*As preparations for Arctic drilling begin, the US must ratify the UN Law of the Sea treaty or risk losing its rights over untapped resources. **Heidi Vella** explains why the treaty is integral to the country's exploration plans*

Despite being on and off the White House's agenda since 1982, the Convention of the Law of the Sea, or Law of the Sea Treaty (LOST), which is ratified by 163 countries and the European Union, has never been ratified into US law.

The treaty's main objective is to define the right and uses of the world's oceans by establishing borders, economic exclusive zones, establishing continental shelf jurisdiction, environmental guidelines and management criteria. ►



SUPPORTERS AND CRITICS



GAINS FOR THE INDUSTRY



THE TIME IS NOW

SUPPORTERS AND CRITICS

It's the exclusivity which has made the Law of the Sea Treaty a sticky point in US politics. Republican critics have regularly expounded their general mistrust in allowing external law makers to dictate how the world's most powerful country can use its surrounding waters. But many senior US politicians – President Obama, John Kerry, Hilary Clinton and five former Republican secretaries of state – all support it.

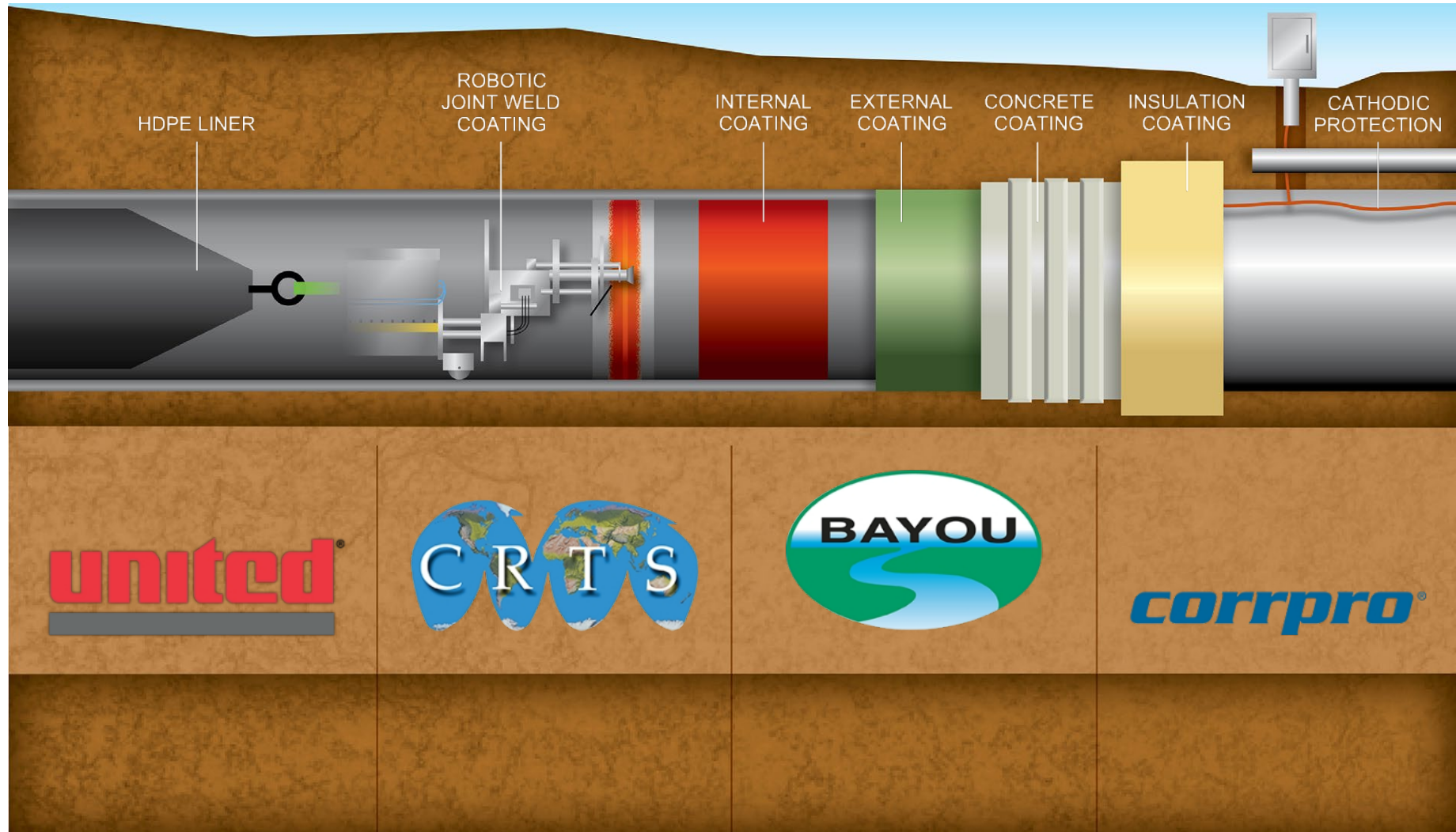
In Obama's first term as President the treaty was first raised by Hilary Clinton, who in 2012 testified to the US Senate Committee on Foreign Relations arguing for the ratification of the treaty. Six more major witnesses, including generals and admirals, also testified in its favour, followed by a number of organisations such as the American Petroleum Association.

However, in July 2012, 34 Republican Senators pledged to vote against the treaty if it was raised for ratification. Thirty-four votes is enough to halt its ratification, as it would require two-thirds of the votes to pass. The treaty was again put on ice.



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Spotlight on Myanmar

*With Western sanctions on oil and gas companies working in Myanmar removed, bidding has begun for the country's vast reserves. **Heidi Vella** looks inside a controversial industry on verge of rapid expansion*

Fifteen years of military rule in Myanmar ended in 2010 with an election that was regarded as a step towards political reform and democracy. This prompted the US and other Western countries last year to lift sanctions forbidding companies to engage in economic activity in Myanmar, opening up the country's rich oil and gas reserves for business.

The military junta that ran Myanmar (which is also known as Burma) for 15 years was accused of corruption and breaching human rights, including forcing opposition party leader Aung San Suu Kyi to be kept under house arrest for 15 years.

Critics of the current government believe that nothing has fundamentally changed, especially within Myanmar's state run oil and gas industry, which is accused by activist groups of being rife with corruption and responsible for carrying out human rights abuses, leaving many concerned that very few of the country's people will benefit from an open energy market. ►



EMERGING OPPORTUNITIES



LACK OF TRANSPARENCY



VULNERABLE COMMUNITIES



ADDRESSING ISSUES

EMERGING OPPORTUNITIES

Until the sanctions were lifted, Myanmar's offshore oil and gas industry has been dominated primarily by Asian companies, most notably in China, who purchase gas from the Shwe Gas offshore project run by South Korea's Daewoo. China is currently building a 1,800km pipeline from Kyauk Phyu in Arakan to Kunming, which will become active this year.

Other significant offshore projects include the Yetagun gas field in the Gulf of Martaban, which contains reserves estimated at 3.2 trillion cubic feet of gas and is run by Thailand's national energy company PTTEP, and the Yadana gas project in the Andaman Sea, which is estimated to contain more than 150 billion cubic metres of natural gas and is run by Total, PTTEP and Chevron.

National oil company Myanmar Oil and Gas Enterprise (MOGE) announced last year that it signed contracts with 14 foreign companies for 30 offshore blocks, with a further 22 blocks up for grabs. Countries currently interested in these blocks include ConocoPhillips, Hess Corp, Royal Dutch Shell, BP, BG Group and Australia's Woodside Petroleum.

Although a tremendously poor country, Myanmar has one of the oldest oil and gas industries in the world and, aside from allegations of atrocities, it apparently runs efficiently. MOGE runs the industry on behalf of the Ministry of Energy (MoE) and all international companies working in Myanmar



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EAST AFRICA'S *NEW* FRONTIER

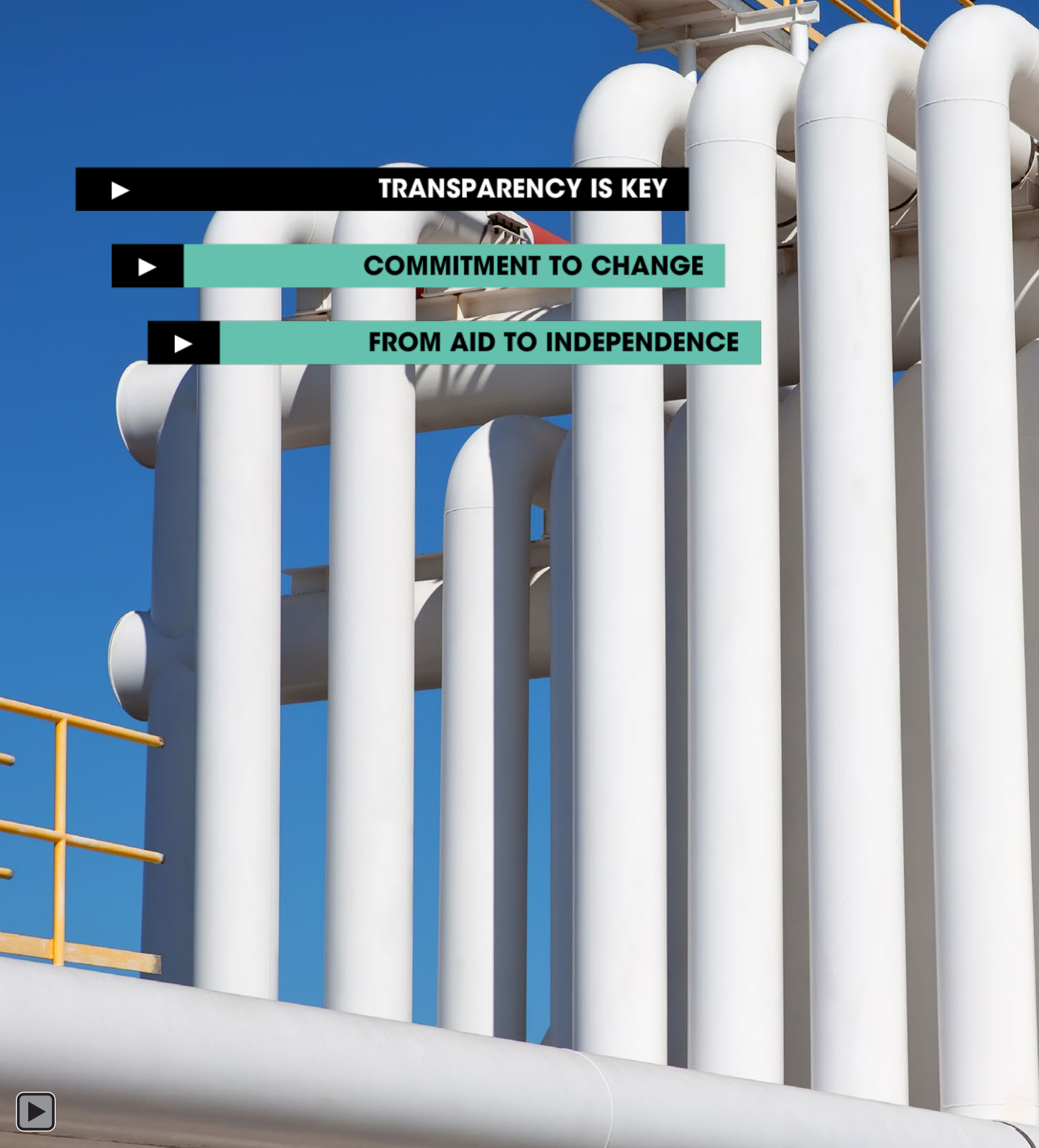
REGIONAL FOCUS

*The East African offshore oil and gas industry is about to become one of the world's biggest energy frontiers. But before this can happen the region has many challenges to overcome, as **Heidi Vella** finds out*

East Africa may have been slow in discovering and tapping its offshore oil and gas reserves, but following several significant discoveries in offshore Mozambique, Tanzania and Kenya, energy companies are queuing up to become part of the new energy boom.

A recent US Geological Survey of East Africa's coastal waters estimated the region may contain up to 441 trillion cubic feet of natural gas, a figure that will likely increase with further exploration.

This is good news for East Africa and energy companies alike. However, the imbalance between the inexperience and pressure facing governments and the commercial interests of companies could lead to a promising venture turning into an unlevel playing field filled with tension and mistrust. Now is a pivotal time for Mozambique, Tanzania and Kenya to get the development process right. ►



TRANSPARENCY IS KEY

Several key issues could hinder the process of offshore development in the region: negotiating contracts, transparency, corruption, regulatory frameworks and the distribution of wealth.

While international help is available from organisations such as the World Bank, the Extractive Industries Transparency Initiative (EITI) and Revenue Watch, which assists in negotiations and regulatory framework, it is ultimately down to the governments to make the right decisions for their countries.

"Now is the right time to put the right systems, check and balances in place," says Revenue Watch deputy director Antoine Heuty.

EITI is working with Mozambique and Tanzania to achieve more transparency in the offshore oil and gas industry and promote a more accountable industry.

In 2010 and 2011 Anadarko discovered huge recoverable gas pay finds in Mozambique's Rovuma Basin, which PTT Exploration and Production and Italy's Eni also have stakes in. There is expected to be between ten and 30 trillion cubic feet (TCF) of natural gas offshore. No extraction of gas has taken place so far. However, this year Mozambique will be taking bids from companies for further wells. The country hopes to export gas to the world's biggest consumer of natural gas, Asia, which it is ideally located to reach.

▶ **TRANSPARENCY IS KEY**

▶ **COMMITMENT TO CHANGE**

▶ **FROM AID TO INDEPENDENCE**





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TIP OF THE ICEBERG

The grounding of Shell's drill ship in Alaska has added fuel to fears that offshore operations in the Arctic may be too risky.

***Sarah Blackman** investigates the debate*

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TO WATCH THE VIDEO ONLINE

T

he idea of drilling the Arctic for oil, however controversial, has conjured up significant support in recent years. According to the Arctic

National Refuge, more than 75% of Alaskans, along with congressional delegations and governors, favour exploration and production in the region, for the billions of dollars it would contribute to the US economy and the thousands of jobs it is expected to create. The Obama administration has also supported the rush for resources in the Arctic, hoping it will reduce the US trade deficit, decrease OPEC power and improve national energy security.

But preliminary drilling by Royal Dutch Shell in the Chukchi and Beaufort Seas has led to a series of debacles during the last few months, and experts fear the company's latest mishap may be just the tip of the iceberg.

On 2 January, one of two Arctic-class drill ships deployed by Shell ran aground in the shallow water off Sitkalidak Island after drifting in stormy weather. The Kulluk rig deviated from one of its tow lines and grounded on rocks along the south-east shoreline. The incident followed repeated equipment failures, including damage to a piece of safety kit during testing in September 2012, prompting Shell to postpone an attempt to drill into oil-bearing rock.

These events should have come as a warning sign that drilling in the Arctic is too risky, say environmental groups, who fear an oil spill



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Beyond THE RIG

Nyhamna

Easington, UK

*As Shell continues to develop its subsea compressor technology for the Ormen Lange deepwater project in the Norwegian Sea, **Heidi Vella** asks if the vision of an entirely rig-less project could soon become reality*

It's been 25 years since the oil and gas industry first started working on the concept of subsea compression. Now, it appears the technology could be ready for use within the decade, doing away with the need for unsightly and unsafe offshore oil and gas rigs altogether. This is an advancement that will change the face of the industry as we know it – and it could potentially ease some of the challenges of drilling in the Arctic. ►



SUBSEA COMPRESSION



CRACKING THE ICE



GOING RIG-FREE

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TO WATCH THE VIDEO ONLINE

SUBSEA COMPRESSION

The Shell-operated Ormen Lange gas project started in 2007 and is the largest project in the Norwegian Sea. Located 120 kilometres north-west of Kristiansund in depths of 850m to 1,100m, the gas project runs completely without an offshore platform.

All its gas production takes place at an onshore facility called Nyhamna and the gas is then exported 1,200km to Easington in the UK through the world's second longest offshore gas pipeline. At full production, the gas covers 20% of the UK's supply.

Engineers working on the Ormen Lange project are currently running a subsea compression pilot using first-of-its-kind technology to provide the project with necessary pressure support when the natural pressure drops, which is anticipated to happen within a decade.

Such compression is needed in order to give the gas enough speed to be able to climb the steep route to Nyhamna. The subsea compressor is currently being tested in a pit connected to the process module, which will simulate the subsea conditions.



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LIQUID ASSETS

PRODUCTION

*As BP's reduced salinity water injection technology moves into field testing, **Julian Turner** reveals how this unique recovery solution could produce more than 40 million barrels of additional oil compared with conventional water-flooding techniques*

As oil demand rises and the search for dwindling reserves forces companies into ever-more inhospitable environments, enhanced oil recovery (EOR) techniques are needed to keep the oil flowing. The great push into the Arctic has coincided with a raft of research into sustainable, cost-effective EOR solutions that could extract 30% to 60% more oil from a reservoir than is possible using primary or secondary recovery techniques.

Globally, only about 35% of oil is extracted, leaving huge natural resources untapped. For a major such as BP, a mere one percent improvement in its recovery rates could yield an additional two billion barrels of oil equivalent. The British multinational is now deploying, for the first time, a new technology that could significantly increase the amount of oil recovered from the UK's largest hydrocarbon resource, the Clair Ridge development, off the west coast of Shetland. ►



PUSHING RESERVOIR LIMITS



LOSAL EOR TECHNOLOGY



RISKS AND REWARDS



GLOBAL RETROFITTING

PUSHING RESERVOIR LIMITS

BP's recovery strategy focuses on four specific injection techniques to displace more oil from injection wells to production wells. Pore-scale displacement uses a fluid to replace another in porous media; sweep looks at the spread of injected material from the injection well; drainage concerns access different sections of a reservoir; and cut off addresses the level of water cut that a well is allowed to flow to.

The company's Pushing Reservoir Limits (PRL) team has spent the past ten years working on these and other EOR technologies, one of them reduced salinity water injection (LoSal® EOR), which improves pore-scale displacement by increasing the effectiveness of water-flooding.

"One day most floods will be done with LoSal EOR, and it will be a feature of production facilities in new fields, as we can design the platforms to accommodate the desalination plant," says the PRL team's R&D manager, Andrew Cockin. "We first tested it in a corner of the Endicott field in Alaska, and based on those results we're introducing it to offshore fields."

Clair Ridge on the UK Continental Shelf is set to be the first sanctioned large-scale offshore EOR scheme to employ LoSal EOR. The £4.5bn development, which is scheduled to come on-stream in 2016 includes \$120m for desalination facilities to create low-salinity water for water-flooding, a technique that involves injecting water into oil-bearing rock to artificially boost recovery rates.



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INSIDE VIEW

Award-winning British engineer Keith Neish talks to *Ozge Ibrahim* about the skills necessary for success and warns that young talent must be cultivated to ensure the future survival of the oil and gas industry

Atracting young talent has been a challenge faced by oil and gas companies for years. Last year saw a rise in the number of people seeking jobs across the sector, according to specialised agents and careers sites serving the industry. Coupled with an upturn in activity in the global industry, the future looks bright for both those seeking opportunities and companies looking to hire the best talent.

However, there remains a shortage in engineering graduates in the UK, which means companies must work harder to seek out and train future employees. According to the Royal Academy of Engineering the number of science, technology, engineering and maths graduates needs to be increased by 50% to keep up with global competitors.

Spotted by an Amec engineering manager during summer placements at the company, Keith Neish joined the services giant in 2006 as a graduate mechanical engineer after completing an engineering degree. He won the 2012 Oil and Gas UK award for Overall Excellence, awarded to people under the age of 30 working across the industry. ►



OZGE IBRAHIM: WHAT INSPIRED YOU TO PURSUE A CAREER IN THE OIL AND GAS SERVICES INDUSTRY?

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OI: CAN YOU DESCRIBE A SITUATION THAT HAS CHALLENGED YOU?

OI: ARE YOU WORKING ON ANY OTHER LARGE PROJECTS?

OI: HOW CAN THE INDUSTRY IMPROVE GRADUATE INTAKE IN THE UK TO HELP MEET GROWING SKILLS SHORTAGES?

OI: WHAT ARE YOUR FUTURE AMBITIONS?



An offshore oil rig with a yellow and red structure, featuring several tall derrick cranes, stands in the middle of a blue sea under a cloudy sky.

Potential for exploration

A close-up portrait of a middle-aged man with grey hair and a woman with dark curly hair, both smiling warmly at the camera. They are positioned in front of a teal background with white curved lines.

Potential for development

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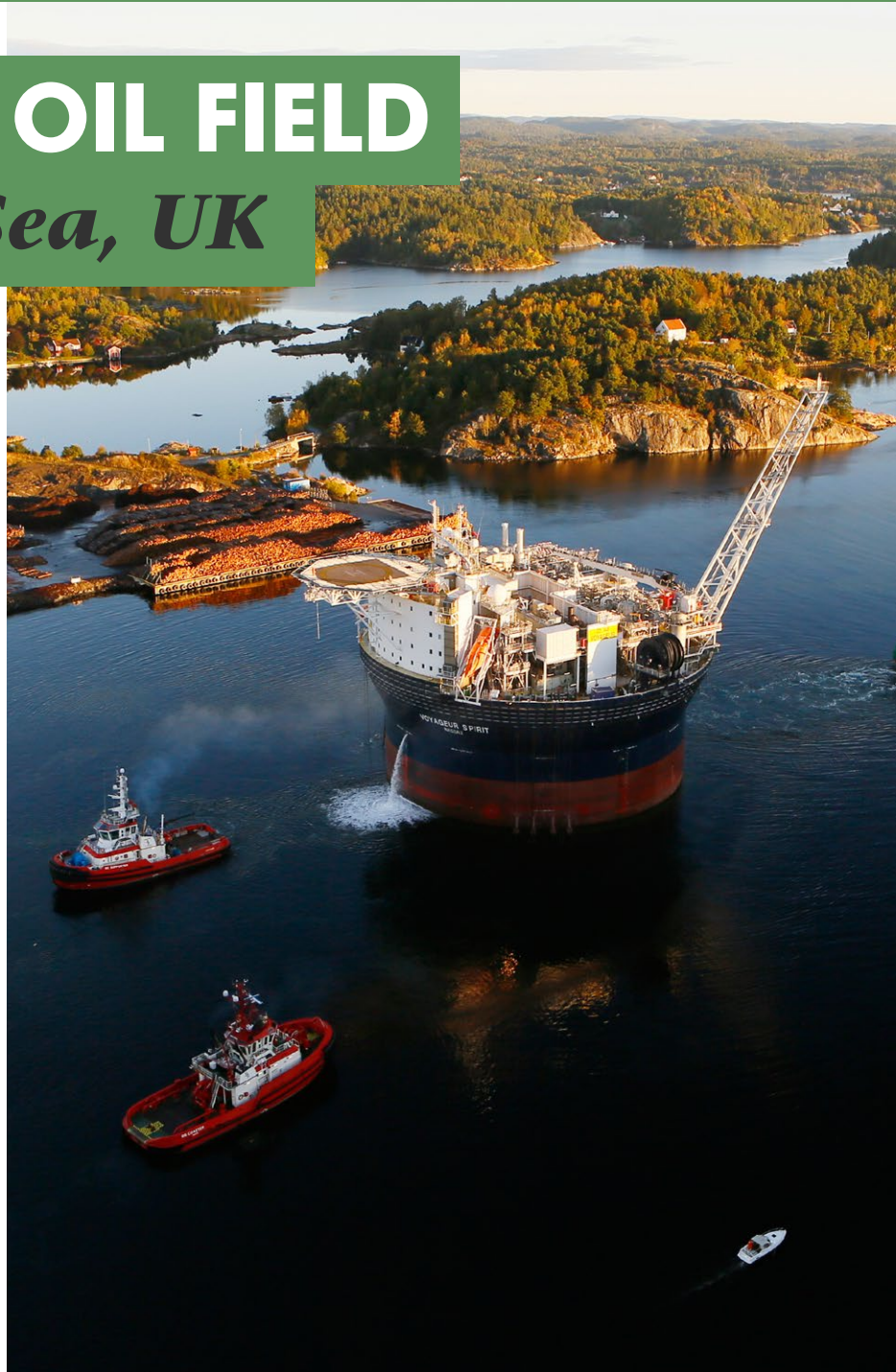


HUNTINGTON OIL FIELD

Central North Sea, UK

Huntington is a light oil field located in Block 22/14b in the UK's central North Sea area, located 205km east of Aberdeen at a water depth of about 91m. First oil from Huntington is expected in the first quarter of 2013. E.ON E&P UK, an upstream oil and gas company owned by E.ON, operates the field with a working interest of 25%. Premier Oil (40%), Noreco (20%) and Carrizo Oil & Gas (15%) are non-operating partners in the license.

The Huntington field was discovered in June 2007 by Oilexco (acquired by Premier Oil in 2009). Block 22/14b includes three discoveries in separate reservoirs, the Paleocene Forties, Upper Jurassic Fulmar and Triassic Skagerrak. A discovery well drilled to a depth of 4,061m in the Triassic Skagerrak formation found oil in two separate zones through a single bore. ►



Key Data

Location
Block 22/14b, central North Sea, UK

Water Depth
91m

Field Discovered
June 2007

Production Capacity
30,000 barrels of oil each day

Owners
E.ON E&P UK (25%), Premier Oil (40%), Noreco (20%), Carrizo Oil & Gas (15%)

Operator
E.ON E&P UK

Wireline pressure and sampling tools have recovered high-quality oil, 41° API gravity from the Forties and 39° API gravity from the Fulmar. Flow rates from the two zones aggregated in excess of 11,000 barrels of oil equivalent per day (boepd) during drillstem testing.

Appraisal drilling of the Forties and Fulmar sands was completed in December 2007 and February 2008 respectively. At the end of the programme, at least 137.7m of oil column was identified in the Fulmar zone.

FIELD DEVELOPMENT

The first phase of the Huntington development project covers the Paleocene Forties reservoir. A field development plan was approved by the UK Department of Energy and Climate Control in November 2010. Development drilling on Huntington was started in April 2011 and finished in July 2012.

Four production wells and two water injection wells are planned for the field. All the wells will be tied back to the FPSO vessel Voyageur Spirit via a subsea manifold. The vessel, which has been upgraded at Nymo fabrication yard in Norway to handle 30,000 barrels of oil each day, reached the Huntington site in early October 2012.

The produced oil will be stabilised and stored in integrated tanks on the FPSO and transported to the market in shuttle tankers, while the produced water will be injected back into the reservoir to maintain pressure.



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PROJECT

VOLUND OIL FIELD

North Sea, Norway

Volund oil field is located six miles south of Alvheim oil field, in Block 24/9 of the North Sea, at a depth of 130m. Marathon Oil Corporation operates the field and owns a 65% working interest in the project, with Lundin Petroleum owning the remaining 35%.

The field was originally known as Grieg, at the time of its discovery in 1994, but exploration was postponed at that time as development was not deemed economically viable. Licence holder Marathon began exploration on the nearby Hamsun prospect in 2003. When the prospect exhibited recoverable amounts of hydrocarbons, further studies revealed that the two prospects, Grieg and Hamsun, were related to each other. In 2006 the fields were joined into the Volund field. ►



IMAGES COURTESY OF MARATHON OIL CORPORATION

Key Data

Location
Block 24/9, North Sea, Norway

Field Discovered
1994

First Oil
September 2009

Recoverable Reserves
**7.8 million cubic metres of oil,
one billion cubic metres of gas**

Operator
Marathon Oil Norge

Licensees
**Marathon Oil Norge (65%),
Lundin Norway (35%)**

Initial production began in September 2009, and regular production started in April 2010. Volund contains recoverable reserves of some 7.8 million cubic metres of oil and one billion cubic metres of gas. The depth of the reservoir is approximately 2,000m.

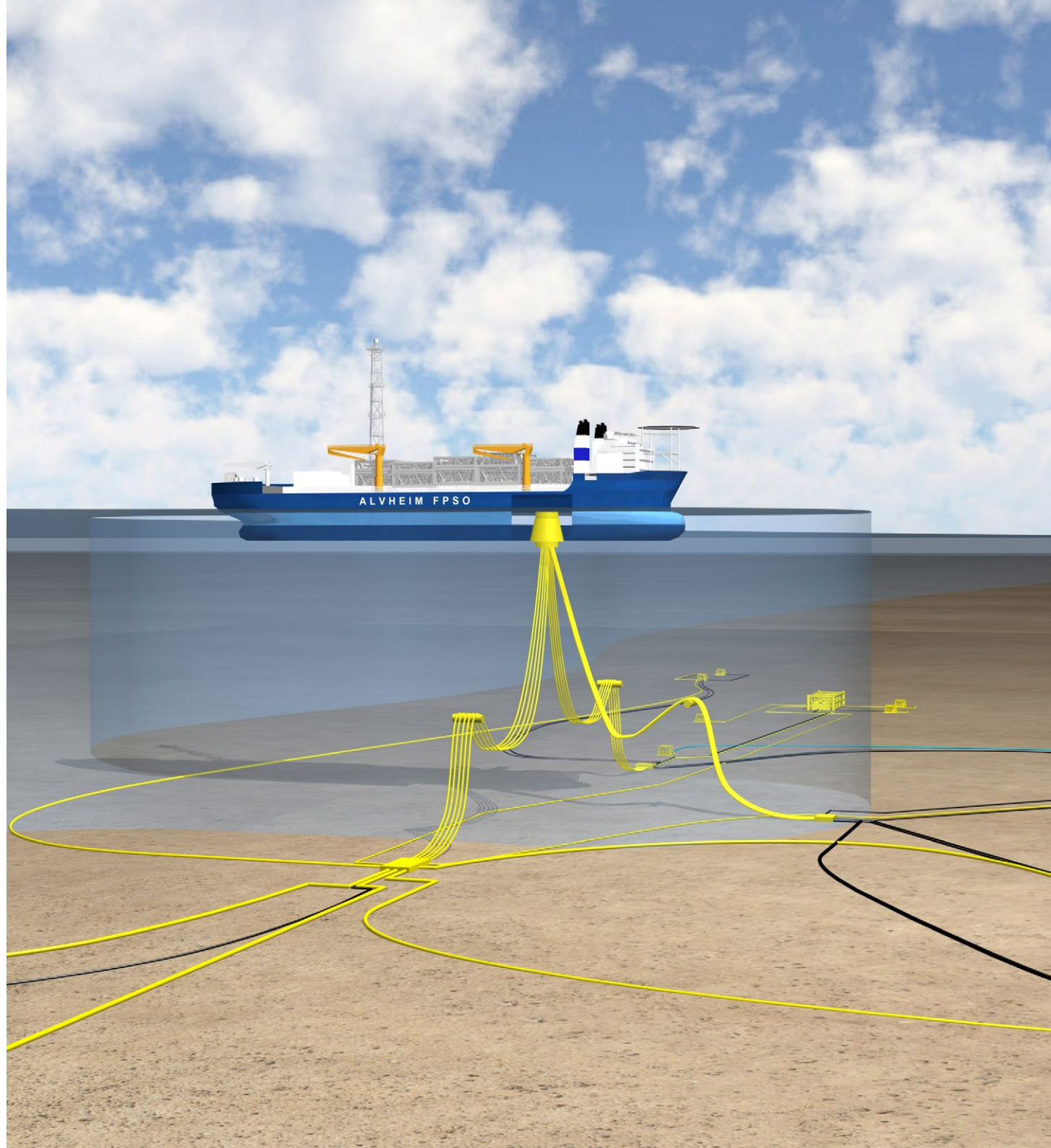
DEVELOPMENT AND INFRASTRUCTURE

The plan for the development and operation of the Volund field was approved by the Norwegian Ministry of Petroleum and Energy in January 2007. Under the first phase of the project, three production wells and a water injection well were drilled and developed as a subsea tieback to the Alvheim FPSO vessel. The first production well was successfully flow tested in September 2009.

Drilling development for the second phase, which involved drilling of two multilateral production wells, started in late 2009 and was completed in 2010. All the oil producing wells were put into production in August 2010.

Pressure support for hydrocarbons production is provided by the single water injection well. Water produced on the Alvheim FPSO is used for injection.

Recovered crude oil from the Volund field is piped to the Alvheim and then shipped to market by shuttle tankers. Associated gas is exported to the St. Fergus gas plant in the UK, via the Alvheim to Scottish area gas evacuation pipeline. ■





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PROJECT

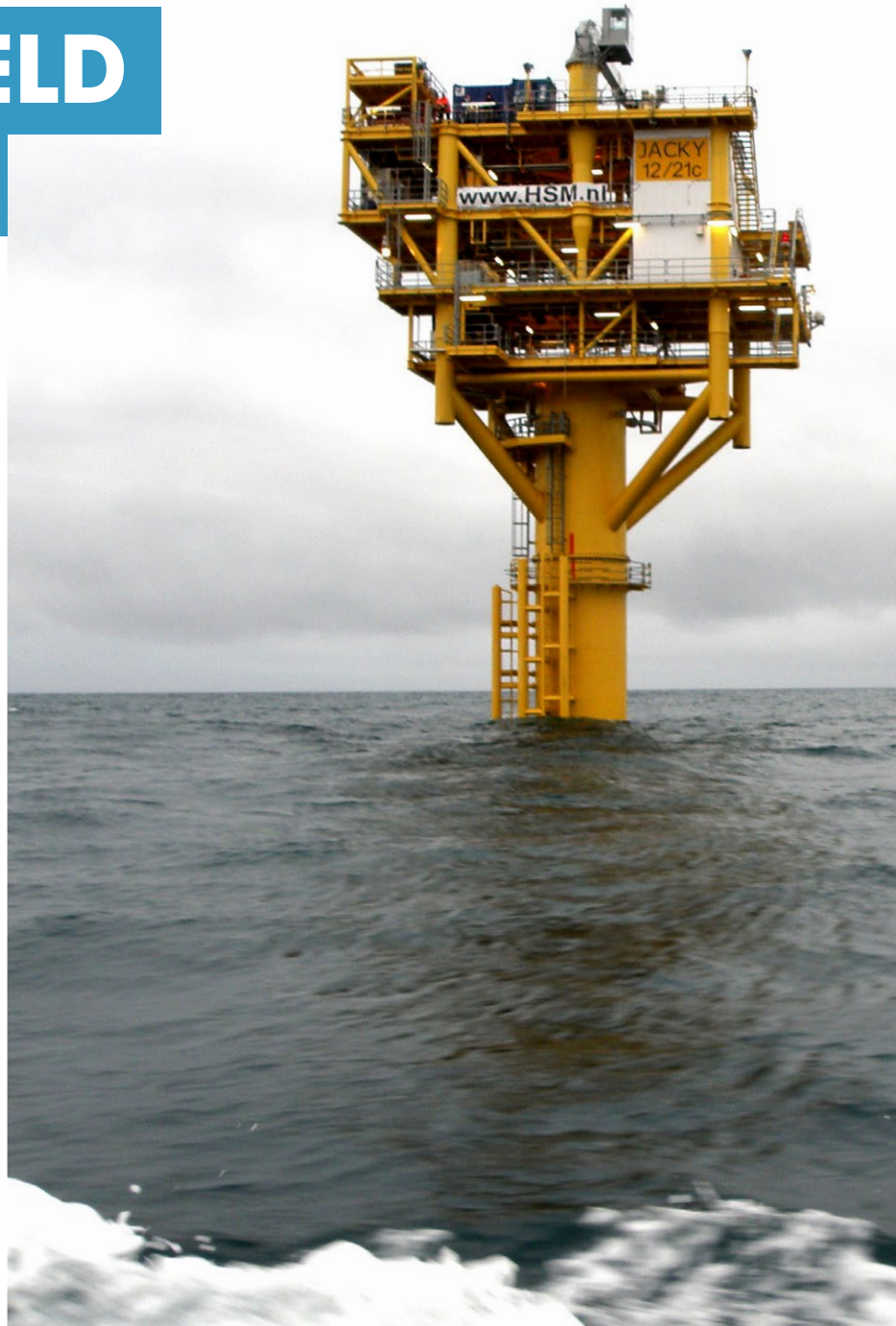
JACKY OIL FIELD

North Sea, UK

The Jacky oil field is located in block 12 / 21c in the UK Continental Shelf, 19km east of the Moray Firth Caithness cliffs, in water depths of 30m-40m. It was discovered in April 2007 and development approval was granted by the UK authorities in November 2008. Jacky is operated by Ithaca Energy and owned by Ithaca Energy (67.275%), Dyas (22.725%) and North Sea Energy (10%).

The Jacky reservoir occurs in the Beatrice A sands, a mid-Jurassic sandstone formation 2,000m below the surface. Reservoir pressure is low and the temperature of the reservoir fluid is about 85°C. The oil is sweet, waxy and, at 38.9° API, relatively light. It also has a low gas-oil ratio, so there is no significant production and, therefore, no exports of gas.

Gross proven and probable reserves are estimated to be 5.1 million barrels, giving the field a predicted economic life of five years. ►



Key Data

Location
**UK Continental Shelf, central
North Sea block 12 / 21c**

Water Depth
40m

Field Discovered
April 2007

First Oil
April 2009

Operator
Ithaca Energy

Ownership
**Ithaca Energy (67.275%),
Dyas (22.725%), North Sea
Energy (10%)**

Proven and Probable Reserves
5.1 million barrels

FIELD DEVELOPMENT

In the first development phase a production well was installed using the Ensco 92 jack-up drilling rig, tied in through an unmanned and removable wellhead platform.

Pipelines and power cables, all 10.5km long, were laid from the Jacky platform to the Alpha processing facility in the nearby Beatrice field, which is owned by Ithaca and Dyas. A small manifold was installed to enable connections for two short pipelines to the Beatrice Bravo satellite platform for potential future use.

Jacky started producing in April 2009 and by May 2009 was flowing without artificial lift at gross rates of 8,800bpd. The intention was to allow the reservoir pressure to fall so that artificial lift would happen.

In phase II, initiated in March 2011, a second production well, named 12 / 21c-J03, was drilled by the Energy Enhancer jack-up rig in the northern area of the field and a water injection well was also completed.

PROCESSING

All processing takes place on Beatrice Alpha. Two parallel oil production trains are sized to process 50,000bpd of wellhead fluids while a test train, which allows individual testing of wells, can process an extra 25,000bpd.

Produced gas is flashed off in the separators and handled by flare systems. The process



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PROJECT

PLUTO LNG PROJECT

Northern Carnarvon Basin, Australia

The Pluto liquefied natural gas (LNG) project is located 190km in the Northern Carnarvon Basin north-west of Karratha, Western Australia. It is a joint venture between Woodside, the operator, who has a 90% interest, and Tokyo Gas (5%) and Kansai Electric (5%), who became project partners in 2008 and have 15-year sales agreements for the gas.

The project will process gas from the Pluto and neighbouring Xena gas fields. The Pluto LNG project was originally scheduled to begin production in 2010. The field's first gas has, however, entered the processing train in March 2012 due to delays in completion of the Burrup LNG Park.

The Pluto field is estimated to contain a total dry gas recoverable reserve volume of 4.4 trillion cubic feet (tcf). Xena, the smaller of the two fields, has a reserve volume of 0.6tcf. ►



Key Data

Location
**Northern Carnarvon Basin,
Western Australia**

Water Depth
**85m (platform),
1,000m-400m (field)**

First Gas
March 2012

Operator
Woodside

Ownership
**Joint venture of Woodside
(90%), Tokyo Gas (5%), Kansai
Electric (5%)**

Recoverable Reserves
5 trillion cubic feet

GAS PROCESSING

The initial phase of the Pluto project consists of an unmanned, remotely operated offshore platform at a water depth of 85m, connected to five subsea big-bore wells on the Pluto gas field. Gas is piped to shore along a 180km, 36in pipeline to the new Burrup LNG Park, located between the North West Shelf Venture and Dampier Port.

The gas is processed in a LNG processing train, which has a production capacity of 4.3 million tons a year, and stored in two LNG tanks with a combined capacity of 240,000 cubic metres, and three condensate tanks with a combined capacity of 130,000 cubic metres.

The Burrup LNG Park has been designed to aggregate gas from the Carnarvon Basin to support future LNG growth and create another domestic gas supply hub for Western Australia.

CONTRACTORS

Contractors include UK-based Foster Wheeler WorleyParsons joint venture for the front-end engineering and design and EPCM, BGC Contracting for the preparation of the storage and export site, Leighton Contractors for preparation of the LNG train site; Netherlands-based CB&I for the storage tanks and Boskalis for the dredging.

In April 2009, Link Weld Engineering was awarded a \$10m contract for the fabrication of 31 subsea tie-in spools for both deepwater and





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PREVIEW

Fire safety is crucial for any offshore installation. In the next issue we explore fire protection technology and find out how personnel is trained to handle emergencies.

We investigate what Brazil's plan to auction 172 blocks will mean for local companies and international oil majors, and ask subsea specialist ROVOP about the demand for remotely operated vehicles for oil and gas operations. We also find out if plans to cut gas flaring by 30% globally are feasible and what the alternatives to flaring are.

Moreover, we profile a new oil spill detection technology capable of detecting the natural fluorescence of even tiny amounts of oil in or on water, and look at a new approach to invisibility cloaking which could one day be used in offshore operations to shield oil rigs and ships from rough waves.



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