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Leak Halts Subsea Compression on Gullfaks

Statoil is unable to say when subsea compression will start again at the **Gullfaks** (*SEN, 32/15*) Field after it was taken offline following a chemical leak on an umbilical line.

Amidst much fanfare, Statoil and its partners Petoro and OMV started the world's first wet gas compression on the seabed of the North Sea Gullfaks Field in October last year with the aim of increasing recovery by 22 MMboe and extending plateau production by about two years from the Gullfaks South Brent reservoir.

But just a month later it was taken offline because of the chemical leak. The two subsea compressors have been returned to the OneSubsea base at Horsøy where they were manufactured, although they are not faulty.

Statoil spokesman Morten Eek told *SEN*, "We became aware of a leak from the barrier fluid system connecting back by a 16-km umbilical to the *Gullfaks C* platform. A chemical fluid has leaked out at some point."

He said the problem was first picked up at the beginning of November last year when the increased consumption of fluids was noticed.

An investigation group was then set up to try to get to the root of the problem although it has still not been identified.

The Gullfaks compressors have been removed from the seabed.

Eek added, "We removed the two compressors from the system to make sure they were kept apart from the investigation. The leak has nothing to do with the compressors. We can't say how long it will take until we can put the compressors back into operation."

Jon Arve Svaeren, OneSubsea's vice president sales processing systems, added: "The compressors have been removed because they can't remain there without any support from the umbilical. They will not be returned until the issue has been dealt with and we don't know when that will be. The compressors have already proved their worth though."

Leaks connected with subsea systems are nothing new, with both Troll Pilot and Tordis subsea separation and boosting being hit by leaks that were not connected with the main subsea equipment.

The protective structure and compressor station for Gullfaks were installed in early May by the heavylift vessel *Oleg Strashnov*. On 26 June the compressor and cooling modules were lowered into place from the *Seven Viking*.

The overall Gullfaks system consists of a 420-tonne protective structure, a compressor station with two 5-MW wet gas compressors totalling 650 tonnes, and all equipment needed for power supply and system control on the platform.

The system can handle a flow rate of 10 MMcm/d and is connected to existing subsea templates and piping 15 km from Gullfaks C.

From the compressor station a power and umbilical cable are tied back to the platform.

The OneSubsea Multiphase Compressor being used on the project is the world's first subsea wet gas compressor with no requirements for an upstream separation facility or an anti-surge system, which greatly simplifies the subsea system requirements.

The compressor is a contra-rotating machine specifically designed for pressure boosting of unprocessed wellstream.

The multiphase compressor is capable of handling high liquid contents without mechanical issues, with gas volume fractions typically in the range of 95% to 100%.

WHAT'S INSIDE

DEVELOPMENT

GoM Keeps up the Pace in 2016

From Houston (BN): Oil markets are in the dumpster for now, but 2016 will still see companies with an eye to the future finishing and starting up deepwater Gulf of Mexico (GoM) projects. Most prominent are Exxon Mobil's **Julia** (*SEN, 32/11*), Shell's **Stones** (*32/17*) and Anadarko's **Heidelberg** (*32/19*).

But there are others. Smaller LLOG, which is Blackstone-financed and very active despite the downturn, will continue expansion of its **Delta House** (*32/19*) hub, tying back its own Otis project and DGE's **Odd Job** (*32/19*). DGE also plans startup of **Kodiak** (*31/13*), tied back to Williams' **Devil's Tower** spar.

Also on the list for this year: tieback of Noble's **Gunflint** (*32/18*) to Williams' **Gulf Star** hub; tieback of **Amethyst** (*32/8*) and **Cardona #7** to Stone's **Pompano** (*32/18*) hub, and startup of Walter's **Coelacanth** (*32/18*), a deepwater bottom-standing platform.

There are two important final investment decisions promised in 2016, BP's **Mad Dog II** (*32/18*) and Chevron's **Buckskin-Moccasin** (*32/14*).

Stone could decide whether to drill Lamprey, an interesting prospect in the context of Mexico's deepwater auction. Lamprey is just across the maritime boundary from Pemex's currently drilling Tiaras-1, and Stone has said success or failure of that well will influence its decision.

Here are some details on startups planned this year.

- Exxon Mobil's Julia subsea (Paleogene, 2,200 m, five blocks around Walker Ridge Block 584, start with six subsea wells, HP/HT at 13,500 psi, initial phase 34,000 bbl/d). Julia is notable for the first high-integrity pressure protection systems in the GoM and its 16-km tieback to the Jack-St Malo semisubmersible unit in WR 718.
- Shell's *Stones* FPSO unit (Paleogene, 2,900 m, eight blocks around Walker Ridge Block 551, two wells at startup, SBM-supplied converted-Suezmax FPSO unit dubbed *Turritella*, capacity 60 Mbbl/d, 0.42 MMcm/d, 800 Mbbl storage). Stones features 15,000 psi-rated subsea pumping. The FPSO unit will be the GoM's second behind Petrobras' *Cascade-Chinook* and the world's deepest-water floating production and storage vessel (FPS).
- Anadarko's Heidelberg truss spar (Miocene, 1,620 m, five blocks around Green Canyon Block 859, capacity 80 Mbbl/d, 2.3 MMcm/d). It's the second of Anadarko's design-one, build-two approach to the FPS. The first was Lucius in Keathley Canyon Block 875, started up in January 2015.
- LLOG's Otis (Miocene, 1,160 m, Mississippi Canyon 79, with a 19-km tieback to the Delta House semisubmersible FPS in MC 254). It appears to be a gas project. LLOG has not disclosed expected flow rate.
- DGE's Odd Job (Miocene, 1,825 m, MC 214, 215, with a 23-km tieback to the Delta House, 15,000 bbl/d, 0.34 MMcm/d).
- DGE's Kodiak (Miocene, 1,490 m, MC 727, 771, with a 8-km tieback to Williams' Devil's Tower spar in MC 773, 15,000 bbl/d, original startup targeted fourth-quarter 2015). It is notable for its record HP/HT frackpac in the GoM, designed for 135 C (275 F) and 15,000 psi.
- Noble's Gunflint (Miocene, 1,860 m, MC 948, with a 35-km tieback to Williams' Gulf Star spar in MC 724). It was a major 2012 discovery for Noble.
- Stone's Amethyst (Miocene, 395 m, MC 26, 1.12 MMcm/d to 1.68 MMcm/d) and Cardona #7 (615 m, MC 29, 4,000 boe/d to 5,000 boe/d) with tiebacks of 8.6 km and 12.8 km, respectively, to Pompano in Viosca Knoll 989. Cardona is notable for Stone's saying development cost is $27/bbl.
- Walter Coelacanth (Miocene, EW 834). A back-to-the-future, 366-m bottom-standing platform will be third tallest in the GoM. Capacity is 30,000 bbl/d, 1.68 MMcm/d and is designed to host future discoveries.

Statoil Seals Subsea Deals

Statoil's efforts to drive down development costs in the low price oil environment have borne fruit with the signing of new master service agreements with OneSubsea Processing and Aker Solutions.

Statoil said that under today's conditions, a sustained focus on costs and efficiency will ultimately be the key to develop several currently marginal prospects and discoveries.

Aker Solutions was late last year left out in the cold by Statoil when it announced new contract awards for maintenance and modifications services work offshore Norway, so it will be happier this time around.

Statoil said the deals form the basis for potential new engineering, procurement and construction (EPC) contracts for subsea equipment in the medium term future.

An EPC option agreement for subsea production systems (SPS) has also been signed with OneSubsea, including framework agreements for subsea operations services and subsea add-ons.

Last year Statoil also signed a master service agreement and an EPC contract including options for EPC project with FMC Kongsberg Subsea for Johan Sverdrup.

"In light of the current challenges the industry is facing the suppliers have demonstrated commitment and drive to break the cost curve and enhance competitiveness. Statoil has cooperated closely with the suppliers on technology qualification, concept development and pre-engineering studies, and jointly we have delivered successful subsea projects," says Torger Rød, vice president for projects in Statoil.

Statoil said the agreements form a good basis for future collaboration with three leading subsea suppliers, "thereby simplifying collaboration in the time ahead."

IOG Chews Over Blythe Options

Independent Oil & Gas (IOG) and Alpha Petroleum continue to assess development options for the U.K. Southern North Sea **Blythe** (*SEN, 32/2*) gas discovery and are considering various ways to improve the economics of the project.

Despite the low gas price environment, IOG said it believes Blythe to be economic on a standalone basis and would provide an attractive return if co-developed with IOG's other discoveries.

IOG and partner Alpha Petroleum are in regular dialogue with the Oil and Gas Authority on several potential variants to the development plan and said a field development plan will be completed and submitted once the optimal plan is agreed by all.

A 1967 discovery, Blythe has defeated previous attempts to develop it not least because of its tight reservoir.

A reservoir study carried out by previous owner ATP estimated reserves at 1.1 Bcm and 400 Mbbl of condensate.

One development option under consideration is a 20-km tieback to Perenco's **Lancelot** platform and export pipeline to Bacton.

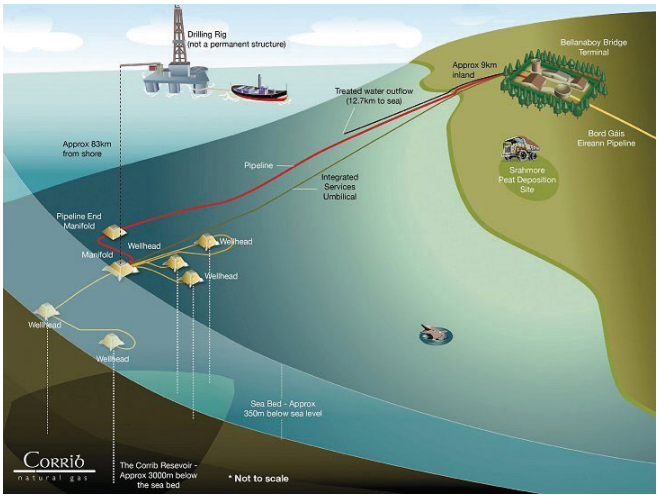
IOG recently has had its U.K. North Sea **Cronx** licence extended by one year to Jan. 9, 2017. The Cronx licence has a firm commitment to drill a well, and IOG said it believes a commercial development well can be drilled and would most likely be tied back to any Blythe development in due course.

The company said it anticipates carrying out a full 3-D seismic reprocessing from the original seismic data across its whole Southern North Sea portfolio in 2016.

IOG said, "The reinterpretation work carried out over the Cronx and **Elgood** discoveries in 2015 has been useful, but it is felt prudent to not revise any specific resource estimates until we have a consistent set of maps across the whole portfolio. Key aims of this work will be to demonstrate commerciality or otherwise of the **Harvey** and **Hambleton** discoveries and to better define the Truman prospect. IOG is fully funded for this work programme."

IOG CEO Mark Routh said, "Our Southern North Sea gas portfolio remains a core part of our business on which we believe can make attractive returns despite the current challenging price environment. We are delighted that the OGA [The Oil and Gas Authority] has allowed us the appropriate licence extensions to keep the portfolio intact. We are funded to carry out a full 3-D seismic reinterpretation over the portfolio, which should allow us to revise resource estimates for the discoveries and prospects. We shall continue to look for new development and production opportunities to enhance the portfolio in 2016."

Corrib Saga Ends as Field Comes Onstream



The layout of the Corrib gas field.

Ending a saga worthy of a James Joyce novel, Shell has finally brought the **Corrib** (*SEN, 32/1*) Field offshore Ireland onstream, more than 15 years after project consents were first issued.

The gas development has been one of the longest running ever to complete and has involved everything from violent protests and sabotage to the jailing of some of the protesters—known as the Rossport 5—for 94 days in 2005.

The field was discovered in 1996, and a planning application was submitted to build an onshore processing terminal at Bellanaboy Bridge in 2001. But lengthy planning disputes and protests lead to significant delays with the field only now coming onstream.

Located 83 km off Ireland's northwest coast in water depths of almost 350 m, the Corrib gas field lies about 3,000 m below the seabed.

At peak annual production, it is expected to produce about 7.28 MMcm/d of gas.

Six wells have been drilled at Corrib with gas transported to the Bellanaboy Bridge Gas Terminal in northwest Mayo through a 20-in. pipeline.

The gas is processed at Bellanaboy before it is transferred into the Gas Networks Ireland network, which delivers it to Irish gas consumers.

At peak production, Corrib has the potential to meet up to 60% of Ireland's gas needs.

Shell E&P Ireland Ltd. Managing Director Ronan Deasy must have breathed a sigh of relief when he said, "We are pleased to have completed the development of this unique project and to bring the Corrib Field onstream. I would like to pay tribute to all those who contributed to delivering this critical energy project, which will continue to bring benefits to the region and the country for years to come."

The Corrib project is a joint venture between Shell E&P Ireland (45%), Statoil (36.5%) and Vermilion Energy (18.5%).

The startup of Corrib has given a welcome boost to the Irish offshore sector which has seen limited exploration success overall.

The slump in the oil price is forcing companies to withdraw from the region and Kosmos last year pulled out of its Ireland licences. Fastnet Oil & Gas has switched focus to pharmaceuticals, while Petroceltic and Lansdowne Oil and Gas are carrying out strategic reviews.

DEVELOPMENT BRIEFS

Statoil is set to award contracts for some of the subsea work on its **Johan Sverdrup** (*32/19*) and **Oseberg Vestflanken 2** (*32/19*) fields off Norway before the end of January.

Statoil spokesman Ola Anders Skauby told *SEN* that awards for parts of the subsea scope for the projects were on the cards.

He said, "We submitted the plan for development and operation of Oseberg Vestflanken 2 at the end of last year. It will consist of an unmanned wellhead platform with a large subsea scope. We expect to make an award before the end of January."

The Oseberg Vestflanken development will consist of an unmanned wellhead platform with 10 well slots. The wells will be remote-controlled from the Oseberg Field centre. Two existing subsea wells also will be reused.

The wellstream will be routed to Oseberg Field centre via a new pipeline. Production startup is scheduled for second-quarter 2018.

Oseberg Vestflanken 2 is the first of three planned phases for developing the remaining reserves in the Oseberg area.

The licensees are Statoil (operator, 49.3%), Petoro (33.6%), Total (14.7%) and ConocoPhillips (2.4%).

A consortium of McDermott International and L&T Hydrocarbon Engineering (LTHE) has been awarded a contract covering the engineering, procurement, construction and installation of major subsea field infrastructure for the **Vashishta** and **S1** development project, a greenfield deepwater development off India's East coast.

The scope of work includes supply and installation of a series of pipeline end terminations and in-line tee structures, a pipeline end manifold structure, rigid jumpers and about 48 km of umbilicals.

The pipeline scope includes 103 km of 14-in. dual rigid pipelines extending from the shallow water shore line to a maximum water depth of 701 m.

"This collaborative consortium created value by utilizing LTHE's strong execution capabilities and strategically located Kattupalli facility for fabrication, setting up a local spoolbase and generating schedule efficiency by using a combination of deepwater reel-lay and S-lay in shallow water," said Hugh Cuthbertson, McDermott's vice president, Asia. "In addition to the deployment of McDermott's modular, portable spoolbase, McDermott's *Derrick Barge 30* (DB30) and deepwater *North Ocean 105* (NO105) also are expected to be utilized."

Premier Oil is hoping to get the U.K. North Sea **Solan** (*32/17*) Field up and running in January, although bad weather is hampering operations. Premier said progress has been made on the commissioning of the offshore installation systems required for first oil and that tanker trials have been successfully completed and commissioning work has continued using the *Superior* flotel. Meanwhile, Premier has completed the disposal of Premier Oil Norge to Det norske oljeselskap for $120 million. The move has made a slight dent in Premier's net debt, reducing it to just under $2.3 billion at year-end 2015.

Subsea 7 has landed a contract from Burullus Gas Co. for the platform extension and tie-in on Phase 1 of the **West Nile Delta** (*32/19*) development of the **Taurus** and **Libra** fields by BP, offshore Egypt. Engineering and project management work will be carried out at Subsea 7's Cairo office and Subsea 7's Global Projects Centre in London. Fabrication of the deck extension and spools will be done at the Petrojet Maadia yard near Alexandria. Offshore work is scheduled to begin in second-half

2016 using Subsea 7's *Rockwater 2* as the main hookup and accommodation vessel with *Seven Borealis* performing the offshore lift of the platform extension and the heavy construction vessel, *Seven Arctic*, installing the umbilical.

Abu Dhabi National Energy Co. (TAQA) has pumped first oil from the **Cladhan** (*32/17*) Field development in the U.K. North Sea. Cladhan has been developed as a 17.5-km subsea tieback to the TAQA-operated **Tern Alpha** platform. The Cladhan Field is located in the northern North Sea and straddles the U.K. Continental Shelf blocks 210/29a and 210/30a in a water depth of about 150 m. The development consists of two producer wells (P1 and P2) and one injection well (W1). TAQA is operator of Cladhan, with a 64.5% interest. Its co-venturers Sterling Resources and MOL Group hold a 2% and 33.5% interest, respectively.

Cladhan oil is routed to the Tern Alpha platform.

Rockhopper Exploration said it is assessing how its **Ombrina Mare** project offshore Italy will be affected after the Italian Parliament approved the 2016 Budget Law, which reintroduces restrictions on offshore oil and gas activity including the general ban on E&P activity within 12 nautical miles of the coast of Italy.

The restriction was originally introduced in 2010 and repealed in 2012.

Rockhopper said certain exceptions apply for existing production concessions and none of the company's other interests in Italy, including the Guendalina gas field, are expected to be impacted by this new legislation.

The company added, "At the same time, Rockhopper has been granted a 12-month extension to the suspension of the Ombrina Mare exploration permit to Dec. 31, 2016. Ombrina Mare is located within the 12 -mile [19-km] limit, and the company is conducting an in-depth review of this new legislation, how the exploration permit is affected and its impact on the Ombrina Mare project."

Norway's Agility Subsea Fabrication (ASF) has been busy picking up contracts worth more than $50 million for the delivery of subsea structures.

The deals include the delivery of manifolds, foundations and well jumpers to Phase 2 of the **Shah Deniz** (*32/18*) project in the Caspian Sea as well as the delivery of manifolds and integrated template structures for a development on the Norwegian Continental Shelf.

"For ASF, this means that we have a solid basis to secure capacity utilization the next two years. The fact that we have won these contracts gives the team at Agility inspiration to continue the systematic work we started several years ago to increase efficiency and reduce costs in project execution," said Tove Nilsen Ljungquist, CEO of Agility Subsea Fabrication.

Agility also signed a renewed two-year partnership agreement with FMC Technologies, enabling the company to tender on all FMC subsea projects worldwide.

Ljungquist added, "The new partnership agreement with FMC means that we will continue the good and close relationship we have had with one of the oil and gas industry's most successful subsea production system providers."

FLOATERS

Yinson Picks Keppel for FPSO Conversion

Singapore's Keppel Offshore & Marine will carry out an FPSO conversion for Yinson for a vessel destined for the **Offshore Cape Three Points** (*SEN, 32/1*) development offshore Ghana.

The work, which is expected to get underway in first-quarter 2016, includes modification work, new equipment installation complete with associated piping, electrical and instrumentation systems as well as installation and integration of the FPSO process topsides.

A consortium of GE Oil & Gas and Oceaneering last year won a deal to deliver the subsea scope for the project, including the subsea production and control system (SPS) and umbilicals' engineering as well as project management, fabrication, transport and testing.

Oceaneering will supply 51 km of electro-hydraulic, steel tube umbilicals.

Keppel in Singapore also is set to convert another vessel into a LNG floating storage unit (FSU) for Bumi Armada.

Work on the LNG FSU conversion is scheduled to be completed in third-quarter 2016, and it will operate at the Delimara LNG Regasification Terminal in Malta.

Chow Yew Yuen, CEO of Keppel O&M, said, "This is the 14th conversion/upgrading project that we are

undertaking for Bumi Armada. It is also their first LNG FSU conversion project."

Meanwhile, Keppel's BrasFELS shipyard in Rio de Janeiro, Brazil, has won an FPSO integration contract from Modec for work on the *Cidade de Caraguatatuba* vessel, which will be deployed to the **Lapa** Field in the Santos Basin. It is expected to arrive at BrasFELS in second-quarter 2016. In the past five years, BrasFELS has completed five FPSO projects, of which three were for companies affiliated to Modec.

Rounding off the new deals for Keppel, the Caspian Shipyard Co. has secured a barge enhancement contract from BP, operator of the **Shah Deniz** gas field development.

The work involves strengthening the steel structure of the hull of the *STB-1* vessel, a purpose-built jacket transportation and launch barge.

Sevan Ties up North Sea Deal

Cylindrical rig supplier Sevan Marine said that following the participation in FEED work over the past several months it has signed two agreements related to an FPSO prospect in the U.K. North Sea.

The company has been working with Shell on a concept for its **Penguins** (*SEN, 31/23*) Field development in the region, although whether this is the field in question could not be confirmed by *SEN*.

Shell has long been mulling the redevelopment of Penguins, which is currently a subsea tieback into the Brent complex.

The first deal signed is a technology licence agreement under which the client will pay a licence fee to Sevan Marine for the right to use their proprietary technology. The second is a service agreement under which Sevan Marine will continue to provide technical and administrative resources to the project. Under the licence agreement payments to the company remain subject to the field developers' final investment decision and start of construction of the unit, which is not expected before second-half 2016.

Sevan Marine CEO Carl Lieungh said, "The entering into these agreements with an oil major is yet another verification of both the benefits and maturity of the Sevan Marine cylindrical hull design. We are excited have reached this stage and look forward to working with all parties to make this project a success."

A Sevan cylindrical rig will be used on the North Sea field.

FLOATER BRIEFS

Malaysia's Petronas said the *Petronas Floating LNG1* (*PFLNG1*) facility is currently 95% complete and is on track to begin operations in 2016. The state oil company's first FLNG facility will be deployed at the **Kanowit** (*32/11*) Field, located 200 km offshore Bintulu, Sarawak, East Malaysia, at a water depth of about 80 m. The *PFLNG1* vessel, which will produce 1.2 MMtons/year of LNG, will play a significant role in Petronas' efforts to unlock gas reserves in Malaysia's remote and stranded fields to help meet the growing demand for gas.

Wood Group has scooped a contract from PetroRio to provide services to the **Polvo A** platform in the southern Campos Basin, about 100 km off the coast of Rio de Janeiro. Integrated operations and maintenance services will be provided by Wood Group PSN under the two-year contract, which is effective immediately. The **Polvo** (32/18) Field consists of a fixed production and drilling platform connected to an FPSO vessel. Wood Group Kenny has held two contracts to provide integrity management support to the field, the most recent of which was completed in early 2015.

The LLOG-operated **Delta House** floating production and storage vessel (FPS) located at Mississippi Canyon 254 in the U.S. Gulf of Mexico has achieved its nameplate oil capacity of 80 Mbbl/d of oil. LLOG recently brought the ninth well on production several weeks ahead of schedule, and two additional wells will be brought on production to the FPS in 2016. Delta House's nameplate capacity includes 50% redundancy of key rotating equipment. The FPS' peak capacity is 100 Mbbl/d of oil and 6.72 MMcm/d of gas with no key rotating equipment redundancy. The Delta House FPS was built, installed and put online in three years. First production was achieved in April 2015.

DOF Subsea has been awarded several inspection, maintenance and repair (IMR) and subsea installation contracts in the Asia-Pacific and Atlantic regions, worth about $30 million.

DOF said the contracts will secure utilisation of the subsea project fleet in the regions.

In the Asia-Pacific, OMV New Zealand has awarded DOF Subsea an IMR contract, where the scope of work includes inspection and work on eight mooring lines on the **Maari** (*32/19*) Field's *Raroa* FPSO vessel offshore New Zealand.

The offshore phase of the project will be carried out during first-half 2016, and the *Skandi Hercules* will be used for the work, keeping the vessel busy until the end of third-quarter 2016.

In the Atlantic region, DOF Subsea has been awarded commissioning support work for Eni at the **Goliat** (*32/18*) Field and installation of mooring systems for BW Offshore in the U.K. sector of the North Sea. The contracts will secure utilisation of the regions subsea project fleet during first-half 2016, the company said.

Amec Foster Wheeler said the Clough AMEC joint venture has been awarded a three-year contract by ConocoPhillips to provide asset support, operations and maintenance services to the **Bayu-Undan** (*32/12*) offshore field development, located in the Timor Sea. The Bayu-Undan offshore facilities consist of a floating storage and offloading facility and three fixed platforms, a remote wellhead platform and a compression, utilities and quarters platform, and a drilling, production and processing platform.

Norway's Ministry of Petroleum and Energy has signed an agreement with Statoil to assess the feasibility regarding CO_2 storage on the Norwegian Continental Shelf (NCS). The study will include various development concepts for storing CO_2 at three different locations on the NCS. The study is to be completed by June 1, 2016, and is expected to cost about $4 million.

Minister of Petroleum and Energy Tord Lien said, "Carbon capture and storage (CCS) will be an important measure in order to mitigate climate change and meet the emission targets under the Paris Agreement. After nearly 20 years of experience with such storage from the Sleipner Field, Statoil is well equipped to conduct these studies."

The Norwegian Government's strategy on CCS contains a broad range of activities aimed at developing technologies for capturing, transporting and storing CO_2. This feasibility study is an important step in the strategy's actions aimed at developing full-scale CCS.

EXPLORATION

Mexico Deepwater Round Takes Shape

From Houston (BN): Mexico's oil and gas agency CNH has released more details of the planned auction of deepwater tracts later this year.

CNH announced it will offer 10 tracts, four in the north in the Perdido Fold Belt near the U.S. maritime boundary and six in the south in the Salina Basin on the outer reaches of the Bay of Campeche.

Most of both areas are 100% covered by 3-D seismic, which will be available to potential bidders. In the Cinturon Plegado Perdido (Perdido Fold Belt), CNH puts P90 reserves in the four offered tracts at more than 797 MMbbl and P10 possible reserves at 8.8 Bbbl.

Sands are described as medium- to fine-grained in the Neogene (Miocene-Pliocene) and Paleogene (Lower Tertiary) trends and expected recovery in various tracts is expected to be mostly light to super-light oil with some wet gas.

In the Cuenca Salina (Salina Basin), CNH lists P90 reserves in the six tracts offered at more than 1.5 Bbbl with P10 possible reserves at more than 15 Bbbl.

Geology is more mixed, with fractured limestone and sedimentary rock layers intermingled with medium- to fine-grained sands. Expected recovery varies by tract and includes light, heavy and extra-heavy oil along with wet gas.

This is the fourth in a series of auctions triggered by Mexico's energy reform, and contract terms have been evolving.

The fiscal regime chosen for the deepwater round is a lot like the U.S. leasing system. It features a royalty/tax approach rather than production-sharing seen in previous auctions.

Winners will pay a minimum royalty on gross revenues, depending on the market price of oil, and a tax on any profits. The bidding variables are how much extra royalty a company offers to pay and how fast a company can drill an exploratory well.

Contract terms are an initial duration of 35 years with two possible extensions of 10 and five years, respectively; an initial exploration deadline of four years, with potentially two extensions of three years each; an evaluation period of up to three years following a discovery; and a development period of 22 to 37 years, subject to continued production.

Local content required will be between 3% and 10%. CNH will annually approve plans for exploration and development as well as work programmes and budgets.

Rescission of licences can occur as laid out in the Mexican hydrocarbons law after a third-party investigation of performance, but the contract framework anticipates settlement of disputes through "conciliation or arbitration."

In the event of "positive surprises"—a big discovery, for example—CNH can seek revision of contracts to make terms more favourable to Mexico.

In response to industry feedback from three previous bid rounds, there are also major changes in qualification and tendering procedures, including simplified submission of technical and financial information.

Rolvsnes Find Boosts Edvard Grieg

The Rolvsnes find has been made near Edvard Grieg.

Lundin Petroleum has hit oil in its **Rolvsnes** exploration well 16/1-25 S in PL338C south of the Edvard Grieg Field in the Norwegian North Sea. The well is located on the southwestern flank of the Utsira High about 6 km south of the Lundin operated **Edvard Grieg** (*SEN, 32/18*) Field and 3 km south of the **Edvard Grieg South** discovery.

The find comes within a month of the Edvard Grieg Field coming onstream and will shore up Lundin's reserves in the area.

The well encountered a gross oil column of 30 m in porous granitic basement, and Lundin said pressure data and oil type indicate that the petroleum system is in communication with the Edvard Grieg South discovery, which was made by Lundin in 2009.

The gross contingent resource range for Rolvsnes, based on natural depletion drive, including the Edvard Grieg South discovery is estimated to be between 3 MMboe and 16 MMboe.

Lundin said, however, "There remains significant resource upside including potential to find a more extensive fracture network and secondary recovery potential. Including this prospective upside potential, the total gross resource estimate is between 10 MMboe and 46 MMboe."

Exploration well 16/1-25 S is the second well drilled in PL 338C, which was carved out from PL338 in late 2014. Well 16/1-25 S was drilled to a total depth of 2,096 m below mean sea level in a water depth of 106 m.

The well was drilled using the semi-submersible drilling rig *Bredford Dolphin* and will be permanently plugged and abandoned.

Lundin began pumping oil from Edvard Grieg at the beginning of December 2015. The oil is being transported via the Grane pipeline to the Sture terminal on the west coast of Norway, while gas will be transported via a separate pipeline system to St. Fergus in Scotland.

Meanwhile, Lundin has completed the drilling and evaluation of exploration well 7130/4-1 on the Ørnen prospect in the southern Barents Sea. The well was dry and was plugged and abandoned.

The well is located in PL708, on the eastern parts of the Finnmark platform and targeted and encountered Upper Permian spiculites and carbonates, but the reservoir quality was poorer than expected. Sampling encountered only water with no indications of movable hydrocarbons.

The secondary target, Permo-Carboniferous carbonates, was encountered with minor hydrocarbon shows and poor reservoir characteristics.

The well was deepened into the third target, Lower Carboniferous sandstones in the Soldogg Formation. These were moderate to good sands with an uncommercial 5-m gas column.

EXPLORATION NOTES

Cairn Energy has successfully tested the **SNE-2** appraisal well offshore Senegal boosting hopes for a hub development on the SNE Field. Cairn said a drillstem test over a 12-m interval of high-quality pay flowed at a maximum stabilised but constrained rate of 8,000 bbl/d of oil. The SNE- 2 well is located in 1,200 m water depth and is about 100 km offshore in the Sangomar Offshore block. The well reached the planned total depth of 2,800 m below sea level and is an appraisal of the 2014 discovery of high-quality oil in the SNE-1 well, some 3 km to the south. The well was drilled with the Ocean Rig *Athena* drillship.

From Houston (BN): In Gulf of Mexico plan approvals, regulators have green-lighted LLOG's exploration plan for **Red Zinger** in 1,788 m in Mississippi Canyon Block 257, about 223 km southeast of New Orleans. The plan calls for drilling a 53-day well early this year and a 60-day well starting in May 2017 along with installation of subsea wellheads or manifolds. LLOG predicts completion will take 40 days for each well. Expected oil is 37°API. Partners are LLOG (35%), Ridgewood (35%), Red Willow (25%) and Houston Energy (5%).

Chevron has submitted and won approval for its own plan to continue exploration of the **Tiber** prospect, discovered by BP in 2008 in 1,250 m in Keathley Canyon Block 102, about 460 km southwest of New Orleans. Chevron's supplemental plan encompasses nine 200-day wells to be drilled at the rate of one a year from 2016 through 2024.

Well locations approved are in KC blocks 57 (one well), 58 (two wells), 101 (one well) and 102 (five wells). Some of the site locations overlap locations for which BP previously had won approval.

After the discovery, BP drilled appraisal wells in KC 57 and KC 147 and had approval to drill others. But in the wake of the Deepwater Horizon-Macondo oil spill disaster and amid declining oil prices, BP did not follow through.

Then, a realignment of interests last year reshaped control of several northwest Keathley Canyon prospects, including Tiber. Among the changes, Chevron acquired half of BP's interest in Tiber and replaced BP as operator. The partnership is now Chevron and BP (31%), Petrobras (20%) and ConocoPhillips (17%), though the realignment might not be over as ConocoPhillips has announced plans to depart the Gulf.

Freeport McMoRan has won approval of its initial exploration plan for **Capri** in 1,880 m to 1,950 m in Keathley Canyon blocks 638 and 682, about 490 km south-southwest of New Orleans. The plan covers seven 180-day to 200-day wells between this year and October 2019 and includes completions and installation of subsea trees. The target is 24.4°API oil. Freeport McMoran (whose co-founder and chairman, Jim Bob Moffett, just stepped down) is considering quitting oil and gas, but time is growing short to drill these 10-year leases acquired in 2009.

Llano will be tied back to the Auger TLP in the Gulf of Mexico.

A newly approved exploration plan for Chevron's **Anchor** sets out a more detailed schedule for the project in 1,400 m in GC 762, 763 and 806, about 327 km south-southwest of New Orleans. The new plan projects nine wells in GC 762 and one well in GC 806 between now and 2025. Wells are projected to take 170 to 175 days to drill. Chevron predicts it will find 25.5°API oil. Partners are Chevron (55%), Cobalt (20%) and Venari and Sampson (12.5% each).

Regulators OK'd a supplemental development plan for Shell-operated Llano in 800 m in Garden Banks

386, about 340 km southwest of New Orleans. Included in the plan are four 200-day wells to be equipped with manifold, jumpers, flowline and started up via flowlines to Shell's **Auger** tension-leg platform in Garden Banks 426. Work is to start immediately and continue at the rate of one well a year through 2019. Production is expected to be 33.1°API. Partners are Shell (30%), Hess (50%) and Mobil (20%).

The high productivity of the presalt carbonate reservoirs in the **Carcará** area offshore Brazil has been confirmed through two formation tests completed on the 3-SPS-105 well, Petrobras said.

The well, known as Carcará Norte, is in the Carcará discovery evaluation plan area, 4.6 km north of the 4-SPS-86B discovery well, in 2,070 m of water. Its final depth inside basalt rock is 6,338 m. Estimates indicate that the well's output potential could be as high as the most prolific wells of the Santos Basin's presalt layer, with good quality 31°API oil. It is a single oil accumulation, Petrobras added.

Petrobras, the operator, has 66% interest in the consortium. Partners are Petrogal Brasil with 14%, Barra Energia do Brasil Petróleo e Gás with 10% and Queiroz Galvão Exploração e Produção SA with 10%.

Completion is expected in March 2018, and the consortium will continue implementing the evaluation plan, which was approved by the National Oil, Natural Gas and Biofuels Agency.

Woodside's **Shwe Yee Htun-1** exploration well in Block A-6 in the Rakhine Basin, located in the western offshore area of Myanmar, hit a gross gas column of about 129 m. The prospect provides evidence of a working petroleum system in the Rakhine Basin deep water.

Woodside CEO Peter Coleman said, "Further analysis will be undertaken to understand the full potential of the play, but this de-risks a number of leads, which will now be matured. This discovery is an encouraging outcome for future exploration and appraisal activity in the area."

Polarcus has received a letter of intent from Maersk Oil on behalf of the Danish Underground Consortium to carry out a 4-D marine seismic survey offshore Denmark. The project is due to begin in second-quarter 2016 and will run for about three months.

Statoil has been given the nod by the Petroleum Safety Authority to drill Madam Felle exploration well 30/11-11 with the *Songa Delta* rig. The well is expected to spud in mid-January and last for 36 days. It is located about 28 km south of the **Oseberg** Field in 106 m water depths.

The low price of crude could make it more likely that oil firms will be allowed to explore in Norway's **Lofoten** region after 2017, which is currently off-limits due to environmental concerns, Petroleum and Energy Minister Tord Lien has said. The shallow waters off Lofoten are expected to hold large reserves that can be produced at a lower cost than the more expensive areas currently being explored further north on Norway's continental shelf.

Lundin Petroleum has spudded the **Bambazon** exploration well in Block SB307/SB308, offshore East Malaysia. The Bambazon prospect is in shallow water and lies to the north of a major producing field in offshore East Malaysia. The well will target hydrocarbons in Miocene aged sands. Bambazon is being drilled with the *West Prospero* jack-up rig to a total depth of approximately 1,250 m below mean sea level. Drilling is expected to take about 25 days.

VESSEL BRIEFS

Shell has terminated the contract for the *Polar Pioneer*.

From Houston (BN): Carnage continues in the offshore rig industry. No surprise that Shell terminated its contract for Transocean's *Polar Pioneer*. The contract was to last until July 2017, but Shell earlier announced indefinite suspension of the project it hired *Polar Pioneer* to do, drilling Arctic offshore Alaska. Transocean also announced that Statoil elected early termination of its contract for *Discoverer Americas*. The contract was to expire in May. Statoil also is letting its contract for *Maersk Developer* expire as scheduled this month. As recently as Dec. 28, 2015, regulators listed the *Developer* as drilling Statoil's **Mirage** prospect in Mississippi Canyon 942.

Songa Endurance has begun drilling operations under its eight-year drilling contract with Statoil at the **Troll** (*32/19*) Field on the Norwegian Continental Shelf,

and the rig is now on operating rate. *Songa Endurance* is the second rig in a series of four Category D semisubmersible drilling rigs specifically built for and contracted to Statoil.

Prosafe and Statoil have agreed to rephase the **Mariner** (*32/17*) Project on the U.K. Continental Shelf from 2016 into 2017 as well as extend the firm hire duration from 8 months to 13 months. Operations at the Statoil Mariner platform will commence within third-quarter 2017 and will be performed by either the *Safe Zephyrus* or *Safe Boreas* accommodation support vessel. In addition to the revised extended firm hire duration, Prosafe has granted Statoil six additional one-month options linked to the Mariner project. Total value of the rephased and extended firm hire duration for the Mariner Project has increased from $76.3 million to about $131.8 million, including a rephasing charge payable in 2016.

A contractor has been killed after the semisubmersible drilling rig *COSL Innovator* was hit by a freak wave while it was stationed on the **Troll** Field in the North Sea, west of Bergen. Rune Morten Narvag worked for Aker Solutions as an offshore team leader in its subsea division. The rig had been taken off the well it was working on due to heavy weather when the incident occurred.

BUSINESS

Finalists Announced for Subsea UK Awards

Aker Solutions, N-Sea and Saab are in contention for the Subsea Company of the Year award at this year's Subsea UK Awards, held during Subsea Expo.

In the Global Exports award category, Flowline Specialists and JDR have been short-listed and the Innovation for Safety award will see JDR, Fathom Systems and Oil Spill Response Ltd. compete for the prize.

The shortlist for the Innovation and Technology award comprises Aker Solutions, EC-OG and Innospection.

Nadine Stanistreet of Hughes Sub Surface Engineering, Robert Weeks from JDR Cable Systems and Nicolas Pellerej from OMS Ltd. are the individuals short-listed for the Young Emerging Talent award.

This year saw the launch of a new category to recognise small companies that have shown outstanding performance in the subsea sector. Vying for the Small Company of the Year award are Fathom Systems, ITC Hydraulics and Subsea Supplies.

Neil Gordon, CEO of Subsea UK, said, "2015 was a challenging year for everyone in the subsea sector. Despite the downturn, however, there have been some outstanding subsea successes, which truly underlines the strength of our sector both at home and overseas. It's crucial that we continue to recognise the ongoing efforts of our companies and the individuals who are making a concerted effort to contribute to the long-term sustainability of our industry.

"It is vital that we continue to come together and celebrate the expertise, leadership and innovation for which the £9billion [US$13 billion] subsea industry is renowned. With intensified scrutiny on cost, value and innovation, the finalists have all demonstrated how they are going the extra mile to support the subsea industry in an increasingly challenging market."

U.K. Production Rises in 2015

Output from Buzzard helped increase U.K. production.

The U.K.'s oil and gas production rose by more than 7% in 2015—the first rise in more than 15 years—but the sector is going to be hard pressed to keep up those levels this year.

Oil & Gas UK's CEO Deirdre Michie welcomed the jump but warned that the industry will be extremely challenged to sustain this into 2016 and beyond.

She said, "Government data for the first 10 months of 2015 shows that the total volume of oil and gas produced on the U.K. Continental Shelf [UKCS] was up 8.6% compared with 2014, with the production of liquids up 10.6% and gas up 6.1%.

"Output in November and December [2015] tends historically to be more stable, but even so, Oil & Gas UK now expects year-end production for the full year of 2015 to be seven to eight percent higher than last year."

She said the industrywide focus on improving production efficiency coupled with investments of more than £50 billion (US$73 billion) over the last four years to bring new fields on stream across the last 12 months has paid off.

Aker Solutions, Lloyd's Register Link Arms

In the first tie-up of the new year, **Lloyd's Register** (LR) and **Aker Solutions** have agreed to collaborate under a new global framework agreement covering engineering and subsea oil and gas developments.

The deal gives Aker Solutions access to all LR's relevant services, including inspection, compliance, certification and advisory/consulting services in areas like risk management/HSEQ, engineering dynamics, asset integrity, drilling, wells and reservoirs.

The first call off from the contract is already in place: a global project for international quality management system standard ISO 9001 and ISO 14001 (environmental) certification of Aker Solution's Subsea division.

Inge Alme, sales director at LR said, "Of special interest is our process for technology qualifications. This is an important area for a company like Aker Solutions, where new innovations in areas like subsea processing can be critical for tomorrow's leading oil and gas operators.

"The Technology Qualification we offer provides a route for companies to provide evidence that their equipment will function within specified operational limits and with an acceptable level of confidence. It gives a step-by-step approach on how to develop and operate new technologies in a safe, reliable and environmentally friendly manner."

BUSINESS BRIEFS

Douglas-Westwood has warned of a shock for the subsea market in 2016.

The analyst said a backlog of subsea orders supported high levels of offshore installation activity in 2015 when major pipelines such as **Ichthys** (*SEN, 32/18*) and **Polarled** (*32/19*) were installed.

Subsea installation activities in West Africa and Latin America also continued to thrive due to Petrobras' commitment to deepwater production – all despite considerable financial constraints. Large deepwater developments such as Total's Egina field and Shell's continued development of the Bonga field are highlights among capital-intensive projects offshore West Africa in 2015.

However, DW says that it is important to note that backlogs are falling rapidly – only a few projects were sanctioned in 2015.

Of these, notable examples of fields receiving final investment decisions (FIDs) over the past year include Statoil's **Johan Sverdrup** field, Shell's **Appomattox** field and BP's **Shah Deniz Phase 2** subsea development. DW believes that subsea installation activity is yet to bottom out, with current backlog disguising the reality of the industry. A decline of at least 15% is forecast in global subsea tree installations in 2016.

The sinking oil price—which is currently hovering around the $34/bbl mark—has claimed its first victim of the New Year in the U.K. sector.

Iona Energy's U.K subsidiaries, Iona Energy Company (UK) and Iona UK Huntington, which amongst other things were developing the **Orlando** (*32/12*) Field in the U.K. Northern North Sea as a subsea tieback to the **Ninian** platform, have been forced into administration.

This could be the tip of the iceberg for the region as far as casualties go this year, with dire warnings emerging towards the end of last year—when oil prices were around $50/bbl—that a third of companies operating in the U.K. North Sea are under threat.

Wood Mackenzie expects upstream M&A activity to increase in 2016, although it says the shape of that activity will be dictated by oil prices.

Should they remain low, balance sheets will become ever more stretched and it expects to see more forced sellers, the analys said.

Woodmac said financing options will be more limited than in 2015. Few companies are safe; while the top tier of IOCs can largely ride out a further year of low prices, the next tier down may have fewer alternatives. Corporate actions will follow, including asset sales.

It added, "Despite the gloomy outlook there will always be counter-cyclical buyers willing to bet on an eventual recovery. Major players will be looking toward long term strategic deals, while the more ambitious, better funded small caps will be looking to come out of this downturn ahead of peers. Private equity continues to remain poised for action."

From Houston (BN): **Petrobras** reported November 2015 presalt oil and natural gas production rose 1.8% from October, reaching 1.023 MMboe/d. Of that total, presalt oil represented 820,000 bbl/d, up 1.3% from October. Petrobras reported total worldwide production of 2.71 boe/d, down 1.8% from October, citing shutdowns of some facilities due to a strike of oil workers. Another factor in the worldwide production drop was maintenance work in the Gulf of Mexico's **St. Malo**, **Lucius** and **Hadrian South** fields, of which Petrobras owns a share.

Moody's and Fitch has downgraded Petrobras debt. Collapsed world oil prices, economic recession, the bribery-kickback scandal roiling Petrobras and threatened impeachment of President Dilma Roussef were factors. Moody's rated Petrobras Ba3 with a negative outlook, down from Ba2. Fitch rated Petrobras BB+ with a negative outlook, down from BBB-.

Norwegian Energy Co. (**Noreco**) has sold its petroleum interests in Norway to Djerv Energi. The owners

of Djerv will be a U.S-based investment fund (70%) and Noreco (30%). Noreco Norway also has agreed to transfer its 4.36% participating interest in the Enoch licence to CapeOmega.

Statoil has awarded two new, long-term contracts worth $1.2 billion for insulation, scaffolding and surface treatment services to Beerenberg Corp. and Prezioso Linjebygg.

They will provide services to 20 of Statoil's 29 installations on the Norwegian Continental Shelf when the contracts take effect in first-quarter 2016. They have a 15-year contract period and will replace Statoil's existing contracts with these two suppliers. In addition, Statoil said it has contracts with Bilfinger Industrier and Kaefer Energy, which the company intends to extend by exercising its contract options at a later date.

Norwegian subsea specialist **DeepOcean** is understood to be shedding 90 workers as lower activity levels bite. The company has been switching focus to the renewables sector in the past few months, but this has not proved enough to make up for the downturn in the oil and gas industry.

New-start Norwegian oil firm **OKEA** has taken over **Repsol's** 60% stake in the **Yme** (*32/7*) Field off Norway. Trondheim-headquartered OKEA (*32/14*) was set up to focus on developing discovered oil and gas fields on the Norwegian Continental Shelf and the Yme transaction is its first deal. The field was initially due to begin production in 2010, but there were problems with construction of the platforms legs, which were found to have cracks.

OKEA will now present a new plan for development of Yme to Norwegian authorities, although production is not expected to start until autumn 2018 at the earliest.

Subsea UK said that two new board members were appointed and seven were reelected on a members' ballot at the subsea supply chain organisation's annual general meeting. **Cameron Mitchell**, technical disciplines assurance manager for Shell UK, and **Mark Richardson**, projects group manager for Apache North Sea, joined the board. **Matt Corbin** of Aker Solutions, **Peter Blake** of Chevron, **David Sheret** of Bibby Offshore, **Brian Green** of Severn Subsea Technologies, **Geoff Lyons** of BPP-Tech, **Ian Mitchell** of BP and **Tim Sheehan** of Ashtead Technology were reelected. They will all serve on the 2016-2017 term.

Due to weak market conditions, seismic specialist **TGS** said it expects multi-client investments of about $220 million in 2016.

Robert Hobbs, CEO of TGS, said, "TGS' 2016 operational multi-client investments will be reduced by more than 50% compared to 2015. This is partly a result of lower cost of acquiring seismic data as average vessel day rates will be substantially lower than in 2015.

"Furthermore, the activity level will be reduced as oil companies have become less willing to prefund new surveys."

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