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APACHE TO CONTINUE INVESTING IN EGYPT'S UNCONVENTIONALS

EDITOR'S NOTE

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The Egypt Petroleum Show (EGYPS 2017), held under the high patronage of Egypt's President, His Excellency, Abdel Fattah El Sisi, has marked a new start for the country's oil and gas sector. In this issue, we bring you highlights of the event, part of which evolved around new alternatives to conventional segments of the sector, namely shale and tight oil and gas.

Egypt has launched exploration activities in unconventional resources, and with the key operator, Apache, at the forefront, the country aspires to develop these hydrocarbons commercially in the near future.

In a series of interviews with Apache's VP & General Manager, David Chi and Schlumberger's Vice President & General Manager, Hussein Fouad El Ghazzawi, we investigated the progress that the companies achieved in the development of Egypt's first unconventional play, Apollonia. In addition, in this issue we introduce all the basics of the Apollonia field and share the updates about the most recent event held by Schlumberger, at which the service provider presented all the technical achievements and challenges directly from the field.

EOG team further researched crucial issues surrounding the unconventional exploration and drilling in Egypt and beyond, by looking at the energy security, economics of unconventionals, and the impact these resources have had on the global oil output. Furthermore, we discuss two significant aspects of the unconventional development in terms of environmental concerns and social licenses. In our Legal Opinion section, Andrews Kurth Kenyon presents structures and processes that regulate this segment of the industry. Last, but not least, we also look at Egypt's external cooperation in the field of shale oil and gas, namely with Canada, to find out what Canadian companies, with their extensive experience in unconventional drilling, can transfer to the Egyptian industry.

We hope that you will enjoy reading this issue.

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inside this issue

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IOCs to Step up Investments in Egypt

At Egypt Petroleum Show (EGYPS 2017), major international oil companies (IOCs) said they plan to step up their investments in Egypt, expecting to find more oil and gas now that Eni's giant Zohr gas discovery has put its Mediterranean waters on the map, Reuters informed.

CEO of Italian energy group Edison, Marc Benayoun, said he was confident more gas would be discovered. He added that Egypt already had plenty of spare capacity in its existing gas pipelines and other infrastructure meant new production costs were competitive.

"We find that there have been very competitive costs and operating costs in a context of volatile prices. This is an area where we think we will continue to make investments and develop as opposed to other regions, which are higher in cost," he said.

Meanwhile, Eni's CEO, Claudio Descalzi, said the Zohr field would enter production before the end of the year, but the company was still exploring and expects more finds in the area. "The big effort in Zohr is there … but we can also find something else," he added.

Furthermore, at EGYPS 2017, His Excellency Dr. Sultan Ahmed Al Jaber, Minister of State, UAE and ADNOC's CEO said in his keynote speech that "Egypt has proved it is a trustful partner in the energy sector through enforcing suitable financial policies and applying convenient legal and organizational frameworks that encourage IOCs such as BP, ENI, Shell, ExxonMobil, Dana Gas, and many others to be listed for investing in the oil and gas sector in Egypt," as informed Egypt Oil&Gas.

Dr. Al Jaber further noted that in 2015, the largest deposit of gas ever found in the Mediterranean Sea was discovered in Egypt's territorial waters with estimated reserves of 30 tcf. This, together with the significant finds in the Nile Delta and the Western Desert, has the potential to make Egypt not just energy independent, but eventually a net exporter of natural gas.

Additionally, Italian Eni and British Petroleum (BP) announced that over the next five years, they will invest in Egypt more than in other parts of the world, reported Bloomberg.

Egypt to Reschedule Debt Payment to IOCs

An official source in the Egyptian oil sector stated to Egypt Oil&Gas that PM Sherif Ismail's cabinet wants to reschedule the debts to foreign oil companies operating in Egypt during 2017 in order to be able to pay out the entire debt by 2019.

The source also mentioned that the Egyptian government is determined to reduce the debts of foreign oil companies to $2.8b by the end of 2017, to be able to pay off part of the debts of foreign oil companies every three months. The process will consists of 60% being paid in USD and 40% in EGP.

The debts to foreign oil companies are currently standing at $3.5b as opposed to $3.6b in November 2016.

The cabinet aims to ensure the continuation of pumping new foreign investments in the oil sector during the upcoming years, and securing the completion of development and exploration plans in all of the Egyptian concession areas.

Accordingly, speaking at EGYPS 2017's opening speech, the Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, said that the ministry is aiming to create an attractive investment environment and turn challenges into opportunities, Al Borsa reported.

He added that the ministry seeks to further accelerate the development of discovered fields, in order to increase Egypt's production of oil and gas and to secure the national energy needs.

El Molla in Talks with IOCs

On the sidelines of EGYPS 2017, the Egyptian Minister of Petroleum, Tarek El Molla, met with delegations from several international oil companies, including US-based Halliburton, French Total and the French Institute of Petroleum, to discuss expanding their investment scope in Egypt, Al Shorouk reported.

Total is looking forward to increasing its investments at North El Hammad concession in the Mediterranean waters, while the French Institute of Petroleum has expressed its interest in getting into the Egyptian market.

On his side, Chairman of Halliburton, David J. Lesar, mentioned that the company is committed to its operations in technology, training, and boosting machinery's efficiency.

El Molla further discussed potential cooperation in the field of mineral resources with a number of Canadian companies, in the presence of the Canadian Ambassador to Cairo, Troy Lulashnyk. The minister highlighted the positive impact of the ongoing economic reform program in Egypt on attracting foreign investments.

Furthermore, a press release to Egypt Oil&Gas stated that Minister El Molla had also met with CEOs of major oil and gas companies on the sidelines of the Egyptian-British Business Council meeting held in London.

El Molla met with BP's CEO, Bob Dudley, General Electric's World Trade Manager, Cristiano Cecconi, and Manager of Governmental and Political Affairs in the European Union (UN) and UK's Governmental and Political Affairs Manager, Krieg Jones. This is in addition to meetings with Bechtel's Regional Manager in the Middle East, David Welch, Iraqi Oil Minister, Jabar Al Luaibi, and Libyan National Oil Corporation's CEO, Mustafa Sanalla.

Shell, Petronas Develop Burullus 9B Phase

An official at the Egyptian Natural Gas Holding Company (EGAS) stated that Shell and Petronas began working on phase 9B of the Burullus gas field, reported Al Shorouk Newspaper. The two companies drilled eight wells in the West Delta deep water concession area with investments estimated at $950m and a production capacity of 387mcf/d of gas. Production from phase 9B was scheduled to commence in 2017, yet plans were rain-checked until an agreement with foreign partners is reached. Accordingly, EGAS held several meetings with foreign partners including BG, Petronas, and Shell to establish a common ground among all parties involved.

AMOC Invests $800m in Production Increase

Alexandria Mineral Oils Company (AMOC)'s CEO, Amr Mostafa, stated to Egypt Oil&Gas that AMOC plans to increase its production for this year after signing a contract with French Axens Group. The company aims to complete oil complex project with total investments of $800m in order to increase the production of heavy oils, micro wax, and asphalt to save the foreign currency spent on imports. Mostafa pointed out that AMOC targets increasing diesel production to be 620,000 tons in 2017/2018. He added that the company will offer between 20% and 35% of its shares on stock market within the first quarter of 2017.

Ganope Negotiates Geophysical Data Tender

Ganoub El Wadi Petroleum Company (Ganope) is in talks with five companies over collecting geophysical data in open areas in the company's geographical scope at a value of $1b, reported Daily News Egypt. Ganope's Vice Chairperson for Agreements and Exploration, Osama Farouk, stated that the value of the offers received by Ganope was initially estimated at $758m, however, the company eventually succeeded in increasing the value of the data collection to be around $1b. Accordingly, two offers to collect data are expected to be merged. The five companies in negotiations with Ganope are PGS, CGG, KGS, Schlumberger, and Nageco.

Dana Gas to Freeze Investments

The Egyptian Natural Gas Holding Company(EGAS) has not frozen or canceled its existing E&P agreements with Dana Gas, said an official source at EGAS, Al Mal reported. On the other hand, Patrick Allman-Ward, the CEO of Dana Gas was reported to have frozen investments in Egypt over delayed payments after announcing the company's 2016 results. According to the source, Dana Gas, like any other international oil company (IOC), is making its investment expansion plans contingent on debt repayment. However, the Egyptian government owes to the Emirati company an amount of $265m in arrears as of the end of 2016, up from $221m by the end of 2015.

Egypt Eyes New Gas Discoveries in 2017

A source at the Egyptian Ministry of Petroleum and Mineral Resources stated that Egypt will announce a new gas discovery in Nile Delta to be located in Mahala city. The new discovery's seismic surveys revealed huge reserves that might be equal to Zohr field's volumes, Egyptian Media reported.

The company responsible for operations in the field is currently drilling a number of exploratory wells to ensure reserves. The discovery will be announced by terminating the first drilling phase, which will take place before the end of 2017.

Additionally, Egypt's Minister of Petroleum and Mineral Resources, Tarek El Molla, said that Egypt may announce new discoveries of natural gas near the Zohr field by the second half of this year, which will bring country on track to achieve its targeted self-sufficiency by 2019, Bloomberg reported.

According to Mohamed El Masry, the Chairman of the Egyptian Natural Gas Holding Company (EGAS), Egypt is set to begin exporting natural gas in the second half of 2019, Daily News Egypt informed.

El Masry also pointed out that Egypt consumes 5.2bcf/d of gas, while production amounts to 4.2bcf/d, adding that a plan is in place to boost production to 5bcf/d as soon as Zohr field production is linked to the national grid, which is expected by the end of the year. In the fiscal year 2017/2018, Egypt aims to increase its gas production to 5.35bcf/d. As he added, ongoing gas project developments are boosting the country's potential achieve its goals. Among several players, BP is on a fast track with its North Alexandria field and will be ahead of schedule by six months.

In related news, CEO of EGAS, Mohamed El Masry, said at EGYPS 2017 that the country hopes its gas market will be balanced in 2018 and expects to begin exporting gas by 2020, Reuters reported. He also mentioned that 2018 will be the last year for Egypt to import gas for the domestic market.

Egypt has gone from exporting energy to being a net importer as domestic output has failed to keep pace with rising demand.

Kuwait Doubles Crude Oil Storage in Egypt

Kuwaiti sources stated that Kuwait has renewed its contract with Egypt to double its monthly amount of crude oil to be stored in the North African country to 4mb/m. The sources explained that the Kuwait Petroleum Corporation renewed its storing contract with the Arab Petroleum Pipelines Company (SUMED) for the third consecutive year in order to strengthen its presence in the Mediterranean Sea.

In December, the Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, had met with the Kuwaiti Ambassador to Cairo, Mohamed Saleh Al Zoewakh. In the meeting, they had discussed bilateral cooperation in oil and gas, which was witnessing noticeable improvements.

El Molla had stated that the joint projects in oil and gas stand as an example to be followed in other areas of multilateral Arab cooperation schemes. He had added that the Egyptian-Kuwaiti projects include the agreement to import crude oil from Kuwait to be processed in Egyptian refineries as well as to import diesel from Kuwaiti Petroleum Authority with the payment facilitations that will last for several years.

Egypt Ponders Iraqi Crude Imports

The Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla disclosed that an oil delegation was to visit Baghdad during February to reach an agreement on the final draft to import Iraqi crude oil to the North African country, Iraq Trade Link News reported. Egypt is aiming to import 1-2mb of Basra Light crude oil on a monthly basis with facilitated payment terms.

In October 2016, El Molla visited Iraq where he discussed the means of cooperation in oil and gas sector with Prime Minister, Haidar Al-Ibadi. The meeting followed Saudi Aramco's halt in the five-year agreement to import 700,000 tons of petroleum products a month to Egypt.

Egypt's Ministry of Petroleum's Official Spokesman, Hamdi Abdel Aziz, confirmed the delegation's visit to Iraq. The spokesperson, however, denied news that Egypt is trying to import light crude from Libya as well due to the fact that the available quantities in the neighboring country were not sufficient to cover the Egyptian demand of oil, El Shorouk informed.

Meanwhile, the Egyptian General Petroleum Corporation (EGPC) is studying the plans to refine Iraqi crude oil to be imported from Basra in February and March 2017 in the Middle East Oil Refinery (MIDOR) as it works with a higher capacity than other refineries, reported Al Mal News.

Sources stated that although MIDOR is working with full capacity, EGPC is considering using it in refining the Iraqi oil in case the international oil companies' (IOCs) oil supply decreases. They added that EGPC puts other refineries, including Alexandria and Al Amerya, as a second priority.

MIDOR has raised its daily refining capacity by 15% to 115,000b/d in January 2017, which was attributed to the $20m first phase of the company's expansion plan. The second phase begins in the second half of 2017 and will last for 36 months with a target to further boost the daily capacity to as much as 160,000b/d, Reuters reported.

Sources expected that the imported Iraqi oil will save between 9% and 10% of the petroleum derivatives monthly imports. The Iraqi crude will be used in producing around 50% to 55% of diesel, 22% of benzene, 12% of naphtha, 2.5% to 3% of butane and the remaining production is coal and sulfur.

Local market's average consumption is estimated at 6.5mt/m of petroleum derivatives and gas.

Bapetco Increased Al Abyad Gas Output

Badr Petroleum Company (Bapetco) increased production from Al Abyad natural gas field in the Western Desert to 140,000boe/d, according to a press release sent to Egypt Oil&Gas. Natural gas production thus increased to an overall amount of 515mcf/d, while crude and condensates output rose to 47,400b/d. The recently discovered field 4-14 OBJ is expected to start producing 30mcf/d of gas and 1,000b/d of condensate by March 2017. An official source at Bapetco said that there are ongoing arrangements to dig a new well in the area of Neyag field to increase oil production by 5,000b/d as part of the company's ongoing development plan.

Ministry Prioritizes Securing Energy Demands

The Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, said that Upper Egypt's development plan is going within an integrated system that prioritizes providing and securing energy in order to promote investment opportunities efficiently and improve the standard of living in Upper Egypt, based on a ministry's press release shared with Egypt Oil&Gas. El Molla also said that, accordingly, there are many other projects being implemented at Assiut Oil Refining Company (ASORC), which includes starting two projects to reform naphtha with Continuous Catalyc Regeneration (CCR) and isomerization to produce gasoline and establishing new complex for gasoline hydro-cracking.

SDX Energy Moves into Egypt's Gas Sector

SDX Energy is about to move into Egypt's increasingly crowded gas sector. The company will spud its first well towards the end of February in the South Disouq concession in the Abu Madi-Baltim trend, an area where 178bcm of gas has been found over 10 discoveries, Interfax Global Energy reported. The company signed a letter of intent with rig contractor Sino Tharwa for the supply of six Sino-Tharwa rigs, Natural Gas World informed. Toronto and London-AIM listed SDX said it is also embarking on an upgrade of its existing Medesa production facility, also in Egypt.

ECHEM to Implement Four Projects worth $5b

The Egyptian Petrochemicals Holding Company (ECHEM) is studying the execution of four projects worth $5b. The projects will produce derivatives of propylene, ammonium, formaldehyde, and medium density fiberboard (MDF), reported Daily News Egypt.

Business Development Engineer at ECHEM, Nouran Salah, stated that the company is going to finalize the technical and financial studies for the propylene production projects in March 2017, in cooperation with the consulting firm Technip.

Salah further added that the investments of the project are estimated at $2b. The project will start in Q2 of 2017, as the company will begin negotiations with financiers when studies are completed.

ECHEM is now studying the ammonium, formaldehyde, and MDF projects, in which it will contract a consulting firm in order to prepare the technical and financial feasibility studies within three months, and it will take 12 months to complete the projects.

ECHEM had previously conducted seven projects in Suez, Port Said, Damietta, and Alexandria in the framework of the national plan for the petrochemical sector with a total investment of $8b.

Sandvik Secures Offshore Projects in Egypt

Swedish Sandvik have secured multi-million dollar strategic projects in Egypt and established its regional headquarters in Dubai, UAE, informed Oil Review Middle East. The company has been awarded a number of offshore projects in the North African country to provide a comprehensive scope of Sandvik oil and gas solutions for the ongoing giant gas field developments in the region, CPI Financial reported. With contract values across the scope of supply in excess of $107 m, this represents a milestone development for Sandvik in the region. As part of the contracts, Sandvik will be providing Super Duplex steel umbilical tubing SANICRO 28, a high-alloy, high strength austenitic stainless steel for OCTG down hole production tubing together with alliance partner Tenaris.

GPC to Produce 6,000b/d of Crude Oil in 2017

The General Petroleum Company's (GPC) Production Manager, Ahmed El Gedawy, stated to Egypt Oil&Gas that the company has set a new plan to raise its production rate during 2017. GPC is seeking to reach nearly 6,000b/d of crude oil after making two new discoveries of crude oil and gas in North Amer field in the Gulf of Suez as well as in North Ras Al Behar field in the Eastern Desert during the first half of fiscal year 2016/2017. Accordingly, the company will evaluate the results soon. El Gedawy also added that the company is willing to start drilling new development wells during the current fiscal year, after obtaining the approval of the Egyptian General Petroleum Corporation (EGPC).

EGPC to Discuss Oil, Gas VAT

Egypt's Tax Authority Vice President, Mohamed Abd El Satar, stated that the Egyptian General Petroleum Corporation (EGPC) will meet with the Tax Authority in order to discuss applying the Value Added Tax (VAT) tariff on oil and gas activities, reported Al Mal News. Abd El Satar added that the Authority's aim is to determine EGPC's activities that should be subject to the VAT. Meanwhile, some oil giants operating in Egypt stated that applying VAT on supply services may create difficulties.

DRILLING

PETROBEL

PETROBEL, a joint venture company between EGPC and Italian Eni is drilling new development wells in its concession areas in the Mediterranean, Delta and Sinai. The production rate of PETROBEL in January 2017 was 2,956,376 barrels of oil and 7,866,889 barrels of gas.

HAPY-16

The well was drilled at a depth of 7,539ft utilizing the ALQAHER-2 rig. Investments surrounding the project are estimated at $26.44m.

NIDOCO N-1

The well was drilled at a depth of 13,593ft utilizing the WF-797 rig. Investments surrounding the project are estimated at $7.3m.

BLS-21

The well was drilled at a depth of 10,023ft utilizing the ST-12 rig. Investments surrounding the project are estimated at $2.247m.

PETROSILAH

PETROSILAH, a joint venture company between EGPC and MERLON International, has completed drilling a new crude oil development well in its concession area in the Western Desert. The production rate of PETROSILAH in January 2017 was 253,349 barrels of oil.

BORHAN-1X

The well was drilled at a depth of 9,230ft utilizing the TANMIA-1 rig. Investments surrounding the project are estimated at $2.627m.

KHALDA

KHALDA, a joint venture between EGPC and Apache, has completed drilling new oil development wells in its concession area in the Western Desert. The production rate of KHALDA in January 2017 was 4,403,403 barrels of oil.

BERENICE-7

The well was drilled at a depth of 12,350ft utilizing the EDC-57 rig. Investments surrounding the project are estimated at $1.479m.

MRZK-27

The well was drilled at a depth of 12,300ft utilizing the EDC-61 rig. Investments surrounding the project are estimated at $1.945m.

MRZK-135B

The well was drilled at a depth of 6,855ft utilizing the EDC-66 rig. Investments surrounding the project are estimated at $1.7m.

SALMA-68

The well was drilled at a depth of 6,300ft utilizing the EDC-65 rig. Investments surrounding the project are estimated at $1.2m.

AGIBA

AGIBA, a joint venture company between EGPC and IEOC, has completed drilling new crude oil development wells in its concession area in the Western Desert. The production rate of AGIBA in January 2017 was 1,371,557 barrels of oil.

DORRA-27

The well was drilled at a depth of 6,500ft utilizing the PDI-147 rig. Investments surrounding the project are estimated at $1m.

DORRA-26

The well was drilled at a depth of 6,300ft utilizing the PDI-147 rig. Investments surrounding the project are estimated at $1.12m.

FALAK-27

The well was drilled at a depth of 8,000ft utilizing the EMSCO-605 rig. Investments surrounding the project are estimated at $1.023m.

DORRA-25

The well was drilled at a depth of 6,500ft utilizing the PDI-147 rig. Investments surrounding the project are estimated at $1.03m.

NORPETCO

NORPETCO, a joint venture company between EGPC and Sahari Oil Company, has completed drilling a new crude oil development well in its concession area in the Western Desert. The production rate of NORPETCO in January 2017 was 271,850 barrels of oil.

GANA-6

The well was drilled at a depth of 8,120ft utilizing the ECDC-2 rig. Investments surrounding the project are estimated at $1.296m.

Iran Discovered Its First Shale Oil

Iran has discovered its first shale oil reserve containing over 2b barrels of light crude. The deposit is located in the western province of Lorestan, Neftegaz reported.

National Iranian Oil Company's (NIOC) studies showed that the shale oil discovered could be brought into industrial production, Press TV informed citing NIOC's Deputy Director for Exploration, Bahman Soleimani.

According to him, exploration is also being carried out for shale gas reserves. As he explained, exploration for probable gas shale reserves in the mentioned area is underway with 80% overall progress and is projected to be completed in October 2017.

Iran had already reported the discovery of another shale oil reserve in Lorestan. In 2015, reports said the Garoo formation in the province contained huge reserves of shale oil, but no exact figure was provided to determine its exact capacity.

Other similar discoveries were also announced to have been made in other provinces such as Khouzestan, Kerman, and Semnan. However, there were no further significant developments to determine how much shale oil they were holding or whether producing oil from those reserves would be economically feasible. Hence, the current discovery is the first one to bring concrete prospects.

However, it is still not clear how the NIOC can produce oil from Lorestan shale reserves given that the exclusive technology to do so is in the hands of US companies that are banned from Iran's oil projects.

Besides, there are already speculations on whether producing oil from shale reserves would be economical for Iran given the high costs involved. Previous reports showed that Iran had the world's fifth lowest costs for producing a barrel of crude oil in conventional ways.

Iran's proven oil reserves of about 160b barrels, almost 10% of the world's total, rank it fourth among petroleum-rich countries.

Assessment of world shale oil and shale gas resources released by the US Energy Information Administration (EIA) in September 2016 pointed out that 46 countries around the world possess deposits of shale oil and shale gas. In addition, the unproved technically recoverable deposits of shale oil stand at 418.9b barrels and those of shale gas at 7,576.6tcf in these countries.

Shale oil is produced from unconventional oil shale rock fragments by pyrolysis, hydrogenation, or thermal dissolution. Shale gas is natural gas that is found trapped within shale formations.

MENA to Invest $294b in Oil Sector

According to MEED Insight's MENA Oil and Gas Report 2017, about $294b of oil, gas, and petrochemicals projects are in the pre-execution phase across the Middle East and North Africa (MENA) region, even as concerns about global oversupply continue to suppress oil prices, Hellenic Shipping News informed.

MEED's Editorial Director, Richard Thompson, said: "The oil, gas, and petrochemicals sectors will continue to be the backbone of economies across the MENA region."

According to him, "with an estimated $294b-worth of projects in the pre-execution phase, the sector provides a wealth of opportunity for business from Saudi Arabia's ambitious oil-to-chemicals complex to the re-emergence of the Iran oil industry following years of sanctions."

Furthermore, gas production investments are set to further increase as countries such as Saudi Arabia and the UAE study higher-cost sour gas and shale gas plans to meet rapidly-growing domestic demand.

Oil producers across the MENA region have been continuing to spend heavily on oil, gas, and petrochemicals' production capacity despite the fall in oil prices since 2014, Times of Oman reported. However, the investments in hydrocarbon industry across the region recorded an eight-year low in 2016, dropping 34% to $32.4b.

Kuwait Eyes 3.65mb/d in Crude Output by 2021

Kuwait plans to raise its crude production capacity to 3.65mb/d by 2021, up from its current 3.15mb/d. The state-run company, Kuwait Oil Co. (KOC) is thus sticking with plans to add 0.5mb/d of oil production capacity to its national output as the country prepares for the eventual expiration of the output quotas OPEC had adopted to help drain a global oversupply, the Head of KOC, Jamal Jaafar, said, according to Bloomberg.

"KOC is producing 2.7mb/d now, and we will maintain this under the deal," Jaafar said. "At the moment we have the capacity to reach 3.15mb/d, but we will stick to the OPEC agreement."

However, Jaafar added that KOC, which is responsible for most of Kuwait's domestic crude production, will add capacity even if OPEC decides to extend the supply cuts beyond June, Times of Oman reported.

"We will continue to increase production capacity because we have a five-year plan to reach 3.65mb/d by 2021, so we cannot stop investing in that," he said. Meanwhile, "we will take advantage of the OPEC cut deal to perform maintenance on facilities in the fields."

In related news, KOC has signed three service agreements with Royal Dutch Shell and another with BP to develop exploration and production projects. Kuwait is expected to drill its first offshore exploration wells by the end of 2017, including wells near Failaka Island in the Persian Gulf, according to KOC's Jaafar. Kuwait is OPEC's fifth largest oil producer.

Glencore Extends Major Libyan Oil Deal

Swiss-based commodities giant Glencore has extended a deal with Libya's National Oil Corporation (NOC) to be the sole marketer of one third of the country's crude oil production, Reuters reported. With the extended deal, Glencore is the exclusive trader of around 230,000b/d from the oil fields Sarir and Mesla, Oil Price informed. The deal extends Glencore's dominance over its rivals such as Vitol and Trafigura in handling barrels from the North African country for a second year running. Back in 2015, Glencore secured a deal with Libya's NOC to buy half of the country's then-oil-output of around 400,000b/d.

Riyadh Lost South Korea's Market Share to Tehran

Figures show that Saudi Arabia has lost a significant share of South Korea's oil market to Iran, Press TV reported. According to Oil Price, South Korea doubled its imports of Iranian crude in January, when Iran returned on the international oil market and started exporting growing amounts of oil in a bid to regain market share lost to the now-lifted international sanctions. Preliminary customs data show that Iran exported around 1.79m tons of crude oil to the Asian country. The figure – which is equal to around 425,000b/d – is almost twice as high as that of the same period in 2016.

Iran to Reach $50b in Oil Revenues in 2018

Iran's oil exports have reached the pre-sanctions level and its oil revenues are accordingly expected to amount to $45-$50b in the next Iranian financial year until March 2018, if prices remain at $55 per barrel, said Iran's Oil Minister, Bijan Namdar Zanganeh. The minister pointed out that this financial year's oil sales brought some $40b, some of which will be collected next year, Zawya reported. According to Iran Daily, Zanganeh added that while oil and condensates exports stood at 1.2md/d in the five months of 2013, the figure reached 2.8b/d in the past four months — up by 1.6m barrels.

Qatar Joins LNG Consortium in Pakistan

State-owned energy company Qatar Petroleum (QP) has joined an international consortium of major US, European, and Japanese energy companies to develop a liquefied natural gas (LNG) import project in Pakistan in collaboration with local developer Global Energy Infrastructure Limited (GEIL), Rigzone informed. The consortium, which includes US ExxonMobil, France's Total, Japan's Mitsubishi, and Norway's Hoegh, will develop a project that includes a floating storage and regasification unit (FSRU), a jetty, and a pipeline to shore to provide natural gas supply to Pakistan. The FSRU will have a minimum regasification capacity of 750mft3/d when it enters service in 2018.

Riyadh Loses Oil Production Leadership to Moscow

Russia overtook Saudi Arabia as the world's largest crude producer in December 2016, when both countries started restricting supplies ahead of agreed cuts with other global producers to curb the worst glut in decades, Bloomberg reported.

As informed by RT, recent data from the Joint Organizations Data Initiative in Riyadh pointed out that Russia produced 10.49mb/d in December, down 29,000b/d from November. On the other hand, Saudi Arabia's output dropped to 10.46mb/d, down from 10.72mb/d and Riyadh's crude exports fell to 8mb/d from the 8.26mb/d in November, the biggest monthly slide since May 2003. This was the first time Russia became the top crude producer since March 2016.

The US was the third-largest producer at 8.8mb/d in December compared with 8.9mb/d in November, according to JODI. The growth in US production mostly came from the Texas' Permian Basin and Eagle Ford regions, which have better quality oil. However, local refineries cannot process it, because they are geared to process poorer quality crude from Canada and Venezuela. The US producers export the higher quality oil and import what they need from abroad.

The data also show that Iraq came in fourth with 4.5mb/d of oil produced, followed by China at 3.98mb/d.

Saudi Arabia and fellow producers from the OPEC decided at the end of November 2016 to restrict supplies by 1.2mb/d for six months starting in January. Non-member producers, including Russia, pledged additional curbs. Brent crude prices have since climbed about 20%.

Iran, Oman Signed Offshore Gas Deal

Tehran and Muscat signed a preliminary agreement for a major offshore pipeline project to supply Iranian natural gas to Oman, with top European and Asian companies reportedly in line to implement the project, Financial Tribune reported. The memo, which is an agreement in principle, was signed on the sidelines of a meeting between Iran's Oil Minister, Bijan Namdar Zanganeh, and his Omani counterpart, Mohammed bin Hamad al-Rumhi, in Tehran. Zanganeh said that activities regarding deep-water mapping of the pipeline project will come to an end within the next few months and a tender will be held afterwards for the selection of a developer for construction of the gasoduct, informed Fars New Agency.

OMV Launched Crude Production in Libya

OMV has successfully started up crude production in both the Sirte and Sharara oil fields in Libya, Post reported. In Q4 of 2016 OMV's production from Libya amounted to approximately 3,000b/d. The company also increased its stake in four Exploration and Production Sharing Agreements (EPSAs) in the Sirte Basin. OMV acquired 75% of the Second Party Share and now holds 100% of the Second Party shareholding in blocks C103, NC29/74, C102, and Nafoora Augila, Your Oil and Gas News informed. The state-owned Libyan National Oil Corporation (NOC) holds the First Party Share and will remain the majority shareholder with a working interest of 88% to 90%. The Sharara fields are located in the Murzuq basin.

Qatar Petroleum Seeks LNG Projects in Cyprus, Morocco

Qatar Petroleum (QP) is exploring for oil and gas in Cyprus and Morocco and joining a project to import liquefied natural gas into Pakistan as part of a strategy to expand the Gulf emirate's global energy investments, Bloomberg reported. According to Reuters, QP, the world's largest LNG producer, has been pursuing deals in Cyprus where it "won a bid for 40% of a plot for exploration" and recently "went into Morocco for exploration," the company's CEO, Saad al-Kaabi, said. QP must cope with local limits on growth as it seeks to expand its LNG business and increase its production and reserves of crude oil and gas, as added Al-Kaabi.

Tunisia's Oil, Gas Production Drops 10.1%

Tunisia has recorded a drop in crude oil and natural gas production of 10.1% in 2016, compared to 2015, Oil Price reported.

As informed by African Manager, domestic crude oil production fell by 6.2%, after a decline of 9.6% in 2015 and 10.6% in 2014. At its highest point, in 1997, the country was producing 93,000b/d. Its record low was 42,000b/d, reached first in December 2015.

Similarly, national gas production decreased by 11% over the same period, down from a drop of 3.9% in 2015 and 8.5% in 2014.

According to the note on 'Economic and Monetary Developments in Tunisia and the Medium-Term Outlook,' published by the Central Bank of Tunisia, the drop was caused by — among other things — persistent social unrest and a series of technical failures in some production locations.

Six years after the revolution, the areas where the fields are located remain underdeveloped, with high unemployment. The problems have been exacerbated by a security crackdown, particularly near the borders with Libya and Algeria.

However, while oil and gas have declined in terms of output, the mining sector has recorded an increase in value over 2016. The Tunisian Central Bank reported an increase of 17.4% in 2016 compared to 2015, largely due to phosphate production levels, which reached $3.8m tons in 2016.

Iraq's Oil Reserves Increased to 153b Barrels

Iraq's oil reserves have increased to 153b barrels, from a previous estimate of 143b barrels, according to the country's Oil Minister, Jabal al-Luaibi, The Star informed.

Al-Luaibi added that Iraq will ask the Organization of the Petroleum Exporting Countries (OPEC) to adopt the new figure as the official estimate for its reserves, Reuters reported.

The increased estimate is the result of appraisals and exploration carried out at seven oil fields in central and southern Iraq. The country is currently developing its oil reserves with the help of foreign companies to make up for three and a half decades of conflict and international sanctions, starting with the 1980-1988 war against Iran.

Iraq's new proven reserves estimate brings it closer to Iran's 158b barrels. It is OPEC's third largest producer after Saudi Arabia and Venezuela; with the two countries having 301b barrels and 266b barrels of oil respectively, according to OPEC's website.

Iran to Build 12 New Oil Refineries

Iran started the construction process for 12 new oil and gas condensate refinery complexes, according to an official of the National Iranian Oil Refining and Distribution Company (NIORDC), Anadolu Agency informed. NIORDC's Director of Corporate Planning, Member of the Board of Directors, Arman Moghadam, said presently nine refineries with an aggregate total capacity of 1.73m barrels are functioning across the country, adding "Setare Khalij Fars Gas Condensates Refinery will soon come on stream with a refining capacity of 120,000b/d," Hellenic Shipping News reported. The official also stated that the country enjoyed 13,000km of pipelines for transmission of crude and petroleum products; "moreover, more than 5,500 petrol, gas oil, and CNG stations are performing in Iran."

Gulfsands Awarded License Extension in Morocco

Gulfsands Petroleum plc has been awarded an extension to its Moulay Bouchta petroleum agreement in Morocco, Proactive Investors reported. Following the extension agreement with Morocco's Office National des Hydrocarbureset des Mines (ONHYM), the initial phase will now run for an extra year to June 2017. According to Gulfsands, the extension comes with a revised work program for the Initial Phase consisting of the acquisition of 200km of 2D line seismic; the reprocessing, and interpretation of selected legacy 2D seismic data; and a legacy field study with the aim to identify any potential for re-activation. Accordingly, the estimated cost of the work program as specified in the amendment to the petroleum agreement has been reduced from $3.5m to $2.5m.

Nigeria Seeks $16.4b through Asset Sales

Nigeria's Federal Government plans to generate up to $16.4b through asset sales in the next four years to reduce the burden on the nation's budget, All Africa informed.

According to Bloomberg, the sales will help to tackle inefficiencies and stem "corruption in public enterprises," which is part of the West African nation's plans for economic recovery from 2017 to 2020.

President Muhammadu Buhari will introduce the proposal on an unspecified date late February. The assets Nigeria may sell were not specified.

The country estimates its economy contracted 1.5% in 2016, partly because of a decline in the price and output of oil, the nation's biggest export and revenue generator. Accordingly, the Federal Government proposed a 20% increase in this year's budget to stimulate the economy and help gross domestic product expand by an average of 4.7% annually over the upcoming four years, and reach 7% in 2020.

According to Vetiva Capital Management Ltd's Head of Research, Pabina Yinkere, the government could look at reducing government stakes in oil joint ventures from around 55% to 40% or 45%. "That alone can generate over $10b," he added.

Meanwhile, Nigeria announced export revenues reached $2.45b in 2016. Additionally, NNPC's monthly Financial and Operations Report indicated that oil and gas sales rose 13.4% from November to December 2016, All Africa reported.

The report further showed that the total export sale in December 2016 was of $195.4m for crude oil and gas compared to the sum of $166.18m recorded in November 2016, informed Online Nigeria News.

NNPC's report stated: "This is $20.22m higher than the preceding month's performance. Crude oil export sales contributed $100.37m [or 51.36%] of the dollar transactions compared with $96.31m contribution in the previous month."

To boost exports, NNPC issued in January 2017 an invitation for bids under the model of direct sale of crude oil and direct purchase of petroleum products. Furthermore, Nigeria targets crude oil production of 2.5mb/d by 2020 to boost export earnings.

Eni Started Oil Production in Angola

Italian Eni started production at an oil facility off the coast of Angola in record-setting fashion, reported United Press International. The production started from the East Hub Development Project, in Block 15/06 of the Angolan deep offshore field, ahead of development plan estimates and with a time to market among the best in the sector, according to an Eni's press release. Eni will also add production from the existing West Hub Project in the Sangos, Cinguvu, and Mpungi fields, where another vessel, the Floating Production Storage and Offloading (FPSO) vessel N'Goma, is operating. Hence, in total, Block 15/06 will reach a peak of 150,000b/d of oil within 2017.

Four African Countries Join Oil, Gas Exploration

Four African countries sharing the Lake Tanganyika basin – Tanzania, Congo, Zambia, and Burundi – met in mid February in the Democratic Republic of Congo to discuss a joint exploration of oil and gas in the area, reported All Africa News. Tanzanian Minister for Energy and Minerals, Sospeter Muhongo, stated: "There are traces of oil and gas in the lake and the meeting is aimed at harmonizing exploration efforts and avoid conflicts over the resources," according to Asian Pacific Daily. The minister pointed out that the joint exploration comes as Tanzania and Congo had signed a Memorandum of Understanding (MoU) for joint oil and gas exploration in and along Lake Tanganyika during October 2016.

ExxonMobil, South Sudan in Talks over Oil Deposit

The US-based ExxonMobil Corporation is in secret talks with Juba to buy a stake in South Sudan's vast untapped oil deposit, a senior-level government source familiar with the negotiations told the South Sudan News Agency. The official, who demanded his identity be concealed, because of the sensitivity of the talks, additionally revealed that France-based oil and gas company Total SA and London-based Tullow Oil Plc have also shown interest in buying stakes of the untapped reserves, All East Africa informed. According to the source, the government is pleased with the fact that Western oil companies are returning to South Sudan.

West Africa Boosts Crude Supply to Asia

West African oil producers, led by Nigeria and Angola, were expected to send the largest volume of crude to Asia in January and February 2017, in at least five years. Shipments on the trade route, among the longest for supertankers, were projected at 1.79mb/d for January, and were set to soar to 2.19mb/d in February, the highest level since at least August 2011, World Oil informed.

This is a clear sign of how refineries in the world's biggest demand region are scouring to replace supplies cut by OPEC's Middle East producers, Bloomberg reported.

China was set to import 1.3mb/d of crude oil from West Africa in February, a 14% increase from January. Buyers included Sinochem Group, PetroChina Co., and Unipec, the trading arm of China Petroleum & Chemical Corp.

Since the beginning of 2017, OPEC and 11 other nations have curbed supplies in an effort to prop up the price of oil, which has lost about half its value since mid-2014 due to a global oversupply. The effect has been a re-drawing of oil-trade routes, because Asia's crude consumption accounts for about one-third of the global total, exceeding that of any other region.

Uganda Likely to Produce First Oil by 2020

Uganda has come closer to materializing its plan to produce its first oil by 2020. Partners in Uganda's oil and gas are expected to make a final investment decision (FID) following the announcement that three companies will be involved in technical studies for upstream developments, The East African informed.

The licensed areas have 5.4b barrels of crude out of the overall discovery volume of 6.5b barrels, but the fields will not come on stream at the same time. Additionally, officials said this amount constitutes merely 25% of the country's potential hydrocarbons.

According to All Africa, the Ugandan government has given the three oil joint venture (JV) partners, France's Total E&P, UK's Tullow Oil, and China's Cnooc, up to December as a deadline for closing FID.

The JV was formed in August 2016 when the Ministry of Energy and Mineral Development issued eight production licenses to the three companies. When the contract was signed, the ministry informed the companies were expected to work towards reaching FID within 18 months after issuance of the production licenses.

The project's $2.5m Front End Engineering Design (FEED) contract was awarded by the JV to Flour (France) working with China Petroleum Engineering and Construction Corporation (CPECC), Technip (France), and Chicago Bridge & Iron Company (US).

BW Offshore to Operate Namibian Project

BW Offshore signed a farm-out deal in order to become the operator of the Kudu license offshore Namibia with a 56% stake. BW Offshore's subsidiary BW Kudu will acquire the license with the state-owned oil company National Petroleum Corporation of Namibia (NAMCOR), which will be holding the remaining 44% interest, reported Offshore Engineering. BW Kudu will pay for past costs once it receives the transfer of the field interest. The final investment decision is planned for Q4 of 2017, Global News Wire wrote.

Nigeria, Niger Enter Joint Pipeline Agreement

Officials at the Nigerian National Petroleum Company (NNPC) stated that the company and the Federal Government will enter into a joint venture with Niger Republic to run crude oil pipeline that will provide oil to the Kaduna Refining & Petrochemical Company (KRPC) plant. This will ensure efficient and uninterrupted production and supply of petroleum products in the country, reported Nigerian Nation News. The government's decision to enter into the joint agreement with Niger Republic may have arisen from militant activities of the Niger Delta groups in the oil-producing region, where crude oil installations are under constant threat of attack, according to The Guardian.

Angola to Increase Its April Oil Exports

Angola will increase its April crude oil exports to 1.691mb/d, according to its provisional loading plan, Reuters reported. The exports contain 53 cargoes that include the first of Olombendo crude oil from the East Pole field that Eni has launched in 2017.

The April plan includes two 950,000-barrels cargoes of the grade as well as one cargo added for loading in March. The March export program initially included a total of 1.51mb/d, which would climb to 1.54mb/d with the added cargo of Olombendo. The deep offshore block has a capacity estimated at 38,000b/d.

Reuters further informed that the initial demand for Angola's April loading cargoes was strong. The demands came with buying interest emerging across Asia. In comparison, Nigeria's April export plans continued to emerge, though trading was muted.

Additionally, Angola remained in January 2017 as the largest oil producer in Africa, overtaking Nigeria, according to the February issue of the monthly newsletter on the oil market released in Vienna by the Organization of Petroleum Exporting Countries (OPEC), Macauhub informed. OPEC's monthly oil market report (MOMR) revealed that Angola's production was now at 1.651mb/d, Leadership reported. Production has thus surpassed Nigeria's 1.604mb/d output, despite Angola's monthly drop of 24,000b/d. This is the third time Angola has overtaken Nigeria as the continent's largest crude producer, following Niger Delta unrests in 2016.

Previously, Angola had also surpassed Nigeria in 2016, with a production of 1.73mb/d, compared to Nigeria's 1.577mb/d. The decline in oil production in Nigeria, which was previously the main oil producer in Africa, is due to ongoing attacks on the country's production facilities and pipelines.

OPEC confirmed its member countries' production levels from secondary sources – traders in the industry – and via direct communication with the country's leadership. The organization also revealed that Nigeria, Saudi Arabia, and the United Arab Emirates recorded massive improvements in their economic outlook. "In Nigeria, operating conditions in the country's private sector improved in January for the first time in a year, as suggested by the Stanbic IBTC Bank Nigeria PMI," OPEC said.

Cairn Energy Drilled SNE-5 Well Offshore Senegal

Cairn Energy has reached Total Depth (TD) at the SNE-5 well offshore Senegal at 2,852 meters below the mud line, Energy-pedia reported. Far Ltd, Cairn's partner in the project, informed that a wireline logging and sampling program has been completed and rig operations are progressing with a Drill Stem Test (DST) of the primary reservoir target at this location. SN-5 well is the first of two firm wells planned to further evaluate the SNE oilfield, Offshore Energy Today wrote. Drilling operations started in January and was carried out by drill ship Stena DrillMAX. The well is located in the southern area of the SNE oil field, approximately 2km southeast of SNE-3.

Ghana's New FSPO to Operate in Tano Basin

Ghana has named the country's new Floating Production, Storage, and Offloading (FPSO) vessel - the 'John Agyekum Kufuor' vessel - commissioned by Eni, Vitol, and Ghana National Petroleum Corporation (GNPC), reported Oil Review Africa. John Agyekum Kufuor was Ghana's former President. The FPSO will operate in the Sankofa-GyeNyame field in the Tano basin offshore Ghana, for Offshore Cape Three Points (OCTP), and it will arrive to Ghana in April 2017, reported Offshore Magazine. The FPSO oil treatment capacity is 58,000b/d and its gas treatment capacity is up to 210mscf/d. The FPSO has additional facilities that include a water injection module of up to 55,000b/d and gas injection facilities of up to 150mcf/d.

DeepOcean Executed 3D Laser Survey Offshore Ghana

ADUS DeepOcean and DeepOcean Ghana Ltd. have recently completed an innovative deepwater subsea 3D laser survey off the Ghana's coast for Tullow Oil, the first extensive commercial survey of its kind, heralding a new era of high resolution, cost effective data acquisition subsea, informed Subsea World News.

The survey has led to a three-year contract for DeepOcean Ghana Ltd, according to Offshore Engineer. Furthermore, it set new benchmarks for high-resolution contextual 3D survey and proved alternative and fast solution to conventional metrology surveys.

The dynamic laser survey solution, from a moving ROV, comprised a deep-rated 2G Robotics ULS 500 Pro Laser and Sonardyne's SPRINT INS system. The performance of the systems exceeded expectations with accuracies approaching 1cm in dynamic operation.

Tullow Ghana's Subsea Project Manager, Hugues Villedey, said:

"The data and images gathered have proved very valuable in increasing our understanding of the dynamics of the subsea assets, enabling more informed decision making."

The accuracy of the survey is providing DeepOcean engineers with valuable quantitative and contextual information to better inform IMR tasks and undertake metrology.

Mozambique Awards 3 Gas Development Projects

Mozambique's National Petroleum Institute (NPI) announced that the government has awarded three contracts for gas development projects across the region. Norway's Yara International, Shell Mozambique, and GL Energy Africa were selected, ESI Africa reported.

Yara International will develop fertilizers and generate 30MW to 50MW of power, while Shell Mozambique will produce diesel and 50MW to 80 MW of energy, and GL Energy Africa will produce 250MW from gas resources, Engineering News informed.

Previously, in August 2016, the government issued a tender, requesting interested developers to bid for the development of natural gas from the Rovuma Basin, which attracted 14 companies. It is reported that upon the discovery of natural gas in the Rovuma Basin, off the coast of Cabo Delgado province, the government and the concessionaires agreed that a portion of the gas should be used domestically.

A source from the Ministry of Mineral Resources and Energy, said that the Rovuma Basin has by far the largest known gas reserves in the country holding an estimated 180tcf of gas.

The operators in the two areas where gas has been found are said to be the Italian company ENI (Area4) and the US company Anadarko (Area1).

Fugro Awarded Seabed Survey Contract in Kenya

Geo-intelligence firm Fugro announced it has been awarded a contract by Shell/BG Kenya for the execution of a seabed survey to detect natural leakages of hydrocarbons, Rigzone reported. Fugro stated the seeps survey complements a seismic exploration program that was completed recently offshore Kenya, according to Offshore Energy Today. Undertaking a four-week campaign of multibeam data acquisition and precise sampling, Fugro will mobilize its specialized survey vessel, Fugro Discovery, to Kenya in March. According to the company, seabed sampling will be carried out using a drop corer and multibeam data will be acquired with the latest deep-water high resolution multibeam echo sounder, installed in a newly designed gondola on the vessel hull.

APACHE
DETERMINED TO CONTINUE INVESTING IN EGYPT'S UNCONVENTIONALS

In an exclusive interview with Egypt Oil&Gas, DAVID CHI, Vice President & General Manager, Apache, shared the company's latest updates on the progress in the unconventional Apollonia field and affirmed Egypt's major potential in developing unconventional resources as a necessary supplement for its matured fields in a few years time, under the Modernization Strategy umbrella aiming for the country to become a Regional Oil&Gas Hub.

By Nataša Kubíková

While "Egypt has good conventional reservoirs, "the country is to start looking at alternative supplements such as unconventional plays to accommodate its growing energy demands and prepare for future energy scenarios.

"The development of unconventional resources is, however, challenging, that is why there has been limited success in this area outside of North America," said Apache's VP & General Manager, David Chi. "For an unconventional development to work, many ingredients need to be in place; the right geology, the right skill set and know-how, availability of equipment and service providers, and the right commercial framework just to name a few," Chi added.

Nonetheless, "Egypt does have potential in unconventional oil and gas," and "I believe these unconventional resources can play a part in Egypt's energy picture. To reach this goal, it requires the partnership and true cooperation from the Government, E&P companies, and service providers."

Initiating Unconventionals

The launch of unconventional exploration in Egypt was marked a few years ago in the identified Apollonia field in the Western Desert and it was made possible thanks to the political will. "I applaud H.E. Prime Minister Eng. Sherif Ismail for initiating the Apollonia project to investigate the opportunity of unconventional resources in the country," David Chi shared his praise for the former Oil Minister.

It is only thanks to this initiation that "unconventional development has a significant lead time," Apache VP confirmed, "yet, it is challenging for any unconventional play to be successful, because the right place tends to be geographically vast."In addition, "every unconventional play is different, hence, there is no one-fit-for-all solution. Therefore, to be successful, one needs to first understand the source rock, its maturity, deposition environment and history, geochemistry, and permeability; namely all the relevant rock and fluid properties. The information should be analyzed prior to conducting the necessary exploration activities and necessary modeling" for actual development.

Apache has been greatly involved in unconventional exploration and production in North America, having collected extensive experience in the field, and poses as the best candidate to accomplish Egypt's unconventional production. "In fact, Apache has had one of the biggest discoveries in 2016 in Alpine High, which is an unconventional play in Delaware Basin, Texas, US." In addition, Apache further confirmed its leading position as a top class unconventional explorer and developer "as witnessed by our discovery of Alpine High, with more than 75 TCF of liquids rich gas and 3 billion barrels of oil based on initial assessment of only 2 out 4 prospective formations," David Chi shared the company's recent success story.

Following upon that, "we are ready to share our experience and expertise in making unconventional resource development a reality in Egypt."In fact, "Apache has been the best explorer in Egypt's Western Desert with around 60% exploration success rate in over 20 years" and it "has a lot of expertise and world class explorers of unconventional resources" to further contribute to the Egyptian oil and gas industry in yet another area, that of unconventional oil and gas.

Based on its previous success stories in North America, the US giant has proven its credentials as one of the most qualified explorers for unconventional hydrocarbons and it is eager and ready to transfer its capacities to Egypt. As David Chi stated convincingly, "we have a lot of experience in drilling and fracking horizontal wells and we can leverage the knowledge we have acquired and try to unlock the potential in Egypt."

> **"We are ready to share our experience and expertise in making unconventional resource development a reality in Egypt."**

Building upon its previous unconventional activities, the company can greatly benefit from its know-how to develop a range of creative designs for Egypt's unconventional resources across the entire country. As firmly stated by Apache's VP, "in North America, unconventional exploration did not just happen overnight. The companies have gone through a lot of hard work with significant investments which resulted in lessons learned and expertise on how to do things right." It was only thanks to these lessons that North America could have turned the applied

processes into positive outcomes through more efficient mechanisms.

The 3-Well Pilot in Apollonia

Indeed, Apache has been a pioneer in unconventional resources development in Egypt. The unconventional Apollonia field exploration started with Apache and its partners Shell and EGPC by identifying "a sweet spot" to operate in the play through the company's joint venture (JV), Khalda Petroleum Company. David Chi explained that "we have developed a 3-horizontal well pilot program, under which we first drilled two vertical wells to acquire core data for well and frack design and to understand its potential before starting the horizontal wells."

"We have a lot of experience in drilling and fracking horizontal wells and we can leverage the knowledge we have acquired and try to unlock the potential in Egypt."

To date, "Apache/KPC as the operator together with our partners Shell/BAPETCO and EGPC/EGAS, have successfully drilled and completed two horizontal wells out of the 3-well program. These two wells have the largest hydraulic fractures in Egypt's history; the first was completed by Halliburton, the second by Schlumberger," stated Chi.

Currently, Apache and its partners "are producing and monitoring those two wells of different orientations in order to gather the necessary data to determine the drainage area, understand the potential recoverable reserves and the surface facilities requirements." We are getting production data and conducting analysis so that we can plan drilling the third well, most likely in the second half of 2017. This 3rdwell will similarly be monitored for an extended time to understand its production performance.

It is not until these processes are completed that the company will consider proceeding to the next stage. David Chi elaborated saying that "based on the results of the three wells, we can then decide on if, when and how to move on to the Next Phase.

For the time being, "the evaluation process is ongoing," however, as VP & General Manager of Apache revealed, "in addition to what has been done so far. We are also looking for opportunities to further optimize drilling and completion of future wells. Furthermore, there is ongoing modelling work and future progress will depend on insights obtained."

"For an unconventional play to be successful, we need to find the right quality of rock and fluid and this is one aspect that we are currently investigating from the Gulf of Suez all the way to the Libyan border. The objective is to be able to determine what the actual potential is, and where the sweet spots are. This work is ongoing right now and Apache has dedicated resources to achieve its targets," said Chi.

As he continued, "once the Pilot Program is completed, we will be able to make a decision with our partners on the possibilities of a full field development."

Commercial Viability

In order for the Apollonia unconventional play to reach positive results and become commercially viable, "the manufacturing stage of the development would require us to become very efficient by lowering our drilling and completion costs, securing suitable infrastructure and partnering with service providers to execute flawlessly" added David Chi.

With such an expert base, Apache will be able to "better assess the upcoming processes and in cooperation with our partners start outlining future plans regarding the gas price and the development concept, which include the number of wells, estimated production and, surface production facilities to successfully proceed."

The fact that the up-to-date results are positive is a good start. "So far, we are encouraged by what we have seen, however, it is still early and more time is needed to evaluate longer-term performance due to the many uncertainties and variables in unconventional plays" David Chi noted.

He then elaborated stating that, yet, "these [results] are still not conclusive as the exploration is still in its early stage." As some companies in different countries had seen major setbacks in the commercial production from their unconventional reservoirs, "when their production levels suddenly declined after the first few months of the production cycle," Apache is determined to "do it the right way" and avoid these problems by applying "lessons learned from other cases." VP Chi is thus convinced that "Egypt needs to work with partners who have unconventional expertise, because the country may take advantage of the right partner's experience from North America and avoid mistakes that have been very costly in some cases."

Furthermore, the development of unconventional hydrocarbons comes necessarily with addressing implicated environmental concerns, which Apache, as a socially responsible partner of Egypt's sector, intends to take into consideration. "Apache is doing unconventional drilling in a responsible way by looking at chemicals, water that is being pumped, a good recycling program, and effective reservoir management to protect the surface in the Western Desert," said David Chi.

Towards Positive Accomplishments

Apache's input and contribution to Egypt's unconventional resources will not cease, the company will rather build upon the significant inflow of capital it has already poured into unconventionals in the country with all its trust in the existing potential and its confidence to achieve what previously might have been perceived as unachievable. Apache "is interested to continue its investments in unconventional portion of Egypt's oil and gas industry," which, as David Chi put it, "this can be a tremendous opportunity for the country to supplement its growing energy demand in the future."

As one of the largest foreign E&P companies in Egypt, which has expressed its commitment to the country understands that the right path to accomplish desirable production targets is to "engage in frank discussions to identify ways to continue moving forward and become successful in the unconventional portfolio," added Chi. The time is ripe to go ahead with this strategy, because successful unconventional development takes time. Indeed, it is never too early to start developing unconventional resources, as in five years down the road, these resources can start supplementing some matured fields that Egypt has an abundance of," as David Chi projected.

In his view, "the future of unconventional opportunities in Egypt fits well with H.E. Minister Tarek El Molla's 'Modernization Strategy,' which covers some of the key factors of success such as commercial framework, human resources, and upstream oil and gas development." This will also translate successfully to Egypt's vision of becoming a regional energy hub.

"Egypt, with its potential that will undoubtedly grow as the country is now targeting unconventionals, can focus on energy exports."

Chi believes that "Egypt is geographically located in an advantageous position in the region with the Suez Canal at hand, being relatively close to the European, East Asian, and Gulf markets, and, more importantly, to the African market with its growing population and larger energy demands."This bears well with the government's long-term vision for Egypt to become a Regional Oil and Gas Hub. "This is great news for Egypt and we would like to be part of that," according to Chi.

Accordingly, projecting a positive future for Egypt's oil and gas sector, Chi concluded saying that "Egypt, with its potential that will undoubtedly grow as the country is now targeting unconventionals, can focus on energy exports," through which "the country's economy will improve, energy costs will be lowered, and more companies will come to invest." Hence, "transforming the energy industry is an important piece of the puzzle, not only in terms of the scope of foreign exchange revenues it can generate, but also with abundant energy resources, thanks to which the country can attract more investments in the future and prosper."

A NEW ECONOMIC MODEL FOR UNCONVENTIONAL PLAYS

Schlumberger co-hosted with Khalda Petroleum Company 'The Apollonia Unconventional Play' presentation in February. At the event, HUSSEIN FOUAD EL GHAZZAWI, Schlumberger's Vice President and General Manager spoke to Egypt Oil&Gas to introduce advancements and challenges that the company has been facing in its work on unconventional oil and gas development with the two field operators in the country.

By Salma Essam, Nataša Kubíková

Schlumberger has had an impressive history working in Egypt and its commitment to the country has been translated into its recent major investment in Egypt's Center of Efficiency (ECE) amounting to EGP 1 billion. In fact, it is the second largest investment of the company in 2016 worldwide. El Ghazzawi affirmed the company's involvement in the country's oil and gas sector. "We are committed to Egypt. We started building our new base three years ago and it is going to be completed in a few months."The ECE "is an impressive place where we will reconcile our operational base for training and operation, a main operational base in Egypt."

The appetite for such a long-term investment came as a result of positive steps that the Egyptian government in general and Petroleum Ministry in particular, have adopted to make the environment attractive for major players. Schlumberger's VP stated: "I am very pleased with the environment, the passion, and the motive of the various JVs and the Ministry of Petroleum and Mineral Resources, EGPC, EGAS, and Ganope. Every entity is keen on making changes and we will be part of the change." Accordingly, as El Ghazzawi further noted, "we are very optimistic about the potential of Egypt's oil and gas industry, and we are excited about the activity in the Mediterranean and the Western Desert."

Among the government's achievements to date, transparency has been seen as the most significant move that the government has presented to old and new investors. "The ministry has been taking steps to consolidate transparency in the oil and gas sector. To make business, Egypt has to rise in the transparency index and I think the progress has been fantastic."

As a result, El Ghazzawi added, "we are happy to invest, and we are happy with the environment and the encouragement coming from the ministry and all our partners."

Challenges of Unconventional Drilling

In light of that Schlumberger has been expanding its portfolio in the country. One of the key areas of expertise that Schlumberger, as a service provider, has been bringing in to Egypt is the technology and expertise required to evaluate, drill and complete unconventional oil and gas plays such as the Apollonia field in the Western Desert.

According to Hussein El Ghazzawi, the prospects for unconventional drilling in Egypt are positive. "We are very pleased with the recent unconventional success. I think Egypt has a very good chance to succeed in this area once we improve the economics of this unconventional play. It stretches from east of the Delta across the Western Desert. It is enormous."

Yet, this potential would need to come down to profitable economics. Therefore, Schlumberger is interested to "continue working with our partners to make it more economical through the two key processes - integration and efficiency." VP & General Manager El Ghazzawi elaborated: "I think these two factors are crucial for a project like Apollonia. Integration and efficiency come obviously from the economy of scale, which implies to have multi wells done at the same time and this would help to generate more than a 15% saving that we are aiming for."

In addition to economics of the Apollonia unconventional play, the service provider has been playing a key role in addressing the other challenges facing the operators such as the understanding and characterization of the geophysics of the area, providing the required technology, and competitive pricing.

As El Ghazzawi affirmed, in these early stages of unconventional drilling, "we are yet in the learning curve." "The main challenge is definitely having operations done with competitive pricing. In this sense, we need to focus on qualifying the local sand," as having the good sand may "help us cut almost 60% of the total cost."

Schlumberger also brings the technology that enables the operators to address the challenges they encounter in understanding the complex geophysical structures of the terrain and acquiring the required data. "Technicalities are also part of these challenges. We are a technology company that brings more software, technological solutions, processes, and workflow. We bring all this together to reduce the cost and overcome the technical challenges," explained El Ghazzawi. "But since there are only two horizontal wells, it is still an early stage to assess, but we will continue to improve."

The company has, nonetheless, already marked a significant progress, according to its VP: "I think that the planning, designing, and execution exceeded everybody's expectations. We are all pleased with the results."

With these positive outcomes, Schlumberger also considers the effects of unconventional drilling on the environment and does its best to tackle them. "The environment is very important for us," according to El Ghazzawi. In line with the company's social responsibility, "in Schlumberger, we always tell our people that they are all empowered to stop the operation when they feel some unsafe acts are being conducted, including environmental hazards," he emphasized. Indeed, as he continued, "it is our home and we are very careful about taking all the environmental standards into account and comply by them." This is true not only of Schlumberger, in fact. The company's VP further stated that "all stakeholders invest a lot in planning such big projects like Apollonia, and under this scheme, the environmental standards are always on top of our priorities."

"Egypt needs gas. Developing this unconventional Apollonia gas field and producing more for local consumption and export is good news."

Profitable Models for Unconventionals

Yet, what is still left for Schlumberger to accomplish is to design an economic model that would prove profitable for unconventional exploration and production, not only for current operators in Egypt, but also for potential investors who may mull other unconventional projects across the country in a near or far future.

Hence, from an economic perspective, Schlumberger as a service company can offer solutions to the operators to generate profits from these unconventional fields, even when the cost of technology is high. "We need to establish a new business model; a model with stronger integration and more risk-and-reward type of contract," said Hussein Fouad El Ghazzawi.

He confidently added: "I strongly believe that a new business model with our partners here will make a considerable difference and it will encourage us and other service providers to deliver a risk-reward contract, which will significantly improve the total cost as our main objective."

While developing a new economic strategy, the unconventionals can bring in major benefits for Egypt. "Egypt needs gas. Developing this unconventional Apollonia gas field and producing more for local consumption and export, is good news," as El Ghazzawi put it. "Egypt needs to have energy," and thanks also to the current developments and progress, "by 2020 we will have enough gas."

Nearest Prospects

Nonetheless, "we have the volatility of changing oil prices, which sometimes discourages investors," El Ghazzawi stated, and that may jeopardize a positive future of the industry in Egypt. Therefore, as he explained, "the industry needs to sustain the price," which is likely to translate into a success story.

Judging by the situation as it evolved around the unconventional oil and gas in North America, Vice-President commented on lessons learnt that Egypt can extract from and utilize that experience. "We have seen North America as an example that had to stop drilling for unconventional hydrocarbons when oil prices decreased. But now they have managed to deliver cost-effective services, therefore, the unconventional drilling is starting again and the E&P sector is again investing in North America."

"We need to establish a new business model; a model with stronger integration and more risk-and-reward type of contract."

Hence, also in Egypt, "the steadiness of the oil prices will make a huge difference in the industry," Hussein El Ghazzawi concluded.

UNCONVENTIONAL OILS

A New Frontier for Energy Security

By Amira S. Badawey

Global population has grown to an estimated 7.4 billion, with the majority of people scattered across Asia, followed in the distance by Africa. Accordingly, the world consumes millions of barrels of oil to fuel our daily lives and drive economic growth needed to sustain ever growing societies. In 2016, the International Energy Agency's Oil Market Report estimated that worldwide demand of oil would reach an average of nearly 96mb/d. It was only natural that economies would look beyond the conventional for additional sources of hydrocarbons.

In order to meet energy demands, each country relies on sources of fuel that are available to them. Governments devise their strategic mix that represents planned energy allocations to various portions of fuel, sourced locally or imported from abroad. Although energy mixes differ from one nation to another, Planete Energies states that fossil fuels account for about 80% of the global energy mix. Additionally, National Geographic's Energy Blog further attests that by 2021 the US's energy mix will continue to rely on hydrocarbons, despite efforts to add cleaner renewable power to the fuel cocktail and dispose of coal plants. It is difficult to wean an economy off oil once development becomes more and more dependent on fossil fuels.

According to the Congressional Research Service report titled An Overview of Unconventional Oil and Natural Gas: Resources and Federal Actions,' following 2010, the percentage of Shale Gas in the US's production has been on par with that of Tight Oil, reaching over 40%. The report further stipulates that Shale Gas production will surpass that of Tight Oil between 2030 and 2035.

As Egypt embarks on an era of extensive economic development, the country's dependency on petroleum is expected to deepen beyond the average production of 493,000b/d of crude oil, based on Trading Economics data for the first ten months of 2016. Although Eni's giant Zohr field is expected to add an average about 2.7bcf/d of natural gas to Egypt's output once production comes online in late 2017, the country should consider the possibility of augmenting the national energy mix with unconventional oils, and find ways to benefit from the experiences of other nations, which have entered into the frontiers of oil sands, hydraulic fracking, and other Enhanced Oil Recovery (EOR) techniques.

A Balanced Energy Mix Vision

Governments pursue a balanced energy mix in order to maintain energy safety and security, economic efficiency in terms of cost, positive impacts on macro economics, and mitigate environmental effects. Countries take these elements into consideration, while also focusing on achieving favorable levels of self-sufficiency by using locally produced energy to cover domestic demand levels and ensuring that energy reaches various areas within a country by constructing power transmission networks and pipelines. In regard to energy security, it is vital for governments to sustain steady and diverse energy supply levels to ensure a continuous flow of fuel.

In recent years, the Egyptian government has been striving to bring balance to its energy market. The state has been exerting much effort to enhance oil and gas production, with a focus on conserving demand and regulating consumption by lifting fuel subsides and monitoring petrol sales through smart distribution methods. The majority of Egypt's fuel is directed towards electricity generation. In early 2016, Egypt Oil&Gas informed that power plants consumed more than 75% of Egypt's natural gas production. Following years of stagnation since 2011, the Egyptian government, led by President Abdel Fatah El Sisi, has been pushing for increased investments to drive the much needed economic growth. As a result, the country's reliance on energy is expected to grow. Accordingly, Egypt has instated multi-tier reform programs to favorably shift the country's energy situation.

In his Occasional Paper titled 'Egypt's Energy Sector: Regional Cooperation Outlook and Prospects of Furthering Engagement with the Energy Charter,' Karim Hegazy stated that the Egyptian government resumed the implementation of its 2017 energy strategy to "revive the sector and bridge the gap between supply and demand over five years, backed up by issuing a new unified investment law." Hegazy further explained that the key measures of this strategy were to address energy security concerns by boosting, diversifying, and improving energy efficiency, in addition to the sustainability of debt buildup and phasing out fuel subsidies, as well as the governance of a modernized oil and gas industry based on close collaboration and synergies between the public and private sectors.

In its efforts to diversify the country's power sources, Egypt instated multiple renewable projects from both solar and wind. The Egyptian Electric Utility and Consumer Protection Regulatory Agency reported that the expected contribution of non-hydro renewable energy sources would reach just over 30% of Egypt's installed power capacity by 2035. With the introduction of renewable sources of power and the much anticipated Dabaa nuclear plant, Egypt will liberate crucial supplies of mazut and natural gas for redirection towards manufacturing and industrial consumers. This comes as the government is encouraging international oil companies (IOCs) to

inject more investments into upstream petroleum developments with the hopes of boosting local production. A reported titled 'Impact of Energy Demand on Egypt's Oil and Natural Gas Reserves', issued by Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection, estimates that Egypt's oil output will reach 280,000b/d by 2030, due to diminishing production rates. Therefore, the country will need to import an additional 400,000b/d or 20 million tons of oil equivalent to satiate demand for refined oil products, with Egypt's oil consumption projected at 22-45 million tons of oil equivalent.

Egypt is increasing its dependency on natural gas, with the promise of about 76tcf of reserves offshore the Mediterranean Sea. The Egyptian-German report estimated that gas production will reach 800bcf by 2030. However, increased gas production will not offset demand for petrol and benzene products. Moreover, as the government promotes the use of natural gas in various sectors, demand will consequently grow. As a result, Egypt should locate alternative sources of fuel.

Egypt's Potential for the Unconventionals

Egypt has taken a proactive stance in seeking unconventional sources of fuel. In 2013, Egypt Oil&Gas informed that a round table discussed the potentials of unconventional oil and gas in the country. Petroleum Minister, Tarek El Molla, who headed the Egyptian General Petroleum Corporation (EGPC) at the time, stated that shale was "one of the most attractive investment opportunities", as he highlighted the importance of unconventional oil in diversifying the country's fuel supplies. Furthermore, in 2015, El Molla witnessed proceedings of the 'Development of Unconventional Resources of Oil and Gas in Egypt' seminar. During his opening speech, the minister stated that Egypt planned to start exploring for unconventional oil and gas "within the framework of the integrated strategy of the State to diversify its current energy mix in Egypt and the addition of new sources." Egypt thus took a number of measures to encourage foreign investors into directing funds towards unconventional discoveries in the Western Desert, Upper Egypt, the Nile Delta, and the Gulf of Suez regions.

This came as Bloomberg reported in March 2016 that both US Apache Corporation and Dutch Royal Shell were planning to start producing unconventional oil in Egypt's Western Desert by the end of June of that year. The companies were to drill the first unconventional gas well in a pilot project, with the addition of two more wells before approaching the government with a full development plan for horizontal drilling and fracking at the field. In Oxford Business Group's report on 'US shale industry a challenge for Egyptian oil producers', Apache Egypt's General Manager at the time, Thomas Maher, said: "While there is definite potential in unconventional oil and gas – [the Egyptian] government hopes to replicate the success of the US in the space – there is still a lot of conventional to be developed." "That said, we hope to unlock the potential in the large Apollonia chalk tight reservoir in the Western Desert," he added.

However, Egypt has many challenges to overcome before the country can leverage its unconventional reserves. A Cairo University statistical analysis on 'Future of Petroleum Energy in Egypt - Challenges and Opportunities' specified Data Management as the first step in Enhanced Oil Recovery (EOR) methodology of extracting unconventional oil, with the 2013 round table citing the need for a database as a recurring topic of interest.

Egypt must embark on extensive data collection, organizing, and storage from all operators drilling below the source rock. Furthermore, EGPC would need to consider altered contractual models for unconventional exploration, which bare increased risks than normal oil and gas discovered. Therefore, the government might need to reexamine production-sharing ratios to make unconventional upstream projects more appealing to investors. Undoubtedly, timely arrear payments for equity conventional oil will also encourage IOCs to shift some focus to unconventionals. Accordingly, alleviating subsidies and liberating the energy market will create pricing schemas based on supply and demand dynamics, thus allowing for preferable selling prices. The Egyptian government has already progressed in the previous steps under the Petroleum Ministry's comprehensive strategy to modernize the industry. These elements, together with heightened governance and extra transparency, will attract more investments to Egypt's novice unconventional oil and gas upstream segment. Moreover, Egypt has an opportunity to capitalize on lessons learned from other nations that have advanced into unconventionals, such as the US, Canada, Argentina, Mexico, and China.

Timing is Everything

By the beginning of the 2000s, the US decided to diversify away from its traditional investment locations in North Africa and in the countries of the Gulf Cooperation Council. Accordingly, the US governmental 2001 energy plan focused on the domestic development of unconventional oils by leveraging hydraulic fracking and horizontal drilling techniques developed in the late 1980s. Consequently, production from tight oil has grown from 600,000b/d in 2008 to 3.5mb/d in 2014. Along the path to the unconventional, the US operators have developed advanced extracting techniques, while addressing issues of unconventional production economies and environmental concerns. By partnering with US firms, such as Apache, Egypt has an opportunity to tap into the company's knowledge in extracting unconventional oil and gas, and thus expediting the country's learning curve in this arena.

Moreover, Egypt can build on the applicable experiences of other developing nations such as Chile, which started tight oil production in 2010 and also suffered from a lack of geological data as unconventional discoveries were overlooked and accordingly the country had not collected relevant data. To overcome this hurdle, Chile deployed a data collection campaign to resample older wells and promote drilling at newer pilot programs. In the 2013 roundtable, Enap Sipetrol's General Manager, Lisandro Rojas, explained that Chile further suffered challenges with technology in terms of availability and costs. He cautioned that initial production costs for unconventional would be "very expensive." As a result, he argued against using the US and Canada as an implementation model due to the difficulties in replicating infrastructure and technological environments. He recommended Argentina instead as a better fit. Additionally, India and China came out as preferable role models for contract schemas. Yet, Apache Egypt highlighted that Egypt can benefit from US's experience in "recycling and reconditioning waste water and various other unconventional solutions" to mitigate water usage required for the fracking processes. Subsequently, the country can undertake proactive actions to efficiently address environmental concerns.

Although Egypt's unconventional oil is still untapped, the country can benefit from these undiscovered potential as the government will continue to rely on hydrocarbons as an energy source for manufacturing and heavy industries. Accordingly, the country's remaining oil and gas reserves, both conventional and unconventional could be used to transition the economy, driving macro-growth on human resources and renewable energy resources.

UNCONVENTIONAL OIL AND GAS RESOURCES IN EGYPT

According to the US Energy Information Administration (EIA), BP Statistical Review of World Energy and unofficial studies, Egypt is rich on unconventional oil and gas resources.

UNCONVENTIONAL OIL

Oil Shale can be found near to the Red Sea in the Eastern Desert like in Safaga and Quiser. Also there are huge volumes in the Nile Valley and in Abu Tartour area. Initial estimates say that there is more than 20 billion tons. These numbers are published by a study ventured between Egyptian Mineral Resources Agency and Canadian Consortium Centurion, later bought by Dana Gas.

Shale Oil refers to the oil bearing shale that has relatively low permeability, tight siltstone, limestone or dolomite. This type of shale oil is covering mostly the northern part of the Western Desert in Matrouh, Abu Gharadig, Alamein, Natrun Basin, and Siwa Basin. Some recent estimates say that Khatatba Shale has more than 100 billion barrels and can recover more than 4 billion barrels.

UNCONVENTIONAL GAS

Shale Gas is the gas produced from shale. Its occurrence is almost the same as that of the shale oil i.e. four basins in the Western Desert has potential for shale gas - Abu Gharadig, Alamein, Natrun and Shoushan-Matruh. As per EIA, the Khatatba Shale Gas contains 535 tcf of risked shale gas in place, with 100 tcf of risked, technically recoverable shale gas resources.

Tight Gas occurs in a reservoir with permeability less than 0.1 md. Obaiyed field is a tight gas condensate field in the Western Desert, which was planned to be developed by drilling 13 wells.

Coal-Bed Methane Gas reserves are yet unconfirmed in Egypt, however, Halliburton has reported the occurrence of CBM in southern parts of Egypt.

Natural Gas Hydrates are stable throughout the Mediterranean deep water basins (>1,000 m) and potentially occur more widely in the gas-rich eastern basin. This potential is confirmed on the Nile Delta fan.

Egypt needs to get ready for such activities if the unconventional exploration is deemed economical. This represents a huge challenge not only on the costs, but also on the availability of rigs that have the ability to drill long reach horizontal wells.

UNCONVENTIONALS PIVOTING GLOBAL OIL OUTPUT

By Mariana Somensi

Unconventional sources of oil and gas strongly affect production levels and drastically change prospects on global energy markets. The increase of oil revenues after the unconventional revolution in the United States and elsewhere in the world clearly pictures this impact.

Prior to the unconventional boom, the US was expected to become heavily dependent on gas imports. Current projections, however, assume the country will be self-sufficient in net energy by 2030. Unconventional output has been on a rise and the global impact of this energy development enormous.

Global Market Impacts

The growth in production through unconventional sources was a plot twist on the global energy market game. While from the US perspective, it resulted in higher energy independence and a considerable decline in the country's trade deficit, from a global perspective, the fast-rising shale supplies helped create a series of side effects.

Concerning the crude oil market, Columbia University's Antoine Halff affirmed in his paper OPEC's Policy Challenge in the Age of Shale Oil, published in December 2015 that, although US shale oil production accounted for less than 5% of the overall oil market in 2015, "shale is a disruptive technology that challenges the industry's long-established business model and the rules of the game for OPEC." Cristiana Belu Manescu and Galo Nuño in the Quantitative Effects of the Shale Oil Revolution, published by the European Central Bank in September 2015 noted that those who are most disadvantaged are the traditional oil exporting countries, which completely rely on the petroleum industry for national revenue. The main winner, on the contrary, is naturally the United States. "This is a major transfer of resources from the rest of the world to the US economy that not only boosts economic growth, but also helps to reduce the US current account deficit," Manescu and Nuño added.

When it comes to natural gas production, the

"Shale is a disruptive technology that challenges the industry's long-established business model and the rules of the game for OPEC."

ANTOINE HALFF
'OPEC's Policy Challenge in the Age of Shale Oil'. December 2015

American shale gas has changed the balance of competitiveness in the world economy, giving the US an unanticipated advantage – and, accordingly, a disadvantage to some other countries. However, it does not happen mainly due to the quantitative output, but especially because American contracts are flexible. "Australian and foreign processors conclude long-term agreements to send gas to specific countries such as Japan and China. Asian buyers have contracted for more than half of the US supply, but they have the freedom to ship the fuel to anywhere in the world, encouraging spot trading," Bloomberg analyzed.

Furthermore, in light of shale gas production, the US has been able to supply inexpensive natural gas that helped companies build new plants and expand existing facilities, improving the US manufacturing sector and strengthening its competitiveness in the market. As explained by the Cambridge Energy Research Associates' Co-founder and Chairman, Daniel Yergin, in The Global Impact of US Shale, published by Project Syndicate in 2014, "with the US market cordoned off by cheap domestic gas, some of that LNG is going to Europe, introducing unexpected competition for traditional suppliers Russia and Norway."

"Developing unconventional oil and gas requires many different kinds of expertise, and successful production relies on large scales of resources and fast output pace to sustain high efficiency."

DAVID CHI
Vice President and General Manager, Apache

In light of that industrial leaders all over Europe "are becoming increasingly alarmed by enterprises' loss of competitiveness to factories that use low-cost natural gas and the consequent shift of manufacturing from Europe to the US." This shift increases the prices of products in Europe, which strongly affects the economy of European countries that rely on exports. Hence, Yergin added that "European Union countries, already suffering from high unemployment, will be forced to reconsider high-cost energy strategies or face weakening competitiveness and loss of jobs."

Furthermore, the fast shale oil and gas expansion in the US, notable since 2008, also collaborates to the oversupply faced by the global petroleum industry in the past years. Although the shale revolution contributed to the relative stability of Brent oil prices observed from 2011 until mid-2014, the American shale reserves – in addition to the increase in production of other countries – were also a factor in the increasing crude oil supply glut that brought a fierce downturn on the global crude price in the past years.

The scenario is not different when it comes to natural gas. Mid-2016, Bloomberg reported that "shale drillers from Pennsylvania to Texas flooded the US with so much natural gas over the past decade that prices slid to a 17-year low." Also in 2016, the country started to export gas by sea and the US Energy Information Administration's (EIA) projected it would become the world's third-largest liquefied natural gas (LNG) supplier in five years. "Now they are going global, with the potential to upset markets from London to Tokyo," Bloomberg further analyzed.

The emergence of shale oil and gas is a clear indicative of how technology innovation can change the balance of global economy and its future prospects. Besides its collaboration to oil and gas oversupply and, accordingly, the downturn of prices, the US unconventional revolution also changed the global trade map in the sense that it introduced the US as an oil and gas exporter rather than an importer – as it was previously predicted.

US Shale Oil & Gas Production

The avant-garde boom of unconventional oil and gas in the US was facilitated by several factors. As Apache's Vice President and General Manager, David Chi, explained in an interview to Egypt Oil&Gas. "Developing unconventional oil and gas requires many different kinds of expertise, and successful production relies on large scales of resources and fast output pace to sustain high efficiency."

The US naturally fits the abundant resources requirement, as well as it has created a solid infrastructure and a friendly environment to the unconventional sector. Firstly, the country has been developing shale gas exploitation, legal incentives for landowners and an advanced oil production infrastructure already since the early 19th century, which started to bring high-quality results during the 1980s. As implied by Cristiana Belu Manescu and Galo Nuño in their study, the US "possesses a unique infrastructure setting consisting of a large number of state-of-the-art drilling rigs, an extensive pipeline network, and associated refineries, which is a key to ensuring a rapid expansion in production."

Lastly, the US counts with legal and institutional features that highlight the economic attractiveness for the extraction of unconventional oil.

Accordingly, in 2013, the US was estimated to have produced 3.5 million barrels per day of shale oil, which is three times as much as in 2010. In 2015, EIA estimated that about 4.9 million barrels per day of crude were produced directly from tight oil resources, which corresponded to about 52% of the country's total production of crude.

When it comes to shale gas production, the US reached its highest recorded total in 2015. In the U.S. Crude Oil and Natural Gas Proved Reserves report, EIA estimated the country holds about 200 trillion cubic feet of proved shale gas resources. Additional unproved technically recoverable shale gas resources are estimated to reach nearly 623 trillion cubic feet.

In consequence of the unconventional oil and gas exploration, the Norwegian consultancy Rystad Energy indicated that the US, for the first time, presented more oil reserves than the petroleum leaders Saudi Arabia and Russia in 2016.

Although unconventional resources are likely available elsewhere in the world, the US is the pioneer in the field, which created a fruitful environment for unconventional exploration and production, and put the country way ahead its competition. Hence, the US is likely to remain the dominant shale oil producer for the next decade.

Unconventional Resources in the World

Positive global production prospects also show that technically recoverable unconventional resources are being developed in other countries, especially in China, Argentina, and Russia. Queen's University Belfast's Senior Lecturer in the School of History, Anthropology, Philosophy and Politics, Stefan Andreasson, pointed out that even though "the US model cannot simply be replicated anywhere there are shale reserves," there is "continued demand for fossil fuels, [which] means that many countries will explore their own resources and potentially become significant producers."

"The US model cannot simply be replicated anywhere there are shale reserves."

STEFAN ANDREASSON
Senior Lecturer in the School of History, Anthropology, Philosophy and Politics, Queen's University, Belfast

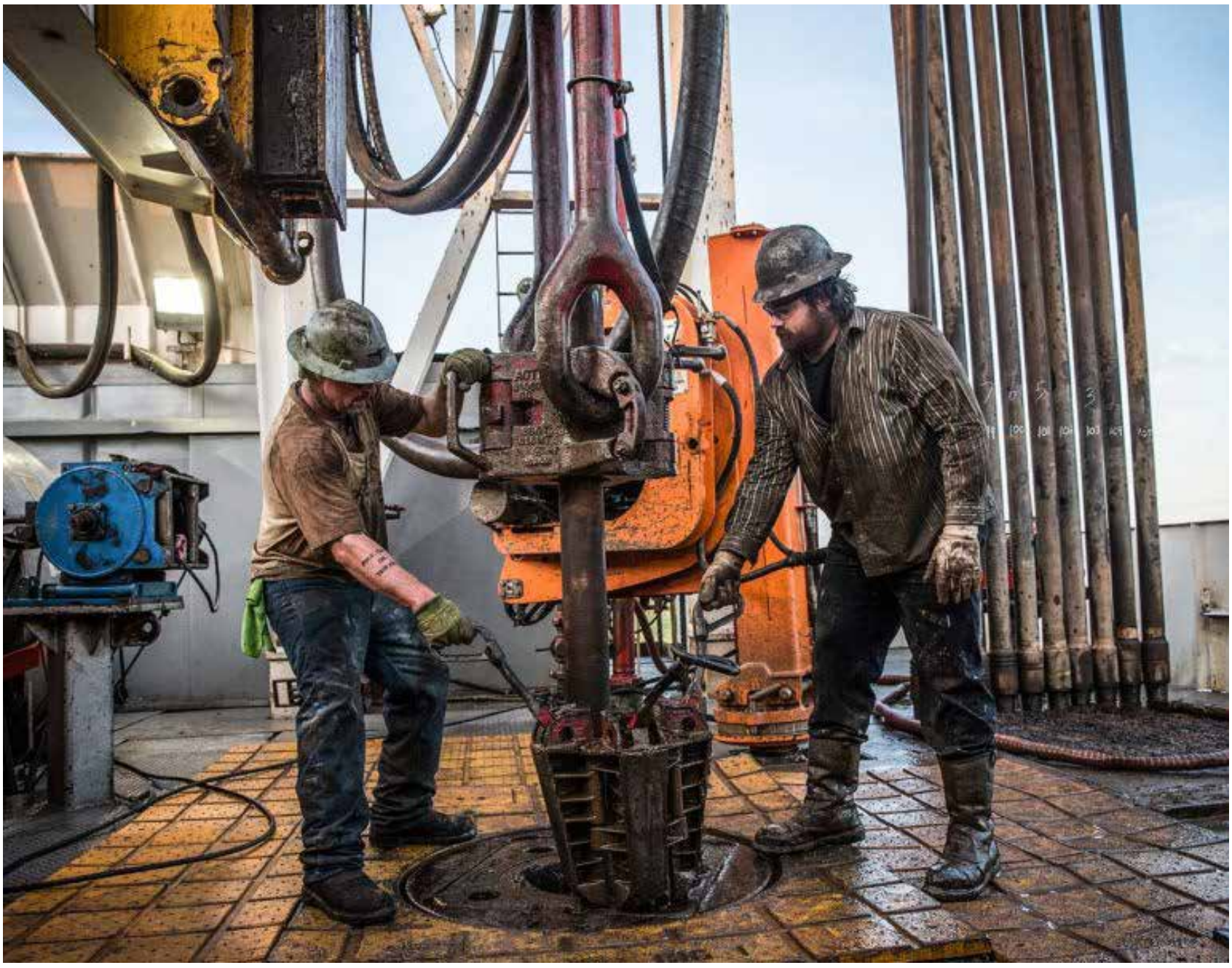
China's shale gas production, for instance, outperformed expectations in 2016. According to Sinopec Ltd., Fuling shale gas field in southwestern China produced a cumulative 3.76 billion cubic meters of gas from January to September, which corresponded to an increase of 107% in production.

In Latin America, Argentina's recoverable shale oil reserves are estimated at 27 billion barrels, the fourth largest shale oil reserves in the world, according to Oil Price. In 2016, the country's Vaca Muerta formation alone was considered to hold technically recoverable shale gas of 308 trillion cubic feet and 16 billion barrels of shale oil.

In Russia, the total Bazhenov shale prospective area in the West Siberian Basin was estimated at a risked shale oil in-place of 1,243 billion barrels, according to EIA data published in 2013.The same area was expected to hold a risked shale gas in-place of 1,920 trillion cubic feet.

In total, some 46 countries around the world possess deposits of shale oil and shale gas, according to the EIA data from September 2016. In February 2017, another country joined the list as Iran announced it found its first shale oil reserve in the western province of Lorestan, containing over 2 billion barrels of light crude.

The development of unconventional oil and gas in other countries, following the American lead, represents the possibility of even stronger transformations in local and global markets, which means that unconventional oil and gas not only resulted in alternative sources of supply, but also brought up a new pivot to the petroleum sector.



BRIGHT ECONOMICS OF UNCONVENTIONAL OIL AND GAS

By Mahinaz El Baz

Unconventional oil and gas activities worldwide are reshaping energy futures and bringing significant benefits to the economies in terms of jobs, government revenues, and GDP. Yet, concerns about the economic viability of unconventional oil and gas have been on a rise since the initial pursuit of these resources. Nonetheless, a new era of affordable and abundant energy from the unconventional sources may tilt the balance promising to create significant competitive advantages for both energy intensive industries and industries that rely on unconventional oil and natural gas derivatives as a critical production feedstock. The new unconventional supply of energy has led to a reduction of hydrocarbon imports in some countries.

Over the past decade, the US and Canada have experienced spectacular growth in the production of unconventional sources of energy, notably shale gas and tight oil, thanks to technological innovations such as horizontal drilling and hydraulic fracturing, according to European Parliamentary Research Service's (EPRS) in-depth analysis – Unconventional Gas and Oil in North America, published in June2014.

Canada actively promotes the development of the energy sector as a component of its broader economic development goals, and unconventional oil and gas is seen as both important sources of energy for domestic industrial and residential needs, and for potential exports.

The US views natural gas from shale deposits, which was unavailable prior to the development of hydraulic fracturing technology, as a transition fuel from conventional fossil fuels to alternative energy. Accordingly, from 2008 to 2014, the US unconventional oil resources have increased the country's total oil output by 25%, while annual shale gas production in the US grew from about 1tcf in 2006 to 9.7tcf in 2012; and it is expected increase further to approximately 19.8tcf by 2040.

"The unconventional oil and gas revolution is all about the free market. It is all about private entrepreneurs and the entrepreneurial spirit. It really is a testament to the US system and the modern-day free market."

NARIMAN BEHRAVESH
IHS Chief Economist

The Cost of Development

With the recent rise in well drilling and stimulation costs related to the unconventional hydrocarbons, some are concerned that much of these resources are uneconomic. Accordingly, the cost of drilling and constructing a well and putting it into operation is a critical component of the economic viability of developing any unconventional oil and gas resources.

The costs associated with unconventionals vary. The cost of a well depends on several factors such as the vertical depth of the well bore, its lateral length, reservoir pressure, rock characteristics, and the number of fracture stages, as well as commercial factors such as the access to materials, supplies of water and proppant, and drilling and completion services. Capital expenditures are undertaken for land, drilling, completion, facilities, gathering, processing, and compression. The development also requires additional pipeline capacity to ship the gas to the markets.

"Unconventional energy contributed $284 billion in 2012 to the US GDP and it is expected to add as much as $533 billion in total in 2025."

IHS, AN ENERGY CONSULTANCY GROUP

"In the US an unconventional gas well in a shale or tight sands target may cost anywhere between $3.5 million and $12 million, while a well targeting CBM may cost between $500,000 and $1.5 million," stated EPRS' analysis.

Yet, the drilling costs are merely one segment of a total financial calculus. In fact, unconventionals pledge high financial contributions.

Financial Contribution

The US and Canada have seen a rise in their hydrocarbon revenues since they have introduced unconventional exploration and production activities. The most visibly has this positive trend reflected on the two countries' GDP.

"Unconventional energy contributed $284 billion in 2012 to the US GDP and it is expected to add as much as $533 billion in total in 2025," IHS, an energy consultancy group stated in its February 2014 report on America's New Energy Future. Similarly, McKinsey Global Institute's Trends survey in 2013 estimated that unconventional oil and gas production in the US could raise the country's GDP by 2-4% by 2020.

In similar veins, the share of Canada's energy sector in the country's GDP has remained around 10% over the last decade, while unconventional oil and gas output recorded the highest growth among all the industries, some 60% between 2007 and 2013, according to the International Monetary Fund's Country Report No. 14/28.

Furthermore, the unconventional oil and gas revenues contributed considerably to the state budgets. "In the US, the unconventionals have added $62 billion to the federal coffers in 2012 through federal, state, and local taxes," noted Brigham A. McCown in his October 2012 article for Forbes. By 2020, the US expects to add extra $111million through various taxes and royalties to the state income, as confirmed by The American Oil&Gas Reporter from April 2013.

Hence, as IHS Chief Economist, Nariman Behravesh, told the magazine, "state governments already are taking advantage of the revenue and economic progress the unconventional revolution brings." In the US' Texas, unconventional gas activity generated state and local revenues of $5 billion, which in overall national budget represents 6% of the education and 13% of the healthcare systems expenditure. In comparison, in Colorado, the unconventional gas industry generated $1.6 billion of the state and local revenues, which equal 13% of its education budget, stated IHS research paper – The Economic and Employment Contributions of Unconventional Gas Development in State Economies from June 2012.

As a result of these positive contributions, the US states have started implementing industry-favorable policies and legislation to encourage more development of the unconventional exploration, drilling, and production. This came also in line with employability targets in the country.

Employment Opportunities

Unconventional oil and gas are already driving major benefits in the Northern American job generation and employment opportunities. "The direct, indirect, and induced effects of the unconventional revolution in the US have added 1.7 million jobs, with 3.3million jobs total expected by 2020 and 3.9 million jobs in 2025," IHS' research from June 2012 informed.

The US Bureau of Labor Statistics data on its website shows that a majority of top unconventional oil producing states has shown lower unemployment rates than the overall national average. In 2010, the top five producing states' unemployment rates were 6.9-8.9%, compared with the national average of 9.6%. "Between 2010 and 2015, the top ten producing states, as ranked by employment generated through their unconventional gas activity, [was to] experience a compound annual employment growth rate of nearly 8%." Pennsylvania and Colorado are expected to lead in employment contribution growth, experiencing compound annual growth rates of roughly 14% and 10% respectively.

The sector has proven its resilience despite job losses elsewhere due to the Great Recession in the first two years of the period between 2009 and 2013. Total average annual employment across all industries in the US saw an increase of 4.17% from 128.6m to 134m jobs in the given period, while, in comparison, total employment in the nation's oil and gas industry increased by 39.02%.

North America's Unconventional

Both the US and Canada have been determined to continue in exploration and production activities in the unconventional resources. In the US, a large portion of shale gas production growth has occurred in the Appalachian Basin's Marcellus Shale. In the Marcellus region, dry natural gas production has more than tripled in the past three years, from an average of 4.8bcf/d in 2011 to an average of 14.6bcf/d in 2014. Tight oil accounts for more than a third of US crude oil total production. A large portion of tight oil production has come from Western Gulf Basin's Eagle Ford and from the Williston Basin's Bakken Shale. In the Bakken region, oil production in 2014 averaged 1.1mb/d more than 2.5 times greater than the 2011 average of 0.4mb/d. In addition, Center for Strategic and International Studies' report on unconventionals from 2014 proved that US natural gas reserves increased between 2007 and 2012 by 30%, from about 248tcf to about 323tcf.

On the other hand, "Canada has 174 billion barrels of oil reserves, of which 169 billion barrels are unconventional, and the country also has an estimated 573tcf of unproved technically recoverable shale gas resources," according to an assessment prepared by the US Energy Information Administration (EIA). Tight oil production in the country doubled between 2011 and 2014 from 0.2mb/d to 0.4mb/d. Most Canadian tight oil production comes from Alberta and Saskatchewan. The same is true of Canadian shale gas production, which increased from 1.9bcf/d in 2011 to 3.9bcf/d as of May 2014, when including output from the Montney formation. In addition to, tight oil, which is 10% of Canadian oil production, 56% of the country's oil production comes from oil sand, which amounts to roughly 2mb/d.

The unconventional revolution that had occurred in the US and Canada can thus as an example for the development of unconventional energy resources on a commercial scale in other regions. IHS Chief Economist, Nariman Behravesh, said: "The unconventional oil and gas revolution is all about the free market. It is all about private entrepreneurs and the entrepreneurial spirit. It really is a testament to the US system and the modern-day free market."

Yet, developing new rules for unconventional oil and gas will be critical to effectively manage the transformation from conventional ways not only in North America, but globally. This is a key moment to determine the future energy balance between the potential positive economic impacts of unconventional oil and gas and other low-carbon alternative fuels.

THE ENVIRONMENTAL DILEMMA OF THE UNCONVENTIONALS

By Sarah Samir

As many oil and gas fields are starting to be affected by the decline in the natural production ratio and they are coming closer to reaching their maturity, oil and gas investors are beginning to operate in the unconventional oil and gas resources. Shale oil and gas, oil sands, and tight oil and gas have a large economic potential. Yet, as companies follow new non-standard methods of extracting oil and gas from deeper geological strata, these have proven to have major environmental impacts affecting the earth, water, air, and people. Nonetheless, many involved risks can be contained; hence, some oil and gas companies are starting to follow ways to decrease these environmental threats.

Impacts of Hydraulic Fracturing

Hydraulic Fracturing is one of the methods used in order to extract unconventional oil and gas from the deeper layers of the earth. "Hydraulic fracturing literally involves the smashing of rock with millions of gallons of water along with sand and an undisclosed assortment of chemicals [and acids] in order to bring gas to the surface," according to Joe Hoffman's article Potential Health and Environmental Effects of Hydrofracking in the Williston Basin, Montana, published in 2011.

Hydraulic fracturing process works through drilling in the strata deep under the surface of the earth. Hoffman explained that "the drilling is then angled horizontally, where a cement casing is installed and it will serve as a conduit for the massive volume of water, fracking fluid, chemicals, and sand needed to fracture the rock and shale," and to push the oil and gas out of these rocks.

The hydraulic fracturing processes affect the earth as they may cause earthquakes. The European Parliament's published study - Impacts of Shale Gas and Shale Oil Extraction on the Environment and on Human Health - stated that during hydraulic fracturing, companies use "explosives [and] over pressurized water [to] open the fractures gaining access to as many pores as possible." The study added that "in April 2011, the city of Blackpool in the UK experienced a small earthquake of 1.5 at the Richter scale, which was followed in June 2011 by a larger one of 2.5 at the Richter scale. The company Cuadrilla Resources, which was conducting hydraulic fracturing operations in the earthquake area, stopped its operations and commissioned an investigation of the issue. It announced that it would cease its operations in case a relation of the earthquakes to its drilling activities would be shown." Hence, unconventional drilling companies' responsibility is of major concern to the industry's sustainable development of these sources.

Furthermore, hydraulic fracturing further consumes a lot of water as it depends on the pressure produced by pumping huge volumes into fractures. Besides, "wells drilled for producing shale gas may have to be fractured several times over the course of their operation time," which means using even more water. The fracturing process thus results into waste water that "reflows to the surface." This waste water might contain "chemicals, heavy metals, radioactive particles." The EU Parliament's study states an example saying that "in August 2010, Atlas Resources was fined in Pennsylvania

"Hydraulic fracturing literally involves the smashing of rock with millions of gallons of water along with sand and an undisclosed assortment of chemicals [and acids] in order to bring gas to the surface."

JOE HOFFMAN

'Potential Health and Environmental Effects of Hydrofracking in the Williston Basin, Montana.' 2011.

for allowing a hydraulic fracturing fluid overflow from a wastewater pit, contaminating a high-quality watershed in Washington County." Accordingly, hydraulic fracturing may eventually lead to a shortage of water resources and lead to the remaining resources being polluted.

In the aftermath, unconventional oil and gas extraction methods may naturally lead to soil pollution. According to Joe Hoffman's article, "the amount of chemically tainted soil from drilling waste increased nearly 5,100% over the past decade to more than 512,000 tons in 2011." Eventually, soil pollution affects agriculture and traffic, and expands concerns over environmental impacts of unconventionals.

Fracturing Polluting the Air

To add fuel to the fire, hydraulic fracking also impacts the air due to the fact that the process releases considerably larger amount of poisonous gases such as methane, toluene, and xylene compared to other standard drilling processes. Frac sand, which is used in the hydraulic fracturing processes to keep the cracks open, "creates significant air pollution from the handling, mining, and processing of the sand," according to Earth Works' article Frac Sand Health and Environmental Impacts.

According to Joe Hoffman's article "4% of the methane produced by [unconventional] wells is escaping into the atmosphere." Methane has a negative effect as it leads to the increase of global warming. Patti Nyman's article Methane vs. Carbon Dioxide: A Greenhouse Gas Showdown stated that methane "traps up to 100 times more heat in the atmosphere than carbon dioxide within a five-year period, and 72 times more within a 20 year period." Thus, produced methane affects climate changes.

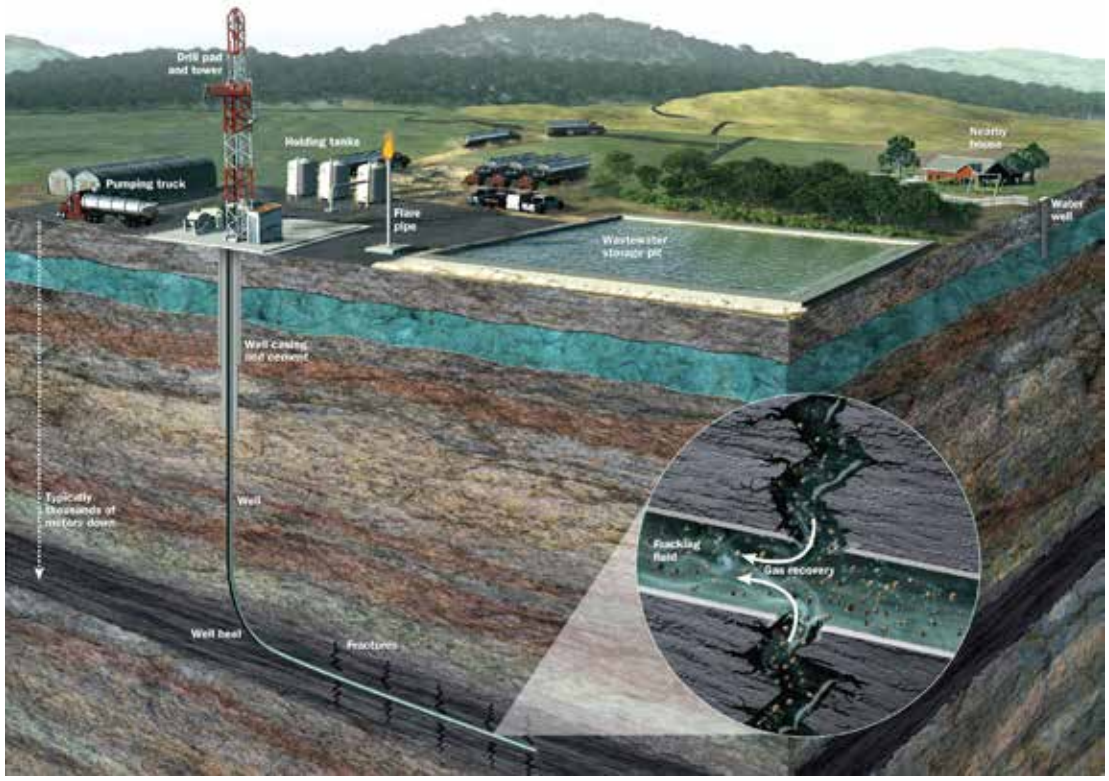
The European Parliament's study explained that the city of Dish in Texas had received "many complaints of human illnesses and even animal deaths around the small city." Therefore, "the Mayor of the city commission[ed] an independent consultant to undertake an air quality study of the impacts of gas operations within and around the city" in order to find out whether the deaths are affected by the fracturing process or not.

Furthermore, C. Pénard-Morand and I. Annesi-Maesano's journal article Air Pollution: from Sources of Emissions to Health Effects stated that "the Environmental Science Engineering Program at the Harvard School of Public Health pointed out that "4% of the death rate in the USA can be attributed to air pollution," which affects people's health.

Hydraulic Fracturing and Health

Additionally, as sand is mainly consisting of silica, being exposed to frac sands endangers the lives of the employees as "breathing in silica is one of the oldest known workplace dangers. Inside the lungs, exposure to the tiny particles has been shown to sometimes lead to serious lung diseases like silicosis and lung cancer." The companies' output from unconventionals may thus suffer as the efficiency of production may be impaired and associated costs for health treatment of such employees may naturally increase upon the firms' expenditure balance sheet.

In addition, the process of hydraulic fracturing releases "benzene, toluene, xylene and ethyl benzene (BTEX), particulate matter and dust, ground level ozone, or smog, nitrogen oxides, carbon monoxide, formaldehyde and metals contained in diesel fuel combustion," according to Hoffman. Being exposed to these toxins may cause "short-term illness, cancer, organ damage, nervous system disorders and birth defects or even death." Hydraulic fracturing endangers humans' health as Joe Hoffman further pointed out that "75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40–50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations."



Coalbed Methane Technology

Unconventional oil and gas industry relies also on another technology that may generate environmental risks. Coalbed methane (CBM) is an "unconventional technology that uses hydraulic fracturing, but requires the removal of naturally occurring water from a formation before gas will flow freely, and has lower production pressures than shale gas and tight gas wells," according to the Environmental Impacts of Unconventional Natural Gas Development and Production report published by US' National Energy Technology Laboratory (NETL) in 2014. In this process the groundwater that contains "a cocktail of chemicals including carcinogenic hydrocarbons such as benzene, toluene, ethyl-benzene, and heavy metals such as arsenic, cadmium, mercury, and lead" should be pushed out of coal, stated FrackOff's article - 20 Impacts of Coalbed Methane (CBM). This may lead to lowering the "water flow," which eventually "allows methane and other gases to be released into streams" and affect the drinking water.

Coalbed methane causes losses to other industries as well like "farming and food production, recreation, and tourism" as "areas reputation and land base are exposed to long term dangers that exist long after the industry has gone." Thus, coalbed methane endangers not only life, but the economic prospect as well.

Unconventional Methods vs. Safe Environment

Although the unconventional methods for oil and gas exploration could have massive environmental threats, there are ways in which oil and gas companies can decrease these risks.

GasFrac Energy Service Firm "introduced a new fracking method that uses no water at all. Instead, GasFrac uses a gel made from propane and a combination of what it says are relatively benign chemicals, such as magnesium oxide and ferric sulfate, a chemical used in water treatment plants," according to Patrick J. Kiger's article – Green Fracking? 5 Technologies for Cleaner Shale Energy. GasFrac's CEO, James Hill, stated to Kiger: "We're actually using hydrocarbons to produce hydrocarbons," which according to his view is "a cycle that is more sustainable."

In Egypt, Vice President and General Manager of Apache, David Chi, stated in an interview to Egypt Oil&Gas that "there are measures that a company can apply to assess and manage the involved risks" to ensure that environmental damages of unconventional methods are minimized and eventually eliminated.

While there are examples where the unconventional exploration methods were not friendly to the environment, the world has had many other projects in which the unconventional exploration was maintaining the environment. In Egypt, Khalda Petroleum Company along with Apache, Bapetco, Shell, and EGPC have executed the first unconventional exploration in the Apollonia Tight Reservoir project. Khalda Petroleum Company's CEO, Mohamed Abd El Aziem, stated in an interview with Egypt Oil&Gas that "all the work we have executed to produce unconventional gas has no negative impact on the environment." The Apollonia project is being executed in the unpopulated Western Desert, and therefore it does not pose any health risks on the Egyptian population. The companies operating in the Apollonia reservoir ensured that they are using the best technologies in order to have the lowest impact on the environment.

Accordingly, despite the environmental impacts of hydraulic fracturing and CBM technologies on the planet and its inhabitants, using the right technology and contracting the right partners will help operators to decrease the negative effects and turn them friendly to the environment. The world has already started to see positive examples and it is waiting for more oil and gas firms to take the initiative to explore unconventional resources in a safe way.

ENSURING A SOCIAL LICENSE IN UNCONVENTIONAL DRILLING

By Salma Essam

Many countries are lining up their efforts to come up with new ways of gas production in a world that highly depends on energy. The successful development of world's vast unconventional gas hinges critically on the advanced methods used. Yet, easily overlooked are the social risks brought about by drilling in unconventional areas. In fact, it is important to apply a set of principles that would guarantee the public acceptance of drilling unconventionally. This would inevitably maintain and earn the industry a "social license to operate." International Oil Companies (IOCs), therefore, are encouraged to treat these anxieties with the highest practical rules to warrant consent to unconventional hydrocarbon production.

Watch Where You Drill

Production of unconventional gas is an intensive industrial process surpassing the conventional gas development in terms of imposing more serious footprint. This is because more wells are needed and much complex techniques are required to enhance the flow of the gas from the well. In essence, the scale of development has major implications and effects on local communities, especially regarding the location of the drilling activities and the water resources. In other words, drilling activities in unconventional fields bear massive impacts on the surrounding areas of the geophysical characteristics of the site. Therefore, it is recommended that the operators choose the drilling sites wisely with regards to the community.

Operators should opt for locations that would have the least effects on local communities in terms of heritage, land use, individual livelihoods, and the environment. In this sense, The International Energy Agency Report (IEA) – Golden Rules for a Golden Age of Gas, published in 2012 stated: "The choice of the well site is a moment when engagement with local stakeholders and regulators needs to be handled with the utmost care." Therefore, the geological subsurface must be a primary consideration when operators choose the well site. Additionally, dense areas, local ecology, roads, infrastructure facilities, and access of water should be taken into consideration. Of all the factors mentioned, the geology of the area can be more challenging. Flawed assessment of geological feature brings about deep fault in drilling that may generate earthquakes or give way to fluids to pass between geological strata.

It is essential that the operators properly survey the geology of area to pinpoint where the drilling can take place and where to hydraulically fracture. In fact, surveillance helps assess the risk that deep faults or other geological features that could generate such as earthquakes or the passage of fluids between geological strata. But in order to properly drill, the companies need to put forward a profound plan. Careful planning can help enhance the productivity and recovery rates of wells by reducing the number

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Senior Director, Africa, AIDO & IFI's Europe and Emerging Markets, Alberta, Canada

of wells that need to be drilled and decrease the intensity of hydraulic fracturing. In turn, this will help decrease the environmental impact drilling incur on the atmosphere. A careful plan of the geological features of the drilled sites is important in avoiding operations in areas where deep faults may create other risks, even if triggering an earthquake is of slight concern.

"All stakeholders invest a lot in planning such big projects like Apollonia, and under this scheme, the environmental standards are always on top of our priorities."

HUSSEIN FOUAD EL GHAZZAWI
Vice President and General Manager, Schlumberger

In addition, operators need to survey for the presence of old boreholes or methane that may occur in shallow pockets above the source rock. They further need to adjust drilling sites or the passage of the wellbore to avoid the areas that contain methane. Monitoring and controlling are as important as planning and surveying. In this sense, IOCs should firmly keep an eye on the drilling sites to ensure that hydraulic fractures do not extend beyond gas producing formation. Despite the fact that the risk of leakage of the fracturing fluid is unlikely since that the aquifers are located at much shallower depths, the IEA report explains that "such migration is theoretically possible in certain exceptional circumstances."

Socially Integrated Engagement

As much as it is important for the operator to apply the latest technologies for extracting the highest quantities of energy from unconventional locations, it is equally critical to engage the public in each phase of a development. Involvement with local communities and residents of drilling areas is essential to address public concerns prior to drilling operations. Operators should provide sufficient space for the community to voice comments on plans, operations, and performance, as the case of Canadian companies affirms. Senior Director, Africa, AIDO & IFI's Europe and Emerging Markets, Alberta, Canada, Shane M. Jaffer, stated in an exclusive interview with Egypt Oil&Gas that "a lot of consultations take place in Canada before any oil and gas development takes place and that social license is derived with the communities, companies, as well as the government." Jaffer further emphasized that "if the development does take place, community engagement needs to take place too, as there need to be benefits for all parties."

IOCs are thus expected to disclose the activity plans by explaining their production practices, environmental and safety standards they adhere to, and how they will contain any health risks resulting from the operations. One example that can be drawn in this sense is the leading effort of Schlumberger as a service provider for drilling activities in Egypt. The Egyptian unconventional field of Apollonia is currently being drilled with high quality equipments that Schlumberger supplies. And despite its location in the Western Desert, where the presence of inhabitants is scarce, the company strictly complies with environmental standards to contain any social discontents and secure a social license to operate. In an interview with Egypt Oil&Gas, Vice President and General Manager, Schlumberger, Hussein Fouad El Ghazzawi affirmed this, saying: "The environment is very important for us. In Schlumberger, we always tell our people that they are all empowered to stop the operation when they feel some unsafe acts are being conducted, including environmental hazards. It is our home and we are very careful about taking all the environmental standards into account and comply by them. All stakeholders invest a lot in planning such big projects like Apollonia, and under this scheme, the environmental standards are always on top of our priorities."

A critical part of earning public trust is to establish baselines for the main environmental indicators before starting drilling such as the quality of the groundwater, whose baseline can be useful in comparing water levels and water quality in hydraulic fracturing. This is in addition to the spillovers the new drilling activities withhold for the ecology. In essence, the resource management of the operator and regulatory agencies should bear a responsibility of sharing the informative data collected with the public to give them an opportunity to address any concerns raised.

Next to establishing indicators, data measurement tends to be of equal importance. In other words, measuring volumes of used water and effect of methane and other air emissions should be taken into account. The high-level monitoring, tracking, and documentation of waste water is essential for prompting and ensuring its proper treatment and disposal. Revealing waste water characteristics, alongside information on fracturing fluid additives and volumes must be mandatory before the commencement of the drilling operations. Effective measurement and reliable information are crucial factors that ensure transparency, and hence, public confidence will inevitably follow.

Yet, the commercial competition among different operators may result in nondisclosure of information and chemicals used in hydraulic fracturing processes and the volumes involved. This practice will likely bring about mistrust among local communities and, in turn, the operator will lose the social license to operate.

Governments' Role

In this regard, the governments should play a role in establishing a framework for disclosure that will involve the community in the processes before any operations are performed. The key task of the public authorities is thus to offer reliable and scientific background information that pave way for an informative debate among stakeholders, according to the IEA's report. The governments should demonstrate socially responsible regulations and strategies when drilling in unconventional fields take place. Operators should then strictly adhere to these policies to satisfy the population and obtain a social license for their business.

In fact, these requirements put substantial demands on policy-makers and regulators. It is, therefore, recommended that the governments should place regulatory arrangements to unconventional drilling through a trained staff. As existing regulatory bodies may require new resources and reformulated functions, the need for a completely new regulatory body needs to be considered and a suitable regulatory regime should be placed.

In addition, the regulatory body will need to be independent from the industry, yet, work closely with industry leaders. It should have the modern tools to address the social concerns and should secure funding from IOCs prior to development activities. This could happen through imposing a mandatory amount of payment on the operators at the time of awarding the exploration rights, in efforts to secure sufficient funds. In this sense, the challenge for policy-makers is beheld within finding the balance between the need to decrease negative environmental and social effects, while fostering responsibility from operators developing the fields. Not only will this mitigate social and environmental risks, it will further bolster the industry's performance, which in turn, will lift the overall economy of any country.

Nevertheless, adopting certain environmental and social strategies and introducing new regulations are not easy jobs. Indeed, the situation is dynamic and the sector has the potential to expand at a rapid pace especially in resource-rich areas where the governments and IOCs need to act promptly to anticipate future demands and place necessary measures in their right places. Even if strict environmental standards are enforced, the risk of water contamination is always present especially when proper monitoring is not present. In order to contain this, the government has to take informed decisions by applying rigorous data collection, carrying out assessments and monitoring water requirements, and measuring the quality of water produced. This will help reassure existing water users, who are skeptical about the availability and quality of water.

"The choice of the well site is a moment when engagement with local stakeholders and regulators needs to be handled with the utmost care."

The International Energy Agency Report, Golden Rules for a Golden Age of Gas, 2012

These measures will further help the local communities to have a clear knowledge of the challenges ahead, receive appropriate response for their questions, and understand the benefits associated with the developments.

The prospects of obtaining a social license for unconventional drilling hinge to a large extent on whether the policy makers and the industry workers can manage the social risks that hold within environmental risks on a basis that would guarantee public consent. In addition, and in order to do that, judgment at highest political levels is required and detailed and prescriptive provisions may be necessary. If IOCs contained these challenges at the pre-development stage, a social license to operate during drilling operations can be guaranteed.

REGULATING UNCONVENTIONAL OIL & GAS IN EGYPT

THE BALANCE BETWEEN PEOPLE, PLANET, AND PROFIT

By Patricia Tiller, Partner, Andrews Kurth Kenyon (Middle East) DMCC

Unconventional oil and gas presents significant potential for Egypt. However, along with this potential, the growth of unconventional techniques presents increased environmental, social, and corporate risks. To date, the legal framework in Egypt has not directly addressed the regulation of unconventional oil and gas development. For the most part, regulation of unconventional development has not been needed.

Egypt has abundant conventional oil and natural gas resources and the application of horizontal drilling and multi-stage hydraulic fracturing has not been required to boost annual production. However, unconventionals are attracting ever greater attention thanks to the US shale revolution and in 2013, operators such as Apache and Shell initiated shale wells/multi-well horizontal drilling programs in the Western Desert. The Ministry of Petroleum now has the unenviable task of deciding whether to introduce a legal framework for unconventional concessions.

Establishing the Right Framework

Technical guidance on hydraulic fracturing risk management is available from multiple sources. For example, IPIECA and American Petroleum Institute provide guidelines aimed at calculating and minimizing the environmental risks associated with unconventional oil and gas production. Understanding and applying best practices used in foreign markets will help move Egypt towards sustainable project development.

Most importantly, any legal framework introduced for unconventionals must strike a balance between establishing reasonable safeguards for the health, safety, and general welfare of the public and the environment, while encouraging the production of available resources. This is a pivotal moment for the Egyptian oil and gas sector. The tenor of the legal framework will determine whether legitimate concerns about fracking are addressed or whether regulatory uncertainty will create an undue burden on the industry. A one-size-fits-all solution with costly requirements and technology mandates could stifle the types of innovation in exploration and development that have revolutionized the industry in the USA.

Below, we examine some of the key areas that a regulatory framework for unconventionals would need to address.

1. Protection of Water Sources

Hydraulic fracturing is a water-intensive practice. Fracking involves pumping fluids, primarily water, along with chemicals and proppants, under high pressure into rock formations to crack them and allow the resources inside to flow to a production well. After fracking a well, a substantial portion of the injected frac fluid returns to the surface as flowback. Along with the chemicals injected as part of the fracking process, this flowback may contain naturally occurring radioactive materials that may be present in the water produced from geological formations. Much of the regulation needed for unconventional development, therefore, concerns the protection of sources of drinking water that may be contaminated by flowback or through a breach in the well itself.

At a minimum, the regulation of unconventionals will need to include:

- Minimizing surface and groundwater risks through well integrity standards and preventing underground injection that endangers drinking water sources.
- Maintaining surface and groundwater quality through ongoing monitoring.
- Committing to 'make good' water quality and quantity impacts.
- Implementing water reuse systems to enable water treatment and reuse wherever possible.

2. Clean Air

A second aspect of unconventional development is the regulation of greenhouse gas emissions. The legal framework will need to encourage operators to ensure that they are employing best practice with respect to measurement and monitoring of emissions.

Many operators of unconventional resource plays in the USA employ 'green completion' methods, whereby the natural gas that would otherwise be vented during the completion process is cleaned and captured for reuse in another process that does not involve direct release into the atmosphere. While 'green completion' may be seen as over-regulation of the industry in Egypt, new regulations for unconventionals may provide the impetus to implement some of the recommended policies[1] and reforms to contribute to reduction of flaring in Egypt, for example, through more explicit and clear rules for when flaring is allowed, and by stricter flare monitoring and reporting requirements.

3. Seismic Events

Another key area for regulation is the introduction of controls to reduce the risks of seismic events associated with unconventional development. Examples of regulations that have been introduced in other jurisdictions include monitoring and control of drilling near natural faults and fractures, and establishing a maximum allowable operating pressure for injection wells on a daily basis.

Overall, best practices are continually changing, and the Government will need to draft regulations in such a way as to adapt to the improvements in unconventional techniques.

Managing the Controversy

The success of unconventional oil and gas development in Egypt will be affected, in part, by whether society accepts it as a key contributor to economic growth. Part of the challenge will be educating the Egyptian public on the real and imagined dangers of unconventional development. Although strong resistance to unconventional development is not likely to come from the general population in Egypt, many of the international oil companies operating in Egypt have far reaching reputational concerns that will need to be managed. However, even the industry's most vocal critics acknowledge that many of the environmental concerns can be addressed if best practices are followed.

The Future of Unconventional Oil & Gas in Egypt

Effective regulations balance environmental concerns and unconventional development through a reasonable and cost effective approach. The Ministry of Petroleum can encourage continuous improvement in operational practices through a well thought out legal framework, without hindering the progress of unconventional operations.

It remains to be seen whether the Egyptian General Petroleum Corporation's (EGPC) next bid round will include shale tenements in the Western Desert and whether there will be any movement of the gas price from the $5.45/MMBtu agreed for the 'unconventional' Apollonia field. The terms that accompany future unconventional concessions will no doubt generate interest in the oil and gas community.

[1] *Associated Petroleum Gas Flaring Study for Egypt' prepared by Carbon Limits AS for the European Bank for Reconstruction and Development, April 2016.*

APOLLONIA PROJECT : IT'S ALL ABOUT EFFICIENCY

By Mohamed ElSebaee, Schlumberger Egypt and East Mediterranean

Apollonia formation forms a reasonable reservoir size spreading over an area of several hundred kilometers and it is characterized as a carbonate reservoir that consists mainly of high-porosity soft chalky and low permeability limestone. Commercial discovery of the Apollonia formation in the JD field was in 2008 by Shell, with first gas from vertical wells in 2012. Production of the tight-gas Apollonia formation from the fractured vertical wells was uneconomical. This trigged the idea of Egypt's first unconventional oil and gas project in the Apollonia JD field back in December 2014, when the Egyptian General Petroleum Corporation (EGPC), Apache, and Royal Dutch Shell signed a $40 million deal to start exploring unconventional gas in Abu Al-Gharadeeq region in the Western Desert of Egypt, about 200 km west of Cairo. A Pilot was designed to apply existing North America tight-gas technology in Egypt. Such technology is a first application in Egypt with an objective to economically develop the difficult gas from the unconventional Apollonia play. As a result of careful planning and design work with the operators, the execution of deploying multi-stage propped sand fractures in a long reach horizontal well of some 1000m was deemed a success.

The pilot phase was to be carried out by Khalda Petroleum Company, a joint venture (JV) of Apache. A service provider company, Schlumberger, was also involved in collaboration from the beginning in all the planning efforts, leveraging advanced technical workflows. Through several conference calls, meetings, and presentations both internally within Schlumberger, and externally with Khalda, Apache and all the involved parties have been discussing the most suitable technologies applicable for such an unconventional horizontal multistage hydraulic fracturing completion.

The project started with drilling two experimental data wells in Apollonia field with the aim to collect field core samples as well as record the logging suit. That, combined together with the advanced core testing performed in the TerraTek Salt Lake City lab, in addition to reservoir modeling and heterogeneity analysis helped the parties understand complex mineralogy, variable rock fabric, and mechanical properties. The combination of reservoir quality and completion quality contributed to the application of the most appropriate drilling, completion, and production strategies.

Building on the success of both Apache and Schlumberger in unconventional plays in the US the companies utilized the plug and perf technique in horizontal wells multistage stimulation, as a technique of choice in such an early phase of the project. As this kind of operation has not been performed in Egypt before and water required as a base of the fracturing fluid would be around 3.5 million gallons per well, this huge amount would be sufficient for two days of drinking in Dallas or enough for eight hours in Beijing, having to haul this amount of water would tremendously impair the efficiency of such project. Hence, in preparation of the project, Khalda and Apache drilled a water source well in close proximity to the horizontal well location to provide water for the fracturing operations. Meanwhile, Schlumberger Fracturing Technical team worked on optimizing fracturing fluid formulation to fit the use of the formation water, instead of the use of fresh water for the Frac fluid.

Schlumberger Egypt Team, integrated the resources and technologies from several product lines and affiliated companies for this operation, that included Filtration services from MiSWACO, FracStack from Cameron group to accommodate the high rate plug and perf Fracturing operations, 2 inch Coiled Tubing deployed wireline guns for multi-cluster perforation and simultaneous setting of bridge plugs, and 2 inch conventional Coil Tubing for sand cleanout and post Frac Nitrogen lifting. In addition, Schlumberger brought Fracturing Equipment that is used for the first time in Egypt operations such as the Precision Continuous Mixing (PCM), to enable treatment on fly with a pumping rate up to 70 bpm and more than 50,000 bbls in one well, in less than 10 days, hence, exceeding client's expectations and benchmark performance by at least one week. All this was combined with a fully comprehensive HSE plan in coordination with Khalda's and Apache's HSE Teams to minimize and mitigate all related risks.

Three month before the project was launched, a rigid project schedule was in place to account for any changes in client's requirements. Subsequently, the client held weekly meetings with its partners to follow on equipment readiness, various resources availability, and project execution plan. In parallel, several meeting were conducted with Khalda's and Apache's Engineering teams to discuss various design aspects and strategies with the help of both Khalda Reservoir team and Schlumberger. Accordingly, Schlumberger was able to model fracturing simulation utilizing the mangrove workflow over the actual petrel reservoir model from Khalda, which enabled the service provider to select the optimum spacing between stages as well as perforation clusters based on reservoir and completion quality and breakdown pressure.

In terms of execution, Schlumberger deployed the bulk system for loading more than 600,000 lbs of sand per stage into sand chiefs, which saved more than 18 working hours per stage, compared to the conventional method of using crane for sand loading. This method also minimized HSE risks on location and allowed loading into different sand chiefs or compartments simultaneously as required. The use of precision continuous mixing (PCM) as well as liquid clay stabilizer, instead of the conventional KCL, allowed enhancing efficiency. Moreover, the technique further enabled continuous mixing and pumping on the fly, filling tanks directly from the frac pit while pumping, eliminating the need for batch mixing, and tackling any risks related to bacterial activity.

Schlumberger supported the project with a fully operational man camp and a clinic as well. Accordingly, client's feedback during all project phases as well as after the project completion was that Schlumberger's integration, state-of-the-art workflow, excellent service delivery, service quality, and HSE performance jointly exceeded all client's expectations in terms of the project schedule and execution timeline in comparison to established benchmarks.

The integration strategy employed from the start of the project, along with the performance excellence in every stage of the project, resulted in stabilized gas production of 7 MMscf/d of gas after 120 days of well production. The production rate is equivalent to five times the offset vertical well off take of around 1-2 MMscf/d; whilst the initial gas production rate is encouraging, the long term success is still under investigation. Some 18-24 months of production performance history is typically required to assess the feasibility of the technology, which if proven would mean long term economic production and higher cumulative recovery in a shorter period of time.

Hence, the partners have succeeded to turn Apollonia pilot phase into an exclusive example of advanced integrated workflows, and through heterogeneity analysis have optimized the unconventional horizontal multistage hydraulic fracturing completion design and efficiency. This has opened the way to further develop the Apollonia chalk towards successful production for Egypt.

SCHLUMBERGER UNCONVENTIONAL WORKFLOW

Data Evaluation of Vertical Wells
Building Initial Petrel Models
Calibrating Models Using Core Analysis
Stimulation Design on Mangrove
Production Simulations Using Intersect

SCHLUMBERGER PROJECT GOALS

Technical Enhancement
- Flexible Gel Loading
- Flexible Fluid Design
- Live Technical Decisions

Operational Enhancement
- Eliminate Mixing Time
- Eliminate Dead Volumes

HSSE Enhancement
- Waste Reduction
- Reduce Lifting Operations
- Camp and Well-site Management

OPERATIONAL STATISTICS

Improvement along the 8 stages reached 63%

Overall operational efficiency by 15% compared to previous operations

Largest job ever pumped in Egypt: Minimum of 13 hours / Stage; 8 Stages in only 10 days

WAY FORWARD

Qualifying local API sources of natural sand

Production history matching for further optimization

Techniques to evaluate against

Schlumberger's benchmark:
- Degradable Ball Drop Sliding Sleeves
- BroadBand Precision CT Activated Sliding Sleeves
- BroadBand Sequence
- Pump Down Plug and Perf

THE APOLLONIA UNCONVENTIONAL PLAY

By Sarah Samir, Salma Essam

The Egyptian petroleum industry is poised to enter a new era as drilling operations in unconventional fields started to take place. On Monday, February 6th 2017, Schlumberger in collaboration with Khalda Petroleum Company held Apollonia Field Presentation in Cairo's JW Marriot, to showcase the success of the unconventional completion operation of the Apollonia JD gas field. Schlumberger along with the field operators; EGPC, Apache, Shell, Khalda, and Bapetco took a massive step towards the start of extracting gas from an unconventional resource, boosting the status of the Egyptian industry in the global energy market.

Apollonia formation forms a reasonable reservoir size spreading over an area of several hundred kilometers and it is characterized as a carbonate reservoir that consists mainly of high-porosity soft chalky and low permeability limestone. Commercial discovery of the Apollonia formation in the JD field was in 2008 by Shell, with first gas from vertical wells in 2012.Production of the tight-gas Apollonia formation from the fractured vertical wells was uneconomical which trigged the idea of designing a pilot aimed at applying the existing North America tight-gas technology in Egypt with an objective to economically develop the difficult gas from the unconventional Apollonia play. The pilot phase agreement was concluded in late 2014 with the joint commitment of the partners to carry out further drilling activities in the field as Egypt strives to meet the local demand on gas.

In his opening words, Khalda Petroleum Company's CEO, Mohamed Abd El Aziem, explained the systematic approach adopted prior to the operations as "Bapetco has signed the development key service agreement that assigns the project execution to Khalda Petroleum Company on behalf of Bapetco."

The Birth of Unconventional Drilling

Production of oil and gas from unconventional resources bears within geophysical and cost challenges, introducing a novel approach to the Egyptian industry and supports the view that the investment environment is becoming safer following a period of economic downturn. Apollonia JD field marks the birth of the Egyptian unconventional extraction from tight reservoirs using untraditional methods in order to push gas out of the deep layers in the Egyptian desert. In this sense, Abd El Aziem explained that Egypt has been encouraged to explore its unconventional resources in the footsteps of key industries, saying: "the economic success in North America that brought that part of unconventional resources to the fore front of the discussions of the energy future; this has a huge influence in raising the interest in the development of our challenging resources such as Apollonia Tight Reservoir." From this point, the Egyptian government and the foreign operators started to consider the deeply buried oil and gas resources that cannot be reached using easy drilling techniques.

Drill Baby Drill

Performing exploration operation in the Apollonia JD field pilot project commenced through two phases to accomplish optimum results.

At first, the companies had to drill "two vertical wells to collect data to incorporate all these valuable data to help us characterize the reservoir," according to Khalda Petroleum's Presentation made by Khalda Petroleum's Team Leader, Mohamed Salah. Then, Salah added, the companies had "utilized this data to drill and Frac two horizontal wells through Apollonia."

Furthermore, Regional Technical Sales Manager at Schlumberger, Ahmad Kamar, explained how the companies used Egyptian talents in the Apollonia Reservoir. Kamar said: "we started this project, barely when we heard about the whole idea, by introducing a new theme into the Egypt technical team which is a technology integrated group and we brought a technical expert assimilated in technical domain who has a lot of experience in unconventional work so he can start building a team using our Egyptian experts in several technical lines."

Schlumberger has mastered the project, overriding many miles by including consultation capacities into the implementation of the project. In order to not "start from scratch" Kamar explained: "we consulted the Schlumberger global technology integrated group, and we had a lot of meetings with them, a lot of advice about the latest experience in this field." The operators held several meetings to agree on the way to execute and run the project. Furthermore, Kamar said: "We started by gathering the data, building additional models and then using additional logs."The companies have conducted "production simulation" to "put an expectation about how this well should behave." The partners decided to "put in perspective all these studies" in order to "decide where the best place to frac is"

Containing Environmental Challenges

It's widely acknowledged that drilling operations, particularly in unconventional fields, could involve damage to the environment, however, the Apollonia Tight Reservoir came with the least harmful effects. Indeed, the project is designed on an environment-friendly basis, taking into consideration the environmental risks that may emerge. Ahmad Kamar, explained that "instead of putting the amount of sand into non-productive zones, we made sure to target productive zones, and of course this will be followed by production history matching every month, to have enough data and to enhance the program." He added that the process followed in the Apollonia project "saved about 15% of the time and 15% of the total fluid used, so it is not just saving time, but saving our environment."

Kamar explained that the objective of the Apollonia project is "to increase the production by increasing the wellbore coverage as well as reservoir contact to increase reserve and confirm development plans." Thus, having strategic plans will eventually result into strategic outcomes.

The project does not have any negative effects on the population due to its location in the desert. During the drilling operations, partners ensured noise reduction and worked on having control over liquid. This is in addition to enhancing efficiency of the overall performance of the operations.

Success and Future Prospects

Moving ahead of schedule, the Apollonia project is eyeing a remarkable technical success, as noted by Kamar, adding: "this success can only be done with integration." The cooperative spirit demonstrated by the partners largely contributed into the success of the project. On his side, Vice President of Production at the Egyptian Natural Gas Holding Company (EGAS), Abed Ezz El Regal, stated: "We have proven technical success, so the next step is to prove it commercially as well."

Egypt has a vision to be an energy regional hub, of which Schlumberger is "striving with [its] partners to achieve it. "Schlumberger's General Manager and Vice President, Hussein Fouad El Ghazzawy, said. As the country has embarked upon a strategy to retain a position on the gas chessboard with the increase in demand, the Apollonia Tight Reservoir could play a key role in boosting the Egyptian natural gas production. Khalda Petroleum Company's CEO, Mohamed Abd El Aziem, said that "the economic production from the unconventional reservoirs is a great challenge in our quest to maintain production annually." This will not only affect the Egyptian local market and help in meeting its demand, but also it will help in rationalizing the natural gas importing bills, which, in turn, will bolster the industry and the economy as a whole.

BETWEEN EGYPT AND CANADA
A PROMISING ENERGY PARTNERSHIP

By Salma Essam

The Middle East region has long been deemed the world's largest energy portal with huge amount of oil and gas reserves and international companies operating across the region, among them Canadian giants. As the Egyptian government has embarked upon a strategy to bolster its economy by developing its energy industry, which was showcased in many partnerships with foreign IOCs, Canadian companies have played an important role in this regard.

Canada's Presence in Egypt

Canada's energy sector is renowned internationally for its active drilling activities and top-notch expertise. Most recently, at the remarkable Egypt Petroleum Show (EGYPS 2017), the Canadian government, in collaboration with the country's oil and gas producers, has confirmed its commitment towards developing the global industry by investing in different markets and transferring knowledge, tool, and expertise, in particular in the Egyptian oil and gas sector.

The Canadian delegation consisting of the country's Ambassador to Egypt and representatives of Alberta region who were present at the major oil and gas event in North Africa held in February, praised the efforts taken by the Egyptian government and expressed their interest in bringing investments to the Egyptian energy industry. "The government has taken some very difficult and hard decisions that were absolutely necessary," including "the floating of the pound, the exchange rates, the issues of the subsidies, new legislations, and reform of the sectors," the Canadian Ambassador to Egypt, Troy Lulashnyk, explained to Egypt Oil&Gas. Even though these brave decisions take long time to be realized, the government is grasping an efficient strategy "to bring Egypt to a new and better beginning and even though it is very tough, it is moving in the right direction," the Ambassador added.

Canada's presence in the Egyptian oil and gas industry has been noticeable over the past years, yet the country's players intend to bolster their involvement in the field. Canadian companies in Egypt "are active and the partnerships already exist," affirmed the Ambassador Lulashnyk. Even though the economic situation in Egypt is yet to fully stabilize, the Canadian delegation showed eagerness in helping in the best way possible to expand the country's engagements.

Canada's key priority is to transfer its knowledge to Egypt's industry since that "there are lots of opportunities in oil and gas, extractives, mining, and these are all domains where Canada have particular expertise in," noted Lulashnyk. In this regard, there is a huge potential for Canada's capital to come to Egypt, as the Canadian Ambassador elaborated: "In our meeting with the Minister of Petroleum, we talked about future opportunities." The Egyptian-Canadian relationships are thus promising as Canada is striving to gain a strong foothold in the North African country.

In their discussion with the Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, the delegation officials further affirmed that "Canada, ourselves [the delegation], and Alberta, are looking for a long term relationship with Egypt," said Shane M. Jaffer, MIT, Senior Director, Africa, AIDO, & IFI's Europe and Emerging Markets, Alberta, Canada, in an exclusive interview with Egypt Oil&Gas.

Alberta's Expertise in Unconventional Drilling

Prospects for successful Egyptian-Canadian partnerships revolve around multiple segments of the sector, one of them being the unconventional oil and gas. As the Egyptian oil and gas industry has taken significant steps in drilling unconventionally, namely in the Apollonia field, the Canadian contribution to the sector can be of considerable value. In fact, Canada stands out in this field and has the capacities and knowledge needed for drilling unconventional resources that require specific tools and expertise. "We have skill base and experience that knows how to do it properly, and how to protect the environment and do it in a safe way," Rod Miller, Associate Vice President Corporate Training Solution, Southern Alberta Institute of Technology, explained to Egypt Oil&Gas. Accordingly, he noted further, with regard to training possibilities as part of the knowledge transfer scheme, "being trained by the methods that we have ensures that the individuals trained here [in Egypt] acquire knowledge in accordance with global standards that the industry requires."

The Canadian companies are thus willing to transfer the technology experience and lessons learned to the oil and gas sector in Egypt. "A lot of the technology expertise that Egypt is looking for resides in Canada; from unconventional resources to marginal oil fields to issues of capacity building," said Shane Jaffer. And "there is a huge advantage that Canada could transfer this knowledge," he added. "The industry environment is becoming safer for expertise transfer, and the potential opportunity is here," as he pointed out.

However, the knowledge of Egypt in Canada is not widespread. Hence, as Jaffer continued, "what we need to do with the help of our Egyptian friends is to increase the understanding of those opportunities that Egypt has and that Canada can contribute to."

Canada Expresses Optimism for Egypt's Oil Industry

With the new discoveries Egypt has been making, including Zohr field, and striding steps towards drilling unconventionally, the Canadian Ambassador has faith that the setbacks that may hinder any progress in the industry are merely temporary and Egypt is undoubtedly looking at a positive future. The Ambassador explained: "The region is very competitive and there are many countries that have significant resources and face similar challenges. We look at long term economic plans, and how a number of countries are trying to diversify the economy and supplement the oil and gas with other resources. I am less worried about Egypt trying to compete with the other countries thanks to its reform processes in the oil and gas sector." In order to achieve desirable progress in the field, "I think we need to be efficient, effective, bring more investments, and begin to use the resources that are available," he concluded.

In line with the Egyptian sector's modernization program that the government has adopted, Egypt's future looks appealing for foreign partnerships. The Canadian Ambassador expressed his optimism for the industry especially that "good partnerships are being struck today and for the immediate future. It is a new beginning for Egypt."

On his side, Shane M. Jaffer shared a similar view as he emphasized that recently held EGYPS 2017 offered a huge advantage for the sector as a driving force for striking new deals. "I hope we can partner with the Egyptian government to increase the understanding of the present opportunities for Canadian companies." Hence, the Egypt Petroleum Show was really "a chance for us to get more engaged," and "as we get more engaged, I see more of our investments coming here," stated Jaffer.

A chance for Egyptian-Canadian cooperation to boost economies of the two countries, especially with both governments' willingness to foster collaboration, is indisputable. "The discussion with the Egyptian government has been positive," said Shane Jaffer, and "if we continue down this path, it could be a positive outcome for Canada and for Egypt as well."

In this sense, Canada is looking forward to building the bridges and establishing a firm foundation for future cooperation that would allow for the transfer of knowledge that the country's oil and gas industry possesses to Egypt through mutually profitable lasting partnerships.

EGYPT PETROLEUM SHOW ATTRACTED OLD AND NEW PLAYERS

By Nataša Kubíková

The Egyptian oil and gas industry eyed a memorable day with the kick off of Egypt Petroleum Show that expands a spotlight on the entire energy sector with the presence of political figures, key industry leaders, delegates, and visitors.

His Excellency President, Abdel Fattah El Sisi, who holds the patronage over the event, has expressed his dedication to the development of the oil and gas sector by attending the official opening ceremony of EGYPS Conference and Exhibition. His Excellency Prime Minister, Sherif Ismail, and His Excellency Minister of Petroleum and Mineral Resources, Tarek Molla, presented their opening speeches in Nefertiti Hall, followed by a keynote speech to open the Ministerial Dialogues panel of the Strategic Conference.

His Excellency Minister Tarek El Molla confidently pointed to the remarkable progress that the oil and gas industry in Egypt has achieved. “We have taken serious action to stop big decline and encourage our partners to put their efforts in bringing up the gas discoveries that they have and develop them. After the serious reforms that we have adopted, we were able to sit together with our partners and readjust our agreements to make the adequate economic balance between both parties.”

Furthermore, the Minister highlighted Egypt’s success in accelerating the work across the entire sector with a specific focus on super giant Zohr gas field. “We were able to put on stream different projects, and as a result, we have been able to talk about Zohr,” which Egypt has tried to materialize in a record time, “by bringing the gas on stream in two years from the day of discovery.”

As he then concluded, “what we are doing currently is accelerating to bring all the resources that we have together on stream as fast as possible. We are achieving self sufficiency of gas, hopefully, by the end of 2018. Hence, afterwards, by 2019 and beyond we will be able to restore our export facilities and resume the export of gas but it needs to have proper added value industry expanded to ensure the proper revenues to our economy.”

“We have proven that we can do amendments of concession agreements if needed and adjustments of pricing if needed. We have a really attractive investment environment in the oil and gas business,” affirmed the Minister.

A distinguished guest of the event, His Excellency Dr. Sultan Ahmed Al Jaber, Minister of State of the United Arab Emirates, and ADNOC Group CEO, delivered an inspiring keynote address to the top industry leaders and government officials.

“Studies and researches show that the demand on energy will continue to increase at a rate not less than 25% by 2040. In order to meet the rising demand, an amount of $25 trillion should be secured in the coming time, according to the EIA estimates. To secure this supply, there is a necessity to establish new creative and fruitful partnerships among the governments, the IOCs and the funding bodies in this sector,” Dr. Al Jaber noted.

Giving an overview on the global energy scene, he further commented on the recent positive development accomplished by the industry in Egypt. “Egypt has proved it is a trustful partner in the energy sector through enforcing suitable financial policies and applying convenient legal and organizational frameworks that encourage IOCs such as BP, ENI, Shell, ExxonMobil, Dana Gas, and many other to be listed for investing in the oil and gas sector in Egypt.”

And “these rational policies began to pay off with important discoveries of hydrocarbon resources,” UAE’s Minister of State further noted. In 2015, the biggest gas field in the Mediterranean Sea has been discovered with reserves of around 30 tcf. Adding to these major discoveries in the Western Desert, Egypt will be able to attain energy self-sufficiency and even more so become a gas exporter.

“The richness in hydrocarbon resources along with the convenient economic policies are the major factors that boost the confidence of the foreign IOCs” in Egypt as well as “the confidence of the global and international institutions including the International Monetary Fund,” which will help to “further reconsolidate the sustainable and deserved future development for Egypt.”

Dr. Al Jaber stated: “This is the right and the ideal time to pump investment in Egypt to secure sustainability of the progress. Holding EGYPS comes in line with the diverse and important developments and discoveries the Egyptian energy sector has been eyeing.”

The Ministerial Panel further introduced His Excellency Dr. Ibrahim Saif, the Jordanian Minister of Energy and Mineral Resources, who contributed to the debate by drawing attention to untraditional methods of strategizing. He stated that “we really need to embark upon a strategy to diversify our sources of supply.”

On this account, First Undersecretary at Egypt’s

Ministry of Electricity and Renewable Resources, Dr. Mousa Omran, added that the country has progressive plans in adding "more than 37% of energy from renewable sources by up to 2035."

As for Jordan, according to Dr. Ibrahim Saif, the kingdom is also looking into possible cooperation scenarios across the region and with the private sector aimed at exploration of the kingdom's resources.

Both regional cooperation and exploration for new resources are standing in the centre of attention also of Cyprus. As Dr. Stelios Himonas, Permanent Secretary of the Cypriot Ministry of Energy, Commerce, Industry and Tourism, noted at the panel regarding the exploration needs: "We have been fortunate enough to have hydrocarbon discoveries in the Exclusive Economic Zone (EEZ) of Cyprus. We are promoting exploration in EEZ, as we all know that we need discoveries to achieve our goals, and the potential seems to be there. We have licensed 4 blocks so far, and we are now negotiating to license another 3 blocks."

This implies to build strong ties with a variety of partners and achieve progress in multiple sectors. "We need to build infrastructures, we need to create an investment-friendly environment, we need to exploit synergies and cooperate with others. We are putting a lot of emphasis in cooperation," Dr. Himonas concluded and thus symbolically defined the parameters of future success for all involved parties in the region.

EGYPS 2017 Exhibition

EGYPS 2017 Exhibition turned the three halls into a rich environment for companies that were looking to expand relations with Egypt and maximize the return on investments. The exhibitors have been enthusiastic and positive having reached optimistic business partnerships.

"EGYPS 2017 Exhibition is really active and a great opportunity to meet our clients and establish new relations. Egypt is a fast improving country and EGYPS made that clear," stated Sigma Petroleum Services Co.'s Sales Manager, Mohamed Fayed.

Wuhan Marine Machinery Plant Co. Ltd. (WMMP)'s International Business Department Project Manager, Yang Ping stated that "Egypt is a really big market and EGYPS 2017 is a great opportunity to reach these new opportunities in the country."

For the exhibitors, EGYPS presented great prospects to generate new sales leads, increase brand awareness, meet with and sell to existing and new clients, gain entry into new markets, find regional agents to represent the company, launch new products, and be part of the growth in Egypt's oil and gas market.

"We are here to open the market in Egypt and find more projects to participate in the Egyptian oil and gas sector. Egypt is developing faster and faster, especially for the oil and gas industry, we came seeking more opportunities," said Lyu Qihui, International Business Department Project Manager from Jiangsu Seagull Cooling Tower Co. Ltd. "EGYPS Exhibition let us relate more with people from the Egyptian market and also from other countries, which gives us great prospects for the future," he added.

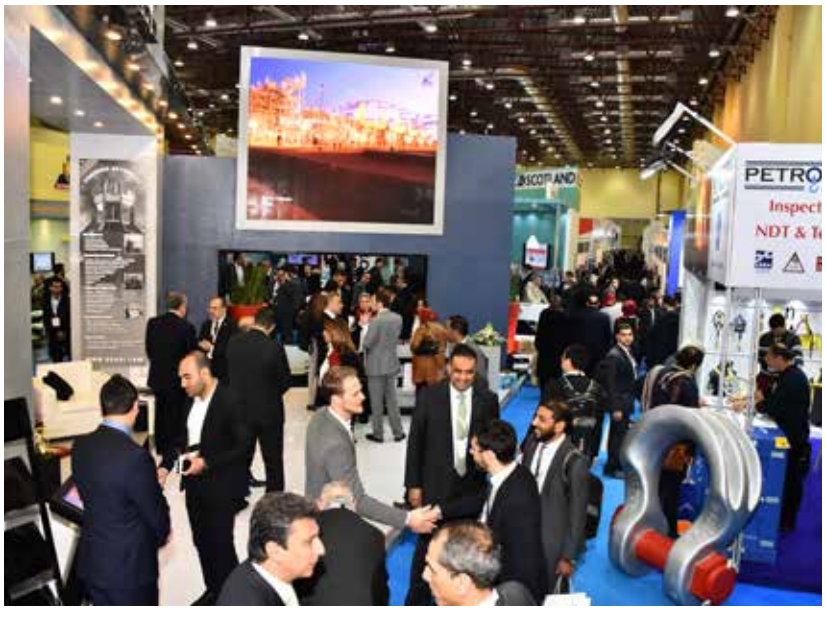
"EGYPS is a good opportunity to see how attractive Egypt really is. We look forward to doing some business in Egypt and we seek alliances with Egyptian companies," John Shand from Scotland Engineering Manufacture (SEM) stated.

"The technical challenges of Egypt are interesting for us. We are coming from the North Sea, and Egypt has many similar technical challenges, such as drilling. We believe the solutions we have are very relevant for Egypt," noted Tom Donnelly, Aberdeen Drilling School's Business Development Manager.

EGYPS 2017 Exhibition has successfully introduced Egypt's resources and potential to the world and it has served as a channel for future collaborations to develop the prominent industry in the country.

"The fact that this event is so large and supported, having the President and the Prime Minister open up EGYPS 2017 is a sign that the country is ready to embrace on oil and gas. And they are looking for foreign investments and technology to move the industry forward. I think this is a very bright day for Egypt and for the oil and gas industry here," concluded Wes Scott, Executive Vice President, Energy, dmg events.

The picture in Egypt is bright with the recent discovery of the offshore Zohr gas field, the largest proven gas field in the Mediterranean, and, in the recent years, over 86 oil and gas discoveries were made. EGYPS 2017 has paved the path for a new prosperous future for the country's industry.



GALA DINNER NIGHT CELEBRATES EGYPS 2017

On February 14th, world's energy industry leaders, political figures, and high profile invitees gathered for Egypt Petroleum Show's (EGYPS 2017) grand Gala Dinner at the sound and light venue of the Pyramids in the metropolitan city of Giza. The night was an opportunity for potential business talks and more networking among invitees.

The event kicked off with a welcome speech from Christopher Hudson, President, Global Energy Division, dmg Events, expressing his pride over organizing the entire EGYPS 2017 event and his honor for bringing together top energy industry figures from all over the world.

Hosted by the eminent Kuwait Energy Company, the event showcased the company's active engagement in Egypt on a huge scale on the backdrop of the historic Pyramids, followed by a speech by Kuwait Energy Chairman (KEC), Mansour Abu Khamaseen. His Excellency, Egyptian Minister of Oil and Mineral Resources, Tarek El Molla, welcomed the attendees in an optimistic speech that pledged a promising future for the oil and gas industry of the Arab Republic.

The prominent event presented a live singing performance during the Four Seasons Hotel-catered dinner. The famous Egyptian musician, Omar Khairat, gave a superb musical performance on his pianoforte, presenting his like-no-other works with his enchanting beats and rhythms.

KEY ATTENDEES INCLUDED

SAHAR NASR
H.E. Minister of Investment and International Cooperation

ENG. TAREK EL HADIDY
Chief Executive Officer of EGPC

SARA AKBAR
Chief Executive Officer and Executive Director, Kuwait Energy

HESHAM MEKKAWI
Regional President, North Africa, BP

HESHAM EL AMROUSY
Chairman and Managing Director, ExxonMobil Egypt

DAVID CHI
Vice-President & General Manager, Apache

KAMEL EL SAWI
President, Kuwait Energy Egypt

HUSSEIN FOUAD EL GHAZZAWI
VP & General Manager, Schlumberger

OSAMA ABDEL HALIM
Egypt & Libya Area Manager, Halliburton

AL AMAL GAIN AND GIVE

By Samir Abdelmoaty - Country Manager, Egypt - Rockhopper Exploration

Al Amal 8th Award Day was a fantastic gathering for exploration pioneers, some with more than 60 years of experience and recent geoscience graduates. The slogan - 'Gain and Give' – symbolizes the transfer of experience, knowledge, and business ethics from experienced professionals to new team members, who will then continue in the practice with an even younger generation that will follow. The interest of many experts in participating in the Al Amal Program has been tremendous.

Al Amal Program is organized by the Egyptian Geophysical Society (EGS) to provide the right coordination channels between universities and the oil and gas industry. This program tackles the identified gap between university education in the field and the actual skills demanded by the industry itself in practical terms. Al Amal was designed to bridge this gap and help to enhance the qualification of fresh graduates in order to make them compatible for the right jobs and competitive in the fierce industry. In addition, the aim was to create a pool of qualified talents for international oil companies (IOCs) to be able to contribute to their projects in a challenging environment. Mohamed Hassan, Aswan University said in his part of the presentation at the event: "In order to gain the best work quality, we should have an effective person in a creative environment with a high level of understanding and leadership".

EGS with the support of major companies, such as Apache, BP, and Shell have worked together to provide the program with experts in different disciplines that would allow for the transfer of relevant knowledge and expertise to young graduates through technical and soft skills sessions, English language courses, practical digital projects, visits to IOCs and technology providers, and HSE awareness raising scheme.

Attendees of the program are selected from universities all over Egypt through online tests. In the assessment processes, candidates are asked to problem solve in groups and only selected ones are invited for a round of personal interviews.

The spirits of the program reflects upon several commonalities that participants and educators share alike. As Mahmoud El Sherbiny from Port Said University, put it in his presentation at the Award Day, "Unity in diversity is a concept of 'unity without uniformity and diversity without fragmentation."

Diversity came out as a crucial element of the Al Amal 8th annual program. It was achieved in the first stage thanks to various experts who decided to volunteer and cooperate in the scheme. Every year, the selection of experts represented different multi-national companies, IOCs, national oil companies (NOCs), services companies, and research institutes. Similarly, a selection of graduates from all over Egypt ensured the diversity on the other pole as well. Graduates came from different universities, with different cultures, genders, and disciplines, and from different education systems, which further enhanced the diversity agenda the companies are aiming for.

As a result, successful graduates from Al Amal Program have been employed by many IOCs, NOCs, and technology providers, in addition, to different universities from which they originally came. They all proved their excellence for their future careers and showed how much they have gained from the program.

It is now their turn to start giving back to younger generation, even with their little experience at present, but which will necessarily grow with time. Their contribution has been remarkable already in the latest edition of Al Amal Program, as it was planned and organized mainly by 'Amalians,' Al Amal Program alumni. This initiative has enlarged our audience as experts and alumni are now returning to their universities and beyond to actively spread their knowledge and engage with new pools of students to bring them to the Egyptian industry.

The program is an extraordinary example of team work among Professional Societies such as EGS, EPEX, and SEG; upstream companies like Apache, BP, Enap Sipetrol, Eni, Pico, Transglobe, Trident, and Shell; and technology providers as CGG, Halliburton, PGS, Schlumberger, and WesternGeco.

In the last year of Al Amal Program, GANOPE and Ain Shams University have taken upon themselves the role to host the training sessions and the participants, organizers, and trainers are all grateful for their support that made the program achieve its objectives.

VIEWS ABOUT AL AMAL PROGRAM

"These are very useful presentations and I am very happy for the efforts by the organizers to transfer their knowledge to the young generation. I hope that this can be repeated in all other disciplines, and as one of the leadership team of Shell, I would like to thank you for providing such talents to the company. I confirm that Shell will continue its commitment to support the Program."

GASSER HANTER
Vice President & Country Chairman of Shell Egypt

"I am very happy to see the high quality presentations that mean how much those graduates have learned and to see how many senior experts are giving back their knowledge and expertise."

AHMED ABDEL HALIM
Ex-Chairman of Petrobel, EMRA, and an exploration pioneer

"I love the program and I always make time to attend the award day and appreciate very much the outcome and the quality of the graduates. As an Engineer, I would like to see the same program run for the engineers."

ABDALAH GHORAB
Ex-Minister of Petroleum

ISLAMIC STATE:
THE GROWING THREAT TO IRAQ'S OIL INDUSTRY

By Salma Essam

The political vacuum and internal conflicts brought about by the US-led war on Iraq has left behind a feeble country, and paved ways for the emergence of armed organizations such as Islamic State (ISIS), which has arisen in Iraq initially as a branch of Al-Qaeda. As the group targeted Iraq's oil sector for generating resources, major disruptions to the sector resulted in a significant drop in the country's oil revenues. Since Iraq is so heavily reliant on oil for its economy, these disruptions have had devastating effects for the entire population.

The value of Iraq's petroleum industry manifests itself in its massive contribution to the Iraqi national economy. In 2011, Iraq's hydrocarbon industry contributed 72% to the country's total GDP. Ranked third in the Middle East, the country's proven oil reserves have hit an amount of 142 billion barrels in 2015, according to OPEC Annual Statistical Bulletin 2016. As the overall performance of Iraq's oil sector has been slowing down in the aftermath of the US-led attacks, ISIS has found Iraq a fertile ground to exploit its resources and recruit fighters.

Oil as a Strategic Weapon

The grave consequences of the US war on Iraq and the state of political unrest brought about by the internal conflicts have been compelling factors for ISIS to establish a base in Iraq. Nevertheless, there was another incentive why the Islamic State militant group found it interesting to create a caliphate in the Gulf country, namely the abundance of oil resources. Energy Analyst, Diana Ngo, explained in her report - The Impact of ISIS in Iraq's Oil Industry - that Iraq is a hotspot for natural resources that have been tempting for ISIS, similar to the United States' pre-2003 ambitions.

Oil has been deemed a crutch for ISIS militants. It has been essential for the survival of the insurgency and for financing the ambition to establish a caliphate. In essence, energy resources fueled the group's war machine, provided electricity to their group-held areas, and offered the crucial leverage for the group to give them power against their enemies. Imposing control over the oil means that ISIS can depend less on any foreign sources of funds and attract more followers. The group has been also actively recruiting skilled workers in the petroleum industry from engineers to trainers to managers, according to Financial Times' article – How Oil Fuel The Jihadi Terrorists, published in October 2015. But Iraqi oil wealth has not been centrally important for ISIS strength only for providing finances and fuel for their military operations. It has, additionally, been bolstering the group's economy, whose success has the potential to expand the organization's popular legitimacy. Accordingly, Iraq Oil Report - Armed with Intel, U.S. Strikes Curtail IS Oil Sector, published in December 2015, explained that ISIS has made a huge business out of Iraq's oil by capturing key oil fields such as the Qayyarah field near Mosul. For example, the group gained around $40 million per month in oil sales from the end of 2014 through to May 2015. In this sense, ISIS group is striving to bring together the elements of a state and relying on their oil market plays a big role in boosting their international position as US Department's Special Envoy for International Energy Affairs, Amos Hochstein, said: "They want to be seen as a state, so they need energy, not just for profits, but also for symbolizing the difference between them and other terrorist organizations - that they control territory and provide electricity and fuel."

Oil is highly valued for ISIS, and it is in this regard that it is centrally controlled by the top leadership.

> **"They want to be seen as a state, so they need energy, not just for profits, but also for symbolizing the difference between them and other terrorist organizations."**
>
> **AMOS HOCHSTEIN**
> US Department's Special Envoy for International Energy Affairs

A senior western intelligence official said according to Financial Times: "They [ISIS militants] are organized in their approach to oil. That is a key centrally controlled and documented area. It is a central shura matter." In addition, ISIS imposes careful oversight of the oil wells by deploying ISIS secret police that ensure that the oil revenues go where they should. Other militants guard pumping stations, while far-located individual wells are surrounded by sand and each trader is carefully checked when driving to fill up.

Effects of ISIS Presence on Iraq's Oil Industry

As ISIS has been carrying out operations against Iraqi forces to capture key oil sources, this has rendered the country's vast oil fields and complex network of refineries vulnerable to attacks and sabotage. This has led to negative effects on Iraq's oil and gas industry over the past few years.

The Islamic State militants have, in fact, took control over massive quantities of oil. Oil Market Analyst, Tim Daiss, said in a Forbes article published in mid 2016, that "ISIS had seized control of around half a dozen of oil producing fields in Iraq." Even in other ISIS-held places such as in Syria, oil operations are less-developed compared to the group's activities in Iraq. Washington Institute Think Tank's Analyst, Matthew Levitt, explained according to Forbes that ISIS had monopolized a huge network of smuggling routes in Iraq, in addition to other underground pipelines that had been built at the time Saddam Hussein was in office. This indicates that ISIS had already built a strong infrastructure, making it a hard job for Iraqi forces to contain the oil activities of ISIS, and thus indicating that the battle against ISIS is complex.

Accordingly, Iraq's output of petroleum products has dropped from around 613,000 barrels per day in 2011 to around 444,000 barrels per day in 2015, according to OPEC's Annual Statistical Bulletin 2016. This has slashed the government's total revenues generated mainly from crude exports. Net oil export revenues stood at $89 billion in 2014 and surged to $18 billion in early 2016, according to the US Energy Information Administration (EIA), derived from EIA's June 2016' Short-Term Energy Outlook. The decreasing trends show that the seizure of key oil fields by ISIS has had a significant negative effect on Iraq's petroleum industry value in the international market compared to other countries.

Another serious effect ISIS has had on the Iraqi oil sector is the increase in petrol prices, particularly in ISIS-held cities. In Mosul, the price of unleaded gasoline had tripled to around $4.73 per gallon in 2015. Residents of Rutba area said, according to Iraq Oil Report, that the price reached to $6.30 per gallon of unleaded gasoline, whereas in Qaim area, the price hit $11.83 per gallon. In addition, kerosene has more than quadrupled in mid-2014, despite being plentiful. Next to the high fuel prices, the city of Mosul has lost water service due to the lack of sufficient fuel needed to run water distribution systems. Instead, people have to buy water from tanker trucks that bring it from the Tigris River.

But ISIS group does not only carry out operations to seize the oil. It further blocks the road for Iraqi forces to recapture any oil fields even if this leads to oil losses for both sides. In August 2016, ISIS destroyed more than nineteen oil wells in Qayyarah town, about 35 miles south of Mosul, in attempts to create a smoke screen as Iraqi forces battled to push them out of the city. According to the CNN article - ISIS Toxic Legacy, updated in December 2016, containing the fire by turning all wells off takes months and costs millions of dollars in lost oil revenue. Even worse, only wells that are set alight can be temporarily shut, yet getting the wells blown up with explosives repaired is far from challenging. Yet, this does not only impact the oil operations and the amount of revenues lost, it further risks the lives of Iraqi engineers who have to repair damaged wells after seizure.

The Future of Iraq's Oil and Gas Sector

Despite the ongoing fight against ISIS and rampant corruption in the sector, Iraq has actually succeeded in increasing its crude output, producing nearly 4.5 million barrels per day in September 2015. The government plans to further ramp up production to 6 million barrels per day by 2020. However, it is impossible to put forward a clear image of Iraq's future oil industry amid the continual battles on multiple fronts. Even though the Iraqi government seems determined to move its oil sector forward, security concerns, political instability, and the already low global oil prices continue to deter investments - a fact that makes Iraq fall short of its production goals over the long term.

The presence of the militant group will largely continue influencing any attempts by the Iraqi government to expand its petroleum sector. Indeed, it is likely that ISIS would continue to exist for long and would unleash distress across the country in defense of the Islamic establishment and the oil resources they current hold under control. Its resilience to Iraqi forces will likely dictate the path for the sector development.

From this stand point, the Iraqi forces must join forces against the presence of ISIS militants and the government of Iraq will need to address drawbacks that hinder the progress in the industry. In particular, Iraq needs to stabilize the country in order to attract more foreign investments. The government further needs to renovate the old infrastructure facilities, pipelines destroyed by ISIS, as well as recruit qualified personnel. This is a requirement by the overall supply chain of the industry; from downstream exploration and production to midstream pipelines to upstream refining. With these renovations, and the containment of security and political threats, the Iraqi government can achieve its export dreams.

INFRASTRUCTURE PLANS AT ALAM EL SHAWISH EAST

By Mariana Somensi

Tanmia Petroleum Company, under the supervision of Petrosannan Company, launched the Early Gas Production Facility Project at the AESE-6 Concession Area, in Alam El Shawish East, to boost daily gas output to around 20.8 million cubic feet per day, in addition to 800-900 billion barrels per day of condensate.

Petrosannan, a joint venture between the Egyptian General Petroleum Corporation (EGPC) and the Ukrainian Naftogaz, controls different areas within the Alam Al Shawish concession, while Tanmia Petroleum Company, the project's contractor, is a young oil and gas fields development company fully owned by the Government of Egypt.

The Alam El Shawish East area, where the proposed activities have been progressing, is situated in the Egyptian Western Desert, between Shell's Alam El Shawish West block and Apache's prolific Abu Gharadig field. Naftogaz first signed a project for the extraction of hydrocarbons in the area in 2006. In 2009, the EGPC recognized a commercial discovery in Alam El Shawish East, which was a prerequisite for the creation of an operating company and commencing production.

Considering Egypt's challenging energy shortages and the downturn in gas production – which turned the country into an importer of natural gas after experiencing a boom in exports – the project represents an extremely relevant step to boost the nation's gas production and help remediate the disequilibrium in its trade balance.

As much as $12 million were invested in the Early Gas Production Facility Project. The project consisted of several stages. In the first, the companies aimed to complete the installation of dehydrated equipment and to pump only dry gases from the field's X-area instead of the t-area.

The process included the extension of the main gas pipeline to X-area, the installation of the dehydration package, as well as the installation of a compressor to recover flared gases at Karima oil facility, which held around 2.5 million cubic feet per day. The operations were successfully completed within the period of four months.

In parallel to the investment in dehydrated equipment, another project was implemented to improve the infrastructure of the Alam El Shawish East area. The project's contract was established between Naftogaz and the design contractor Al-Naft company, which is also controlled by the Ukrainian firm.

The Design Works for Permanent Facilities Project raised as much as $2.3 million of investments, and was divided in two different stages. The first one consisted of the Front End Engineering Design (FEED) works, which covered the basis of the design and the geological survey. The second one was projected to establish more detailed design works. Both stages were expected to be concluded within four months each.

The FEED Engineering Work, carried out in the first phase, included the establishment of a gas pipeline with eight inches of diameter and 22 kilometers of length, and an oil pipeline equally designed with 8 inches of diameter and 28 kilometers of length.

In addition, the project also consisted of a FEED of internal flow lines between the field's HG and AES-E6 stations, which included an oil pipeline of 19 kilometers of length and 6 inches of diameter, and another one with the same length and diameter for gas. Deloitte Engineering Company reviewed the FEED of the oil and gas pipelines work, as well as the FEED of the oil and gas stations work.

According to Naftogaz, the operational activities of the first phase of the project have been effectively completed since 2014. Following the FEED conclusion, the Detail Design works included in the second stage were supposed to start immediately. However, when the project was released, the budget of 2014/2015 did not include any item for permanent facilities, which happened to delay its second stage.

Petrosannan, the supervisor of the mentioned projects, and Naftogaz carried out many discussions through a contract and tender committee. At the meetings, Petrosannan and Naftogaz agreed on trying to accommodate part of permanent facilities in the budget of 2015/2016, which was still under preparation at the time.

Nevertheless, the Ukrainian firm exclusively told Egypt Oil&Gas that it was not possible to include the necessary operations in the 2015/2016 budget. As the company further explained, the second stage of the Design Works for Permanent Facilities Project remains on stand-by as Naftogaz still awaits to receive its pending dues, which amount to as much as $30 million.

Although one phase of the overall planned activities is still pending, the two proposed tasks (Early Gas Production Facility Project and Design Works for Permanent Facilities Project) consist of very important initiatives for Egypt's gas sector development.

Since infrastructure is the basic physical system of a national natural gas scheme, which is completely vital to a country's economic development and prosperity, the investments in oil and gas pipelines and permanent facilities are important steps to improve the Egyptian petroleum sector. Accordingly, Egypt is most likely to receive a great positive impact when the second phase of the project is concluded and the permanent facility turns operational.

Wael El-Serag contributed to the report.

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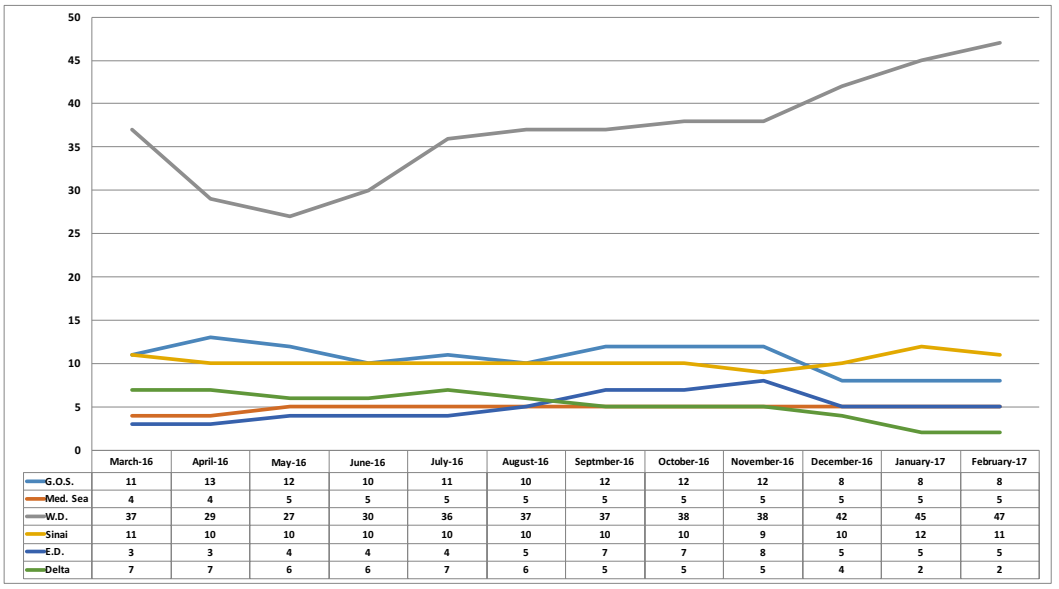
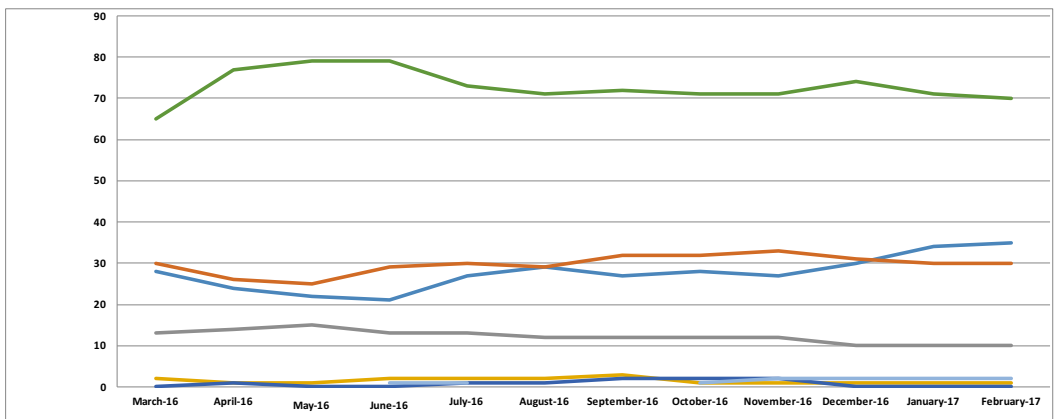
STATISTICS

Changes in Rigs by Area- March 2016 to February 2017



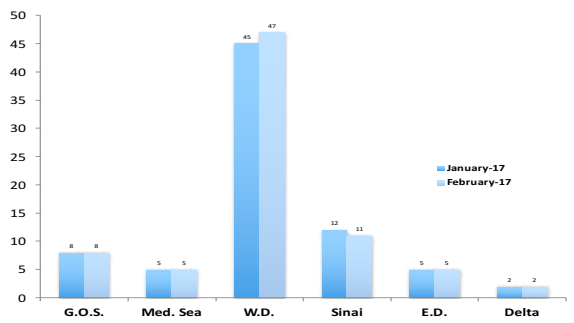
	March-16	April-16	May-16	June-16	July-16	August-16	Septmber-16	October-16	November-16	December-16	January-17	February-17
G.O.S.	11	13	12	10	11	10	12	12	12	8	8	8
Med. Sea	4	4	5	5	5	5	5	5	5	5	5	5
W.D.	37	29	27	30	36	37	37	38	38	42	45	47
Sinai	11	10	10	10	10	10	10	10	9	10	12	11
E.D.	3	3	4	4	4	5	7	7	8	5	5	5
Delta	7	7	6	6	7	6	5	5	5	4	2	2

Changes in Rigs by Type - March 2016 to February 2017

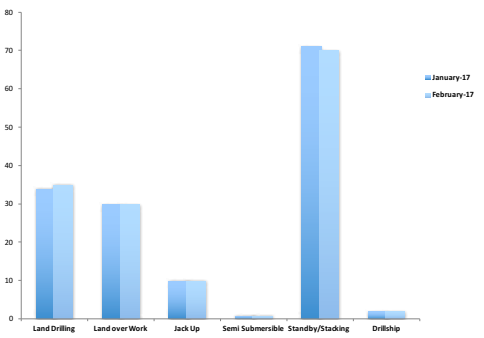


	March-16	April-16	May-16	June-16	July-16	August-16	September-16	October-16	November-16	December-16	January-17	February-17
Land-Drilling	28	24	22	21	27	29	27	28	27	30	34	35
Land Work-Over	30	26	25	29	30	29	32	32	33	31	30	30
Jack-Up	13	14	15	13	13	12	12	12	12	10	10	10
Semi Submersible	2	1	1	2	2	2	3	1	1	1	1	1
Fixed Platform	0	1	0	0	1	1	2	2	2	0	0	0
Standby/Stacking	65	77	79	79	73	71	72	71	71	74	71	70
Drillship				1	1			1	2	2	2	2

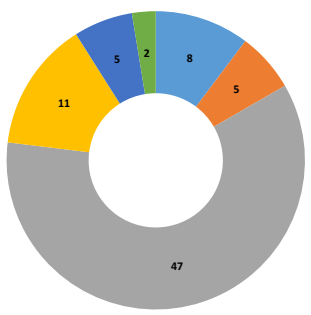
Rigs per Area - January 2017 - February 2017



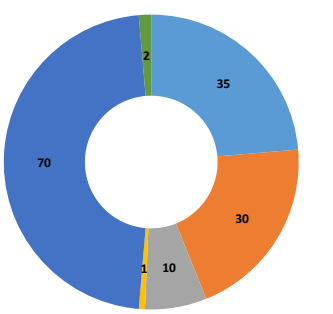
Rigs per Specification - January 2017 - February 2017



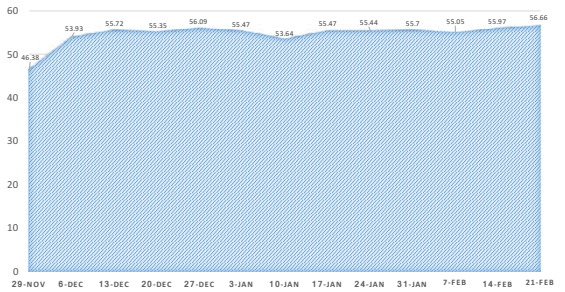
Rig Count per Area - February 2017



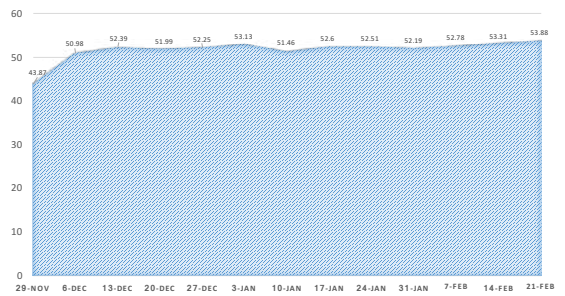
Rigs per Specification - February 2017



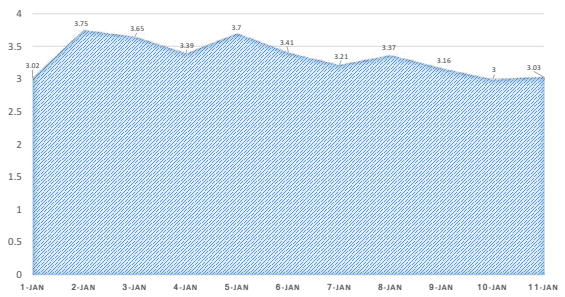
BRENT PRICES



OPEC BASKET PRICES



NATURAL GAS PRICES



PRODUCTION FEBRUARY 2017

	Crude Oil	Equivalent Gas	Liquified Gas	Condensate
Med. Sea	-	8945000	155750	570373
E.D.	1992703	14643	2904	996
W.D.	9156664	7781786	718062	1399238
GOS	4124745	632321	261043	72231
Delta	26961	6818036	101839	449917
Sinai	1730408	1071	30701	24904
U.Egypt	7686	-	-	-
Total	17039167	24192857	1270299	2517659

Unit: Barrel

RIGS PER SPECIFICATION
JANUARY 2017 - FEBRUARY 2017

LOCATION	January-17	February-17
Land Drilling	34	35
Land over Work	30	30
Jack Up	10	10
Semi Submersible	1	1
Standby/Stacking	71	70
Drillship	2	2
Fixed Platform	0	0
Total	148	148

RIGS PER AREA
JANUARY 2017 - FEBRUARY 2017

LOCATION	January-17	February-17
G.O.S.	8	8
Med. Sea	5	5
W.D.	45	47
Sinai	12	11
E.D.	5	5
Delta	2	2
G.W.		
Total	77	78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