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EGYPT OIL&GAS NEWSPAPER

CONSOLIDATING THE EGYPTIAN - CYPRIOT STRATEGIC RELATIONS

EXCLUSIVE INTERVIEW WITH
THE CYPRIOT MINISTER OF ENERGY,
COMMERCE AND INDUSTRY,
GEORGIOS LAKKOTRYPIS


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EDITOR'S **LETTER**

Egypt Oil & Gas dedicates its November issue to discuss Quality, Health, Safety and Environment (QHSE) topics. The issue includes an overview of two of the most known process safety management (PSM) systems, which are OSHA and CCPS.

Our industry insights highlight the lack of safety driving in the sector and its impact on oil and gas workers. Another industry insight introduces marine life protection in the oil and gas industry.

In our politics section, we dig deeper into the secrets behind the Saudi Aramco attack. Furthermore, the paper review section summarizes a recent scientific paper about the process safety capability model as an assessment tool for process safety performance.

In the research and analysis section, we provide our readers with an analytical report that tracks exploration and drilling of the Egyptian natural gas fields in Fiscal Years (FYs) 2016/17 - 2017/18.

Last but definitely not least, Egypt Oil & Gas interviewed the Cypriot Minister of Energy, Commerce and Industry, Georgios Lakkotrypis.

And as always, we wish you a happy and informative reading!

MAHINAZ EL BAZ

Acting Editor-In-Chief
Research & Analysis Manager

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EGYPS
EGYPT PETROLEUM SHOW

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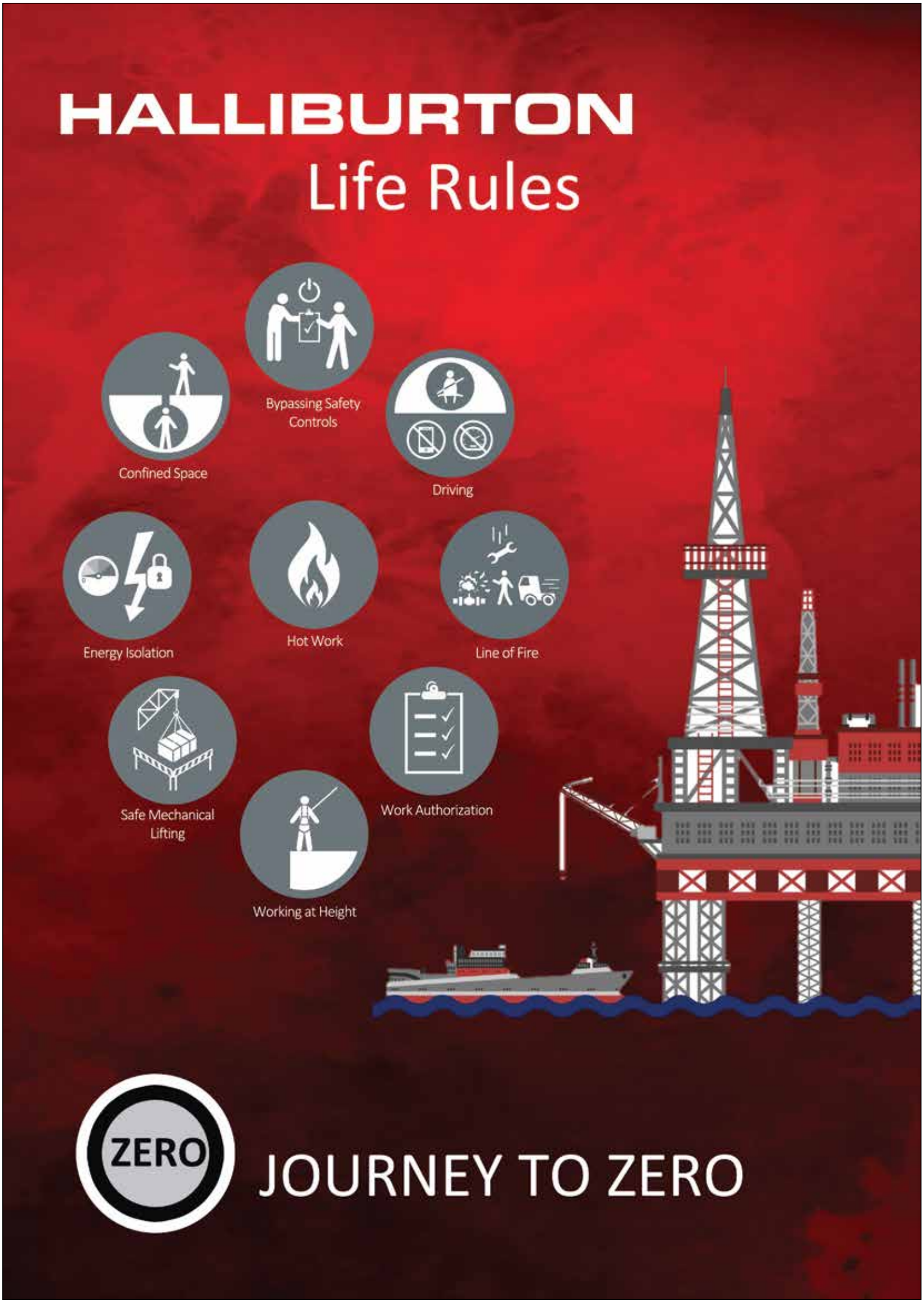
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EGYPT TARGETS CRUDE OIL PRODUCTIVITY OF 700K B/D IN FY 2019/20

The Minister of Petroleum and Mineral Resources, Tarek El Molla, held a meeting with the heads of the leading firms in terms of crude oil production in the petroleum sector: Petrobel, Khalda, Qarun, Badr El-Din, Agiba, and GUPCO, in order to follow up on the implementation of crude oil production plans during the current fiscal year (FY).

El Molla highlighted the necessity of boosting crude oil production, which will have a positive impact on the Egyptian economy, noting that the ministry targets to increase the productivity to nearly 700,000 barrels per day (b/d) during FY 2019/20.

BURULLUS SUCCESSFULLY LINKS 60 MMCF/D NEW WELL TO PRODUCTION

The Chairman of Rashid Petroleum (Rashpetco) and Burullus Gas Company, Sabry El Sharkawy, exclusively reported to Egypt Oil & Gas that three new wells will be linked to production with a total capacity rate of 220 million cubic feet per day (mmcf/d) before the end of the current year. Moreover, El Sharkawy added that the last three wells from Phase 9B will also be linked to the production next March, with a total capacity of 170 mmcf/d.

Burullus successfully extracted oil from Sapphire East DB well, with a capacity rate of approximately 60 mmcf/d. This is considered the second newest well added to the production during October 2019 after Swan East well, which had a capacity of 100 mmcf/d.

Burullus's Chairman forecasts that Silva well would be linked to the production in November 2019, with a capacity of 60 mmcf/d.

AGIBA PETROLEUM INCREASES CRUDE OIL PRODUCTION TO 45,000 B/D

Agiba Petroleum Company has increased its crude oil production to nearly 45,000 barrels per day (b/d) from its fields in the Western Desert and the Gulf of Suez.

Bringing wells at South Meleiha field online at the end of H1 2019 has remarkably contributed to the rise of crude oil production to 4,500 b/d.

Agiba managed to boost its production from Faras field in the Western Desert, resulting in the company exceeding the limit of 4100 b/d, let alone 4,000 b/d, pumped by Ashrafi field in the Gulf of Suez.

ENPPI PUTS BSW FIELD INTO PRODUCTION WITH 100 MMSCF/D

Enppi announced that the first well of the Baltim South West (BSW) field has been put into production at an initial rate of 100 million standard cubic feet per day (mmscf/d) through a new offshore production platform connected to the Abu Madi onshore gas plant through a 44-kilometer-long pipeline.

The field's production will upsurge to 500 mmscf/d after the completion of the upgrading scheme of drilling five new wells by Q2 2020.

Enppi has successfully accomplished its scope of work, which comprised the detailed engineering works for the platform's topside facilities (TSF) and the new multi-phase sub-sea pipeline with a 26" diameter and 18 km in length, connecting the Baltim concession in the Mediterranean Sea and Nidoco-11 Area up to IFC revision; issuance of MRQ's, TER's, and Vendor Print Review, as well as the associated procurement services; expediting and inspection, up to Ready-for-Shipment for all TSF equipment and line pipe material, together with the supervision of the subsequent offshore commissioning and start-up tests.

EGYPT'S NATURAL GAS HITS NEW RECORD IN FY 2018/19

The Minister of Petroleum and Mineral Resources, Tarek El Molla, confirmed that the natural gas industry witnessed a breakthrough over the past two years, given that the recent production rate hiked to its peak in September.

The Egyptian Natural Gas Holding Company (EGAS)'s Chairman, Osama El Bakly, said that the natural gas production hit a record of 7.2 billion cubic feet per day (bcf/d) in September. He also reported that the firm has extended its range of natural gas exploration to five new areas in the Mediterranean and the Delta after a bid that witnessed the entrance of ExxonMobil into the Egyptian market to assist in the process of exploration and searching.

El Bakly noted that four areas are being demarcated at the east of the Mediterranean, further, EGAS is due to sign seven agreements with international oil companies (IOCs) during Q4 2019, with investments reaching minimum $712 million aimed at drilling 23 exploratory wells.

EGYPT CUTS NATURAL GAS OUTPUT BY 1 BCF/D AMID SLOW DEMAND

The Ministry of Petroleum decided to cut the output of Egypt's natural gas to 6 billion cubic feet per day (bcf/d) from 7 bcf/d in the current period, due to lower consumption rates in the domestic market and exports.

Egypt's surplus in natural gas output reached nearly 1 bcf/d due to a decline in power stations' consumption to around 3.7 bcf/d, compared to 4.5 bcf/d during last year's summer months. Egypt targets to boost its production from natural gas to stand at 7.5 bcf/d by 2019/2020.

The domestic consumption of natural gas will gradually increase to 7 bcf/d by the coming fiscal year (FY), reaching 9 bcf/d by FY 2020/21, versus 6.2 bcf/d in the current year.

OIL TRADE BALANCE RECORDS SURPLUS

The oil trade balance recorded a surplus for the first time since fiscal year (FY) 2012/13, registering $8.1 million as a result of the leap in investments in the oil and gas sector.

The balance of payments performance in FY 2018/19 attributed the surplus to a number of factors ranging from the increase in oil exports to $11.6 billion due to higher exports of natural gas to the decline in oil imports payments by 7.5%, which amounts to $11.5 billion.

Reflecting on the achievements in the petroleum sector, the Central Bank of Egypt (CBE) said the government stopped importing natural gas in Q2 FY 2018/19, causing a decline in imported quantities of oil products and crude oil.

EGYPT TRIMS GASOLINE PRICES BY EGP 0.25/LITER

Egypt's Fuel Automatic Pricing Committee decided to cut the price of all gasoline types by 25 piasters per liter, effective on Friday, October 4, 2019, at 12 AM.

The price of Octane 80 was reduced to EGP 6.5 per liter, while Octane 92 was set at EGP 7.75, and Octane 95 stood at EGP 8.75.

Also, the Egyptian committee, which reviews and determines the prices of some petroleum products on a quarterly basis, has trimmed the price of the industrial-use mazut by EGP 2.50 per ton to reach EGP 4,250.

EFIA PROPOSES APPLYING "GAS DOLLAR" MECHANISM

The Egyptian Federation of Investors Associations (EFIA) will prepare a proposal for the Ministry of Finance (MoF) in order to determine gas prices for manufactures through a new mechanism named "gas dollar" that will be like the "custom dollar" set by the MoF, EFIA's Head of Tax and Customs Committee, Sobhi Nasr, said.

Early in October 2019, the manufactures highly appreciated the decision issued by the Cabinet regarding gas prices, as it set the price at $6 for the cement industry and at $5.5 for the industries of iron, steel, aluminum, copper, ceramic, and porcelain.

EGYPT SUCCESSFULLY DELIVERS NATURAL GAS TO 21 NEW REGIONS

The Minister of Petroleum and Mineral Resources, Tarek El Molla, announced that the ministry plans to deliver natural gas to 1.2 million residential units during the current fiscal year (FY) 2019/20. Natural gas was delivered to 306,000 customers between July-September 2019, representing 102% of the outline.

The government has successfully provided 21 new regions with natural gas for the first time from a total of 86 villages and regions during FY 2019/20.

EGYPTIAN GOVERNMENT SECURES BUTANE'S STRATEGIC RESERVES

The Egyptian government has prolonged the butane's strategic reserves to 32 days instead of only 15 days, as reserves increased after building two strategic reserves in Alexandria and Sohag provinces during the past three years.

Moreover, the imported butane has increased and this required expanding the number of ports and using bigger containers to meet the increasing demands of the domestic market.

The ministry pointed out that the imported butane quantity has declined to 155, while the output increased to 8.5%.

INAUGURATION OF MOC 2019 AT BIBLIOTHECA ALEXANDRINA CONFERENCE CENTRE

Mohamed Saafan, the First Undersecretary for Oil Affairs in the Ministry of Petroleum and Mineral Resources, delivered the opening speech of the 10th Mediterranean Offshore Conference and Exhibition (MOC 2019) on behalf of Tarek El Molla, the Minister of Petroleum, on October 15, 2019.

Saafan said that during the past five years, the petroleum sector has achieved the highest investment rate in the sector's history, totaling $30 billion.

Moreover, Egypt registered the highest production rate in crude oil and natural gas in its history, with 1.9 million barrels of oil equivalent per day (boe/d), in addition to realizing natural gas self-sufficiency during September 2019, and posting the highest rate in delivering natural gas to 1.2 million households last year.

It is noteworthy that the petroleum industry posted the widest rate in the Gross Domestic Product (GDP), representing 30%, while it acquired 50% in the foreign direct investment (FDI).

EGPC TO EXTEND CRUDE OIL IMPORTATION FROM KUWAIT

The Egyptian General Petroleum Corporation (EGPC) plans to extend importing crude oil from Kuwait, according to an official source, noting that it is likely that an announcement will be made soon regarding renewing the importation contract, which will expire by the end of 2019.

Egypt imports around 2 million barrels per month from Kuwait, with payment allowance of 270 days. In addition to Kuwait, Egypt imports 1 million barrels of crude oil per month from Iraq.

EGYPT'S PETROLEUM MINISTRY SEEKS NEW OPPORTUNITIES IN TANZANIAN MARKET

Tarek El Molla, the Minister of Petroleum and Mineral Resources, received Medard Kalemani, Tanzania's Minister of Energy, and his delegation in order to seek the cooperation between the two parties and opportunities for Egyptian oil and gas firms to enter the Tanzanian market, aiming to execute diverse projects and activities.

The two sides agreed to establish joint working groups to promote cooperation between Egypt and Tanzania, and exchange experiences in the technical and administrative fields.

On the other side, Tanzania targets to utilize the Egyptian experience in its petrochemical projects, aiming to maximize the economic benefit from the country's oil discoveries, in addition to making use of the distinguished training centers in Egypt to prepare Tanzanian cadres, Kalemani pointed out.

FRANCE GRANTS EGP 1.2 B FOR EGYPT'S ENERGY, GAS PROJECTS

Egypt and France signed two grants with a total value of €71 million (EGP 1.2 billion) to fund a €68-million project of delivering natural gas to houses, in addition to a €3-million program of energy sector support.

Sahar Nasr, Minister of Investment and International Cooperation, stressed that the €69-million agreement is keen on covering the cost of delivering natural gas to houses in the neediest villages, which amounts to EGP 2,060 for each house, with a target of 2.4 million households over four years.

Nasr pointed out that the above-mentioned project was funded through a financing package from the French Development Agency (AFD), the World Bank (WB), and the Kuwait Fund for Arab Economic Development (KFAED).

EGYPT, GERMANY DISCUSS OIL, GAS AREAS OF COOPERATION

Tarek El Molla, the Minister of Petroleum and Mineral Resources, received Cyrill Nunn, the German Ambassador to Egypt, following Nunn's assumption of his new position in Egypt.

El Molla and Nunn discussed the bilateral cooperation ties in the oil and gas sector, in light of having close economic relations. Furthermore, they reviewed the exploration and production (E&P) activities of the German oil and gas companies in Egypt, especially Wintershall Dea.

MOODY'S: NEW DISCOVERIES TO BOOST EGYPT'S GROWTH RATE

The Vice President and Senior Credit Officer at Moody's Investors Service, Constantinos Kypreos, said that the Egyptian economy is witnessing positive progress, speculating an increase in the country's growth rate ranging from 5% to 6% over the coming four years.

Kypreos pointed out that the fact that the Egyptian government settled its due payments to foreign oil companies, as well as the recent oil discoveries, had its positive impact on the country's balance of payments and oil exports.

Moody's positive outlook for Egypt is based on the country's recent economic, fiscal, and legislative reforms, according to Kypreos. The Vice President further speculated that oil prices would range from $50 to $70 as a result of the global economic slowdown.

IMF: COMPLETION OF FUEL SUBSIDY REFORM TO ATTRACT INVESTMENT

The International Monetary Fund (IMF) has issued the report of the fifth and final review of Egypt's economic reform program, as the completion of the review allowed the authorities to draw the equivalent of about $2 billion.

The report asserted that the completion of fuel subsidy reform will encourage energy efficiency, attract investment in more labor-intensive industries, and free up fiscal space for high-priority expenditures, including targeted cash transfers to low-income households.

IMF clarified that the automatic fuel price indexation mechanism is critical to safeguard the budget against the re-emergence of subsidies from future changes in fuel prices, and to signal the continued commitment to the fiscal discipline needed to reduce public debt.

ECHEM INVESTS $2 B IN FY 2018/19

Egyptian Petrochemicals Holding Company (ECHEM) has contributed to the petrochemicals industry in Egypt by increasing production rates of petrochemical products from 600 tons per year when it was founded in 2002 to up to 4 million tons annually in the fiscal year (FY) 2018/19.

The Head of ECHEM, Saad Helal, confirmed that ECHEM implemented several projects to produce derivatives of propylene, ammonium, formaldehyde, and Medium-Density Fiberboard (MDF), with investments reaching $2 billion.

ENPPI ASSISTS SAUDI ARAMCO TO RECOVER OIL FACILITIES

Enppi has been cooperating with Saudi Aramco to repair Shaybah oil field as well as Abqaiq and Khurais refineries in the aftermath of the allegedly Iranian strikes that targeted the Saudi oil industry.

According to a source at the petroleum sector, Aramco has assigned Enppi to examine Abqaiq and Khurais refineries and file a technical report about the volume and scale of required repairs, coupled with the company's recommendations.

Being tasked by Minister of Petroleum and Mineral Resources Tarek El Molla, Enppi had immediately dispatched its experts and engineers to assist Aramco shortly after the drone attack. For its part, the Saudi government appreciated the Egyptian cooperation.

APC REVIEWS ACHIEVEMENTS WITH EL MOLLA FOR FY 2018/19

Alexandria Petroleum Company (APC) raised the refining of crude oil quantities by an additional 10% in fiscal year (FY) 2018/19 than that of the previous year, reaching 4.8 million tons. This increase contributed to saving oil products valued at EGP 55 billion that met the needs of the domestic market.

The APC has fed the national project of roads with around 593,000 tons of asphalt, the company also invested EGP 290 million dedicated to projects related to maintenance and renovation, as well as developing safety systems in the petroleum geographic zone in Alexandria.

AMOC TRANSFERS ALEXANDRIA WAX PRODUCTS' 455 SHARES TO EGPC

Alexandria Mineral Oils Company (AMOC) transferred 455 shares from Alexandria Wax Products Company, one of its affiliates, to the Egyptian General Petroleum Corporation (EGPC).

The deal was executed at the share's par value, which is EGP 100 per share during the September 30 session, according to AMOC.

Moreover, AMOC's board of directors approved transferring a 5% stake from Alexandria Wax Products Company to EGPC at the beginning of August.

EGYPT SEEKS WB FINANCING FOR MICRO-BUSES REPLACEMENT PROJECT

Egypt's Prime Minister, Moustafa Madbouly, praised the existing cooperation with the World Bank (WB) during his meeting with WB President, David R. Malpass, in Washington.

The Minister of Petroleum and Mineral Resources, Tarek El Molla, who attended the meeting, highlighted the ambitious project adopted by the Egyptian government for replacing diesel-powered micro-buses with either natural gas or combined cycle (CC) gas/fuel micro-buses, aiming to optimize the use of resources.

El Molla added that Egypt is looking forward to the WB's contribution to financing this project, whether in terms of the replacement program or the establishment of natural gas supply stations.

EGYPT, TOYOTA DISCUSS MICRO-BUSES REPLACEMENT PLAN

The Egyptian Prime Minister (PM), Moustafa Madbouly, held a meeting with Toyota Tsusho's President & CEO, Ichiro Kashitani, and a delegation of the firm's officials.

The PM highlighted the government's keenness to start the executive procedures of replacing diesel-powered micro-buses with either natural gas or combined cycle (CC) gas/fuel micro-buses, aiming to optimize the use of resources and provide the amounts incurred by the state budget for diesel imports in light of the Egyptian President's instructions.

The PM asserted to Toyota's delegation that the government is very serious in implementing the replacement plan according to a specific timetable, noting that the government will provide a financing program with credit facilities to encourage old micro-buses' owners.

PETROLEUM MINISTRY COLLABORATES WITH GLOBAL CONSULTANT TO ENHANCE INVESTMENT MODELS

Tarek El Molla, the Minister of Petroleum and Mineral Resources, asserted that the ministry aims to boost the value added by the mining ores, as well as encourage investors to establish industries with a high added value of mining ores instead of exporting them, which will improve the state's income.

Also, the ministry is collaborating with an international consultant to update its financial systems, as well as the investment models, in line with the best global systems in the field, which will achieve a balance between the state and the investor, El Molla stated.

EGAS REPORT: EGYPT EXPORTS 172.8 BCF LNG IN FY 2018/19

The Egyptian Natural Gas Holding Company (EGAS) has issued its annual report for the fiscal year (FY) 2018/19, which revealed that 15 new gas discoveries were announced to add actual reserves of about 817 billion standard cubic feet (bscf) of gas and 2.2 million barrels of condensate in the Mediterranean Sea and the Western Desert.

Also, the annual report clarified that the liquified natural gas (LNG) exported from the Egyptian LNG plant reached 172.8 bcf (equivalent gas to LNG exported) through 45 cargoes.

In September, 2018, EGAS succeed in reaching self-sufficiency and stopped importing LNG, as it released (FSRU 1 "HOEGH GALLANT") for a third party as LNG carrier to reduce hiring fees borne by EGAS and kept (FSRU 2 "BW SINGAPORE") as a strategic plan to secure gas supply in case of gas production deficiency or operational problems in the national network. LNG imports were 51.56 bcf during FY 2018/19.

EGYPT PLANS TO DRILL 15 EXPLORATORY WELLS IN FY 2019/20

The Egyptian Natural Gas Holding Company (EGAS) announced in its annual report for the fiscal year (FY) 2018/19 that it will launch a new international bid round during FY 2019/20 on the western part of the Mediterranean Sea to attract more foreign investment.

EGAS added that it plans to drill 15 exploratory wells in the Mediterranean Sea and Nile Delta with an estimated cost of about $422 million during the coming FY.

Moreover, EGAS aims to sign four development leases in the Mediterranean Sea and Nile Delta, with a signing bonus of $5.3 million.

The annual report revealed that 12 natural gas development projects will be on stream, with an initial gas production of 2.046 million standard cubic feet per day (mmscf/d), and an average weighted added production of 1.464 mmscf/d, with an estimated cost of $7.108 billion.

MALAYSIA POSTS $9 B OIL, GAS INVESTMENTS IN EGYPT DURING 2018

The Malaysian investments in Egypt's oil and gas sector reached nearly $9 billion, Malaysian Ambassador to Cairo, Mohamed Abdel Rahman, said.

In the same context, the Egyptian-Malaysian Business Council's Chairman, Sherif El Gabali, pointed out that the two countries recorded a commercial volume of about $550 million in 2018, noting that this amount is not up to the regional size of both Malaysia and Egypt.

Egypt plans to become a regional hub for the trade of liquefied natural gas (LNG) after a string of major discoveries in the Mediterranean, making the country self-sufficient in gas by the end of 2018.

EGYPT CONTRIBUTES TO LIBYAN OIL SECTOR'S RECONSTRUCTION

The Egyptian Ministry of Petroleum and Mineral Resources has welcomed Libya's National Oil Corporation's Chairman and Libya's Acting Oil Minister, Mustafa Sanallah, to discuss boosting bilateral cooperation in the oil and gas field.

The Egyptian ministry asserted its keenness to support the Libyan efforts to bolster the petroleum industry, clarifying the petroleum sector's readiness, through its specialized firms, to contribute effectively to the reconstruction and rehabilitation of oil and gas infrastructure in Libya.

The ministry highlighted its willingness to provide all technical expertise and engineering consultancy for the Libyan side.

DAMIETTA PORT COOPERATES WITH ITALY TO SUPPLY SHIPS WITH LNG

Damietta Port Authority's Chairman, Waleed Awad, has received an Italian delegation from the Port of Bari, the Italian Chamber of Commerce, and other Italian logistics firms, aiming to highlight Egypt's strategy to be regional energy hub.

The meeting sought the possibility of boosting cooperation with the Italian side by providing ships with liquefied natural gas (LNG) and their required infrastructure, in addition to unlocking the potential of gas liquefaction in Damietta port, according to an official statement.

Awad asserted that this comes in light of the Ministry of Transportation's efforts to convert Egyptian ports into green ports, which will be positively reflected on the environment.

EBRD FINALIZES EGYPT'S $4 B BENBAN SOLAR POWER PARK

The European Bank for Reconstruction and Development (EBRD) announced the completion of Egypt's Benban solar power park, worth $4 billion, saying: "After three years of work, construction of one of the largest solar parks in the world is now complete and all its plots are now operational."

Benban, located in Aswan desert and extending over 37 square kilometers, will generate 1.5 GW, which will be enough to provide renewable energy to more than one million homes.

EGPC: MONTHLY FUEL'S IMPORTS SLIP TO $900 MM IN AUGUST

The value of the petroleum sector's imports of monthly fuel retreated to nearly $900 million in August, 2019, by about $300–400 million during the same period a year earlier, an official source in the Egyptian General Petroleum Corporation (EGPC) reported.

The source added that Egypt's imports of petroleum products acquired the largest share of total monthly imports, valued at $640 to $660 million.

Last August, the petroleum sector imported crude oil worth nearly $175 million, directed to either governmental or private local refineries, EGPC's source noted.

TOWN GAS CONVERTS 66 K UNITS TO RUN ON NATURAL GAS IN 2019

Town Gas successfully converted 66,000 units to run on natural gas, with an accomplishment rate of 111%, Town Gas's Chairman, Yasser Bahnas, reported.

Bahnas pointed out that his company provided new areas in Cairo with natural gas for the first time, to reach around 2 million units now running on natural gas.

It is worth mentioning that 2018 witnessed the delivery of natural gas to around 100,000 residential units in Cairo, Bahnas added.

ENI: NEW RESOURCES DISCOVERED IN OFFSHORE GULF OF SUEZ

Eni announced the discovery of new resources in the Abu Rudeis Sidri development lease in the Gulf of Suez, where Petrobel, equally held by Eni and the Egyptian General Petroleum Corporation (EGPC), drilled an appraisal well of the discovery of Sidri South last July.

The Sidri 36 appraisal well was drilled to assess the field continuity westward in a down-dip position with respect to Sidri-23 discovery well.

This new and important result continues the positive track record of the near field exploration in Eni's historical concessions in Egypt.

Eni clarified that the well will be completed and put into production in the next few days with an expected initial flow rate of about 5,000 barrels per day (b/d).

DRAGON OIL ACQUIRES BP'S STAKE IN GUPCO

Dragon Oil announced that it has acquired the stake of BP at the Gulf of Suez Oil Company (GUPCO) after obtaining the approval from the Egyptian Ministry of Petroleum and Mineral Resources.

The company will become the contractor with Egyptian General Petroleum Corporation (EGPC) instead of BP in all oil production and discovery concessions in Gulf of Suez area where GUPCO is the contractor.

Dragon Oil said the above-mentioned acquisition came as a part of its ongoing drive to be among regionally and globally ranked oil and gas companies. The completion of the acquisition will enhance the company's strategic production and investments in a number of regions and countries, such as Turkmenistan, Iraq, and Afghanistan, bringing the company's daily production to an estimated 150,000 barrels per day (b/d), which is part of Dragon Oil's strategy to reach production of 300,000 b/d by 2026.

It is noteworthy that GUPCO Egypt is currently producing 60,000 b/d from 11 concessions, while the sustainable production target is 75,000 b/d by 2021.

This important deal for Dragon Oil follows the recent successes of investment in the Egyptian oil sector, which has had a positive impact on attracting international companies to invest in the Egyptian oil sector.

SHELL'S RASHID, BURULLUS FIELDS OUTPUT UP TO 290 MMCF/D IN SEPTEMBER

Royal Dutch Shell witnessed a rise in its natural gas output from Rashid and West Nile Delta Burullus fields in September to 290 million cubic feet per day (mmcf/d) from 220 mmcf/d during August.

The firm recently linked 80 mmcf/d from the second well of the Burullus field (Phase 9B) to the production.

A source in the Egyptian Natural Gas Holding Company (EGAS) said that the decline in Rashid and Burullus fields' productivity by nearly 10 mmcf/d was attributed to the wells' aging, noting that the maximum production rate per well at Phase 9B is 100 mmcf/d.

The source added that the project included eight production wells and two exploration wells, pointing out that Phase 9B will be linked to the production in the coming fiscal year (FY).

Shell aims to raise Rashid and Burullus fields production to 320 mmcf/d by the end of FY, from 290 mmcf/d in the current period.

UNITED TO FINALIZE ROCKHOPPER EGYPT'S ACQUISITION BY Q4 2019

Rockhopper Exploration announced that the transaction of selling Rockhopper Egypt to United Oil & Gas plc (United) is still on track and to be completed by the end of Q4 2019.

Rockhopper highlighted that the process to satisfy the remaining conditions precedent, including United shareholder approval, completion of the readmission of United to trading on AIM, and receipt of Egyptian government approvals, are progressing well.

Rockhopper had signed a share purchase agreement with United for the sale of Rockhopper Egypt worth $16 million in July 2019. The key asset of Rockhopper Egypt was a 22% working interest in the Abu Sennan concession.

Under the terms of the agreement, the consideration will be satisfied by a payment by United of not less than $11 million in cash at completion.

SHELL EGYPT TO SELL ONSHORE UPSTREAM ASSETS IN WD

Shell Egypt is putting its current onshore upstream assets in the Western Desert up for sale to be able to focus on expanding its Egyptian offshore exploration and integrated gas business.

"We are looking for a capable buyer that will bring new investment and growth into the Western Desert and build on our successful partnership with the Egyptian General Petroleum Corporation," Khaled Kacem, Shell Egypt Country Chair, said.

He added that "any sale is contingent on finding an appropriate buyer, commercial negotiations, and required approvals. We anticipate the start of active engagement with potential buyers in Q4 2019. During the divestment process we remain committed to ensure continued safe and reliable operations, and will keep our stakeholders regularly informed."

According to Kacem, "Shell companies are progressing with new offshore activities, including our West Delta Deep Marine (WDDM) Phase 9B project, which involves eight new development wells, and exploration in WDDM, for which a 2nd offshore rig has been recently mobilized, that will be followed up with exploration in Rosetta as well as the recently awarded Blocks 4 and 6."

SCHLUMBERGER TO PUMP MORE INVESTMENTS INTO EGYPT

Schlumberger plans to increase its investments in Egypt in the upcoming period, according to Karim Badawi, Managing Director – Egypt and East Mediterranean at Schlumberger.

Badawi pointed out to the vital partnership with the Egyptian Ministry of Petroleum and Mineral Resources in the development of human resources in the sector and in digital transformation, as the company has the latest technology to increase oil exploration and production (E&P).

Additionally, Badawi noted that Schlumberger supports the Modernization Project of the oil and gas sector, stressing that the company is cooperating with the Ministry of Manpower and Immigration to develop the young cadres, as about 120 industry leaders were trained using the latest technologies.

Considering explorations in the Red Sea region, Badawi explained that Schlumberger will begin the second phase after awarding tenders to different companies, adding that the company is currently preparing for a comprehensive survey in the Gulf of Suez with the latest technology in the seismic field for new explorations.

SHELL TO INCREASE INVESTMENTS IN AN ARREAR-FREE CLIMATE

Royal Dutch Shell plans to increase its investments in Egypt as the country no longer owes the company any arrears.

According to the Executive VP Upstream JVs at Shell, Gerald Schotman, Shell plans to begin operating its concession areas in Egypt during H2 2020.

Schotman told Reuters on the sidelines of the Mediterranean Offshore Conference and Exhibition (MOC 2019) that his company applied to participate in the bid round that was announced earlier in March for oil and gas exploration in the Red Sea. The company also looks forward to participating in the next bid round in the Mediterranean, which is expected to be announced soon.

Shell is currently doing seismic surveys in the blocks it had won in the previous bid round as the company won the most concessions — three for oil and two for gas.

WINTERSHALL DEA WINS OFFSHORE BLOCKS IN BRAZIL

Wintershall Dea was awarded two offshore blocks: S-M-766 and C-M-845, in Santos and Campos basins in Brazil's 16th bid round for oil and gas exploration blocks.

Wintershall Dea will own a 20% stake in the two offshore blocks, alongside its partners Repsol and Chevron.

Currently, Wintershall Dea holds interest in nine exploration licenses in offshore Brazil, of which four as operator. The blocks award is considered a sign of success for the merger.

Moreover, Wintershall Dea is working on strengthening its commitment to Egypt through successful cooperation. In early 2018, it announced the start of an extensive work program in all of its operational Egyptian assets. The company is currently investing more than $500 million over three years (2018-2020), aiming to significantly boost its gas and oil production in the country.

Furthermore, the company seeks to intensify the exploration and production (E&P) activities in the Egyptian sedimentary basins through expanding its activities and increasing investments in all different regions.

HSE SOLID STEPS IN THE OIL AND GAS SECTOR

IN EGYPT

EOG LAUNCHES NEW HSE SUBCOMMITTEE

The first meeting of the Egypt Oil & Gas (EOG) Health, Safety, and Environment (HSE) Subcommittee was held on August 21 at the Halliburton premises in Katameya.

The HSE Subcommittee's inaugural meeting discussed initial ideas on how to ensure that HSE standards are incorporated within the systems and policies of the Egyptian petroleum sector, and how to raise awareness among the sector's workforce by establishing a culture of safety that builds on the industry's accumulated experience. The subcommittee's main objective is to provide firm recommendations for actions that have an immediate positive impact on creating safer practices within the sector, in line with the Ministry of Petroleum and Mineral Resources' HSE initiatives.

EOG has long supported promoting HSE standards as an integral component in achieving sustainability within the petroleum sector, through its Upstream Operational Excellence Technical Convention, under the patronage of Tarek El Molla, Minister of Petroleum and Mineral Resources, among various initiatives and activities, including roundtables and workshops.

The meeting was attended by Colby Fuser, Halliburton Vice President - Egypt and Libya; Thomas Maher, President and Chief Operating Officer at Apex International Energy and the EOG Technical Committee Chairman; and Mohamed Fouad, the Chairman and Founder of Egypt Oil & Gas and the Co-Chair of the EOG Technical Committee.

Other attending members were Hussam Abu Seif, General Manager for Egypt and Sudan at Baker Hughes, a GE Company; Nicola Marella, Managing Director at Agiba Petroleum; Salah Abdelkareem, Chairman & Managing Director at Badr Petroleum Company (Bapetco); Mohamed Shimy, Chairman and Managing Director at the Egyptian Maintenance Company (EMC), as well as Jeff Edelman, Deputy Country Manager and Joint Venture General Manager at TransGlobe Energy; Ahmed Abdelhakam, HSE Manager at Khalda Petroleum (Apache); Ahmed El Gabry, Social Performance Manager at Shell Egypt; Taher Gado, HSE Manager at Apex; and Dalia Tawfik, Head of Operations and Business Development in Egypt at Wild Well Control.

ECHEM, METHANEX EGYPT HOST PSM CONFERENCE

Methanex Egypt, in partnership with the Egyptian Petrochemicals Holding Company (ECHEM), held the second edition of the annual Process Safety Management (PSM) Conference, titled "Modernizing Process Safety Management: Sharing the Vision" at the JW Marriott Hotel in Cairo.

The conference was attended by the Chairman of ECHEM, Saad Helal; Senior Vice President for Corporate Resources at Methanex Corporation, Brad Boyd; and Methanex Egypt CEO and Managing Director Mohamed Shindy, in addition to more than 400 petrochemicals industry and downstream sector leaders and top executives.

Keynote speakers included Ken Rivers, President of the Institution of Chemical Engineers and Chairman of the UK's Control of Major Hazards (COMAH) Strategic Forum; Michael Broadribb, Senior Principal Consultant in BakerRisk's Process Safety Group; Brad Boyd, Methanex Senior Vice President for Corporate Resources; and Jason Clement, Director of Process Safety Management at Methanex Corporation.

In the first session, Rivers highlighted the importance of the roles of leaders in driving PSM, while Broadribb discussed the importance of learning from previous incidents. Afterwards, Boyd briefly presented the experience of Methanex in building organizational capability around PSM, and then Clement showcased the company's PSM journey and its evolution as a learning organization.

In its first edition back in 2018, the event included key international speakers and was attended by over 200 industry leaders and executives from the Egyptian petroleum and petrochemicals sector. Methanex has worked with ECHEM since then to keep the momentum going through regular discussions and meetings around the topic, committing to organizing the PSM conference annually to empower other sector leaders and executives with the needed PSM knowledge.

ECHEM was established in 2002 to manage and develop the petrochemicals industry in Egypt through new promising areas of investment. It aims to enhance the growth of the petrochemicals industry by implementing the National Petrochemicals Master Plan, with the target of realizing optimum utilization of natural gas in value-added products, which covers 14 complexes including 24 projects and 50 production units during the coming 20 years.

On the other hand, Methanex Egypt is an Egyptian methanol company, a joint venture (JV) between Methanex Corporation, a Vancouver-based, publicly-traded company and the world's largest producer and supplier of methanol, and a number of Egyptian public entities. Methanex owns a 50% interest in the JV, while ECHEM and the Egyptian Natural Gas Holding Company (EGAS) each controls a 12% stake. The Egyptian National Gas Company (GASCO) owns 9%, and the Arab Petroleum Investments Corporation (APICORP) holds a 17% stake.

EL MOLLA MEETS WITH YOUTH IN HSE TRAINING PROGRAM

The Minister of Petroleum and Mineral Resources, Tarek El Molla, met with 74 young engineers and chemists from the HSE departments of several oil and gas firms. The young professionals had previously enrolled in a training program that aims to develop their abilities in HSE after they had passed qualification tests and the first phase of the training program.

The meeting was held at the end of the first phase of the program, which had been launched as part of the ministry's Modernization Project to invest in developing the oil and gas sector's human resources and to support young talents. During the meeting, El Molla encouraged trainees to exert every effort to benefit from the upcoming phases that provide great potential and nontraditional programs.

EL MOLLA BOOSTS COOPERATION IN HSE ACTIVITIES

El Molla met with David L. Phillips, Chairman of the Board Bilateral US-Arab Chamber of Commerce, along with JNG Chairman to discuss HSE approaches.

During the meeting, they presented new JNG technologies and new refining and natural gas treatment applications, showing the companies' interest in investing and applying new modern technologies in Egypt.

El Molla pointed out plans of establishing new joint refineries, as US companies have showed interest in investing in the Egyptian petroleum sector for the progress it has achieved in different petroleum fields, especially in the oil and gas explorations. The minister showcased the Egyptian petroleum sector's projects that have applied HSE measures, which have increased the local oil and gas production and helped in turning Egypt into a regional energy hub.

Phillips also praised the visits of two US middle management delegations during the last period that served the HR young calibers development pillar program.

PETROJET SUCCESSFULLY ACHIEVES 3.2 MM SAFE WORKING HOURS

The Petroleum Projects and Technical Consultations Company (Petrojet) has successfully managed to achieve a new accomplishment through the implementation of the occupational health and safety strategy in all projects.

Petrojet has achieved 3.2 million safe and continuous working hours without any accidents during the execution of ZOHR 1 G.E. project.

This achievement comes in line with the government's interest in occupational health and safety standards. Moreover, it supports Petrojet's plan to reach international safety rates and be aligned with the quality standards in the implementation of integrated projects.

In this context, Petrojet thanked all the project's employees for their intensive efforts. Moreover, Walid Lotfy, Petrojet's Chairman and Managing Director, pointed out the company's keenness to implement all occupational health and safety standards in all projects.

As recognition of Petrojet's efforts, Baker Hughes, a GE Company, awarded Petrojet a certificate of appreciation for such an accomplishment. Lotfy expressed his pleasure to receive such a certificate, stressing that Petrojet is taking steady steps to execute all the projects it undertakes.

PETROBEL INTRODUCES NEW HSE FIRE TRUCK

Belayim Petroleum Company (Petrobel) has brought in a new fire truck "Fahd", which has the most advanced firefighting technology in the oil and gas industry in Egypt. The achievement was announced in order to fulfill the vision of the Ministry of Petroleum and Mineral Resources regarding enhancing HSE and preventing any accidents during the oil and gas manufacturing process.

The truck was received on June 30 and is considered to be one of a kind in Egypt as it has special capabilities of heat endurance and instant response to fires. Petrobel had previously received two other trucks and is still expecting one more by the beginning of 2020, after contracting with one of the biggest fire-truck manufacturers in the world.

RASHPETCO ISSUES FIRST LOGISTICS SAFETY BROCHURE

Rashid Petroleum Company (Rashpetco) prepared a pioneering safety brochure for logistics services in the petroleum sector to identify and manage risks associated with land, maritime, and air transport.

The brochure is the first of its kind in the Egyptian petroleum sector, and it seeks to form a detailed reference case study that helps other companies in identifying, evaluating, and managing risks.

Rashpetco's Chairman and Managing Director, Sabry El Sharkawy, praised the employees' efforts to achieve sustainable development within the company's current and future projects and their support of the HSE system.

Rashpetco managed to identify and prioritize the main points that need the most work through an internal audit process in the logistics services system. The logistics services safety brochure was prepared to align with the HSE and environmental protection standards in Egypt and the UK, taking into consideration the needed verifications in choosing equipment, operational procedures, and risk aversion.

KUWAIT ENERGY SPONSORS MEDICAL CONVOYS IN RAS GHARIB

Kuwait Energy Egypt sponsored two-day medical convoys at the Ras Gharib Hospital. The first convoys took place on June 21-22 and witnessed a wide range of specialized medical care, which included physical examinations by doctors, free minor surgical procedures and interventions, and medicine for underprivileged communities in the area.

About 1,048 patients were treated at the first convoy, which offered diverse services by otolaryngology specialists, gastroenterologists, pediatricians, dermatologists, orthopedic experts, and urologists.

The convoy of medical consultants performed medical checkups, conducted basic laboratory tests, as well as X-rays. Kuwait Energy employees volunteered their time to assist doctors, spread awareness about the convoy, and share information about disease prevention with local families. Moreover, a pop-up pharmacy dispensed free medication. There was also a group of non-medical volunteers who assisted participating medical practitioners.

The second medical convoy was a more specialized unit for ophthalmology specialists. A total of 578 patients were treated and 1,844 ophthalmology services were provided, which included 49 surgeries.

In August, a follow-up convoy provided 286 patients with medical glasses. This convoy was the second in a row, through a joint initiative by Misr ElKheir Foundation in partnership with Nahdet Baladna and El Fardous foundations, to dispatch well-equipped mobile medical convoys in rural areas across the country to serve communities that lack access to quality medical services.

INTERNATIONAL

ENOC INTRODUCES NEW TRUCK FLEET WITH MODERN HSE STANDARDS

Emirates National Oil Company (ENOC) introduced a new fleet of fuel distribution trucks compliant with the latest international HSE standards. The new fleet of trucks are powered by the latest technologies and are all complying with ADR, the European Agreement for the International Carriage of Dangerous Goods by Road.

ENOC says the new vehicles ensure safe driving, reduce driver fatigue, increase fuel-efficiency, as well as vehicle stability and accident prevention. Furthermore, the body of the new tanker is made of lightweight aluminum, which increases the fleet's operational efficiency by 65% from 2.3 kilometers (km) per liter to 3.4 km per liter. This also reduces stress on the truck's engine, which ENOC says will cut maintenance costs by 22%.

According to ENOC, the new fleet of trucks is driver-proof through an Electronic Stability Program, a novel concept in the automobile industry to eliminate vehicle rollover and maintain the stability of the truck. Moreover, the program monitors the tilting tendency of a truck and supplies more air electronically into the air bellows on the opposite side to stabilize the vehicle.

KOTC PLEDGES TO ENHANCE GAS CYLINDERS SAFETY

Kuwait Oil Tanker Company (KOTC) has created a plan to prevent possible hazards caused by the misuse of three million gas cylinders currently in use across the local market. Public entities are cooperating to address this growing problem, as the improper use of gas cylinders is both costly and dangerous.

Although gas cylinders can have a shelf life of 24 years if used properly and safely, KOTC says nearly 90% of these cylinders are misused, resulting in tremendous waste accumulation that threatens the environment and the oil industry

Around 14,500 gas cylinders were reported to have been damaged or tampered with, which is mainly attributed to misuse such as hurling the vessels around.

ADNOC'S "100% HSE" SETS AN EXAMPLE FOR STRONG HSE

The Abu Dhabi National Oil Company's (ADNOC) "100% HSE" is considered a strong example when it comes to continuous improvement in HSE and process safety. ADNOC's employees and contractors are placed at the core of the "100% HSE" program to ensure the implementation of the company's HSE policy, identity, and risk mitigation to keep themselves and their colleagues safe.

It is worth mentioning that in unsafe situations, all employees are empowered to intervene in order to address issues and ascertain that the company's HSE policies are followed and implemented. That is why the petrochemicals industry and refineries in Abu Dhabi are considered one of the safest in the world.

KUWAIT'S OIL, GAS LEADERS PARTICIPATE IN KUWAIT HSE FORUM

The Kuwaiti HSE forum for 2019 was held from October 8-10. The forum included prominent speakers from Kuwait's oil and gas industry.

Despite rapid developments in Kuwait's HSE standards, it still faces a range of challenges, including reducing environmental hazards, improving the effectiveness of health policies, addressing communication issues, and promoting healthy lifestyles and behaviors that will encourage a safer work environment and advance worker wellbeing.

The forum provides a platform for the sharing of insights, expertise, and best practices on critical issues across the spectrum of health and prevention, safety and security, environment, risk management, and technology.

EUROPE, NORTH AMERICA PAY GREAT ATTENTION TO HSE

Europe and North America are exerting great efforts when it comes to the HSE consulting and training services market. The US is considered the most dynamic user in North America, while the UK is the most active user in Europe. In these countries, organizations, especially in the oil and gas sector, are devoted to the safety of workers in the workplace.

When it comes to developing countries, various small- and medium-sized organizations still have an opportunity to invest in HSE consulting and training services.

SAUDI ARABIA

Russian President Vladimir Putin ensured that Russia is willing to cooperate with Saudi Arabia to bring stability to the global energy market. Putin revealed that the country's largest petrochemicals company, Sibur Holding, is proposing to build a petrochemical facility in Saudi Arabia with total investments of $1 billion. Moreover, the Russian Direct Investment Fund will invest more than $2 billion in the Saudi agricultural and petrochemicals sectors among others. The Russian President noted that Moscow plans to work with Riyadh and other Arab partners to reduce [destabilization] to zero.

The Saudi Oil Minister, Prince Abdulaziz bin Salman, discussed energy cooperation to stabilize the global energy market with the Minister of Economic Development of the Russian Federation. Prince bin Salman discussed with Russia's Maxim Oreshkin the role of the two countries in the stability of global markets through continuous coordination in this area where both sides praised the results achieved by the Organization of the Petroleum Exporting Countries' (OPEC) agreement, which helps to stabilize the oil market and the future of petroleum industries.

Saudi Arabia is seeking long-term partnerships with India, with an investment of $100 billion in the country's petrochemicals, infrastructure and mining sectors. Saudi Aramco will acquire a 20% stake in India's largest private sector company, Reliance Industries (RIL), for $15 billion in refining and petrochem businesses. The investment is subject to regulatory approvals, which will further help RIL to cut its debt. India's investment climate is especially attractive for the Kingdom, in which Saudi is looking to make business with New Delhi in key sectors like oil, gas and mining.

Saudi Aramco has awarded a $75 MM engineering, procurement, and construction (EPC) contract to Target Engineering Construction Company, a subsidiary owned by Arabtec Holding. According to the contract, the subsidiary will be responsible for the upgrade and development of a produced water disposal facility at Qatif's gas-oil separation plant (GOSP-1) in Eastern Province, Saudi Arabia. Furthermore, Arabtec is planning to install a water-oil separation vessel, water disposal pumps, water injection pumps, low-pressure de-gassing tank water draw-off pumps, and a pipeline to transfer oily water from Ju'aymah Terminal to Qatif's GOSP-1.

Saudi Arabia's oil production dropped by 660,000 barrels per day (b/d) in September, compared with August. The oil production in Saudi Arabia was falling month-on-month (MoM) in September by 1.28 million b/d to 8.56 million b/d. The attacks on Saudi Aramco's installations in Abqaiq and Khurais plants led to shutting down around 5.7 million b/d and increasing prices by around 20%.

At least seven refiners across Asia will receive the full Saudi crude volumes they have requested for November loading, a sign the top oil exporter's production has stabilized after the September attack. Most of the refiners are getting the crude grades that they want, pointing out that there was no request from Saudi Aramco to change grades.

The attacks on Saudi Aramco's installations on September 14 will have no effect on its listing plans in the stock market. Aramco's Abqaiq and Khurais plants were attacked, which led to shutting down around 5.7 million b/d and increasing prices by around 20%. Nevertheless, these attacks did not impact Aramco's revenues and also had no impact on the initial public offering (IPO) whatsoever.

Aramco Trading Company (ATC), an affiliate of Saudi Aramco, purchased 70,000 tons of naphtha from Indian Oil Corporation on October 4. ATC paid a premium to IOC price formula on Free-on-Board (FOB) basis in the mid-$40 per ton range for a 35,000-ton cargo scheduled for October 18-20 loading from Chennai and for a 35,000-ton cargo for November 3-5 loading from the same port. Following the attacks on Aramco's facilities, ATC seeks to compensate the supply gap in the market, according to trade sources. Hence, ATC bought more than 120,000 tons of naphtha from Europe and about 130,000 tons from India.

UAE

The Abu Dhabi National Oil Company for Distribution (ADNOC Distribution) revealed that its board of directors approved the distribution of interim dividend. The company nods to distribute around AED 1.194 billion or AED 0.0955 per share to its shareholders for the first six months of 2019. This dividend distribution marks the first payment under the company's new dividend policy approved by shareholders in April 2019. The second and final dividend for 2019 is supposed to be paid in April 2020.

Weatherford International announced that it has signed a $220-million contract with ADNOC Offshore, a subsidiary of the Abu Dhabi National Oil Company (ADNOC). The three-year deal will see Weatherford provide directional drilling services to increase offshore production for ADNOC in the United Arab Emirates (UAE). The agreement entails using the Weatherford Magnus rotary steerable system in both re-entry wells and new wells. The contract comes in line with ADNOC's In-Country Value (ICV) strategy and its commitment to supporting the Emirati private sector.

Abu Dhabi National Energy Company, Taqa, has finalized the issuance of $500 million in bonds. The 30-year bonds will carry a coupon and re-offer yield to maturity of 4%, which is due in October 2049. The bonds received $4.5 billion in demand, where Taqa hired BNP Paribas, First Abu Dhabi Bank, JP Morgan, Societe Generale, and Standard Chartered Bank to arrange the deal. The firm attributed its July 2019 milestone to new wells coming on stream and the impact of debottlenecking work over the past few months, which increased the capacity of volumes handled by the facility.

ADNOC and OCI N.V. have settled the transaction of combining ADNOC's fertilizer into OCI's Middle East and North Africa (MENA) nitrogen platform to create a new leading joint venture (JV). The new JV is named Fertiglobe and is headquartered in the international financial center Abu Dhabi Global Market with over $1.7 billion of annual revenues based on 2018 pro forma figures. Fertiglobe will be the largest nitrogen platform globally, with a production capacity of around 5 million tons of urea and 1.5 million tons of merchant ammonia.

The UAE's Brooge Petroleum and Gas Investment Co (BPGIC) plans to boost the crude oil storage capacity and expand refining facilities. BPGIC estimates to add storage and services capacity of 3.5 million cubic meters (mcm), in addition to the existing storage capacity of 1 mcm across about 22 tanks for crude and oil products. The company asserted its aim to start construction of the new facilities later in 2019 and the first phase of the planned 250,000-barrels-per-day refinery to be completed in Q1 2020.

Al Gharbia Pipe Company has begun commercial production of large diameter sour grade steel pipes for uses in the construction and energy industries. The UAE-based company is a JV between Senaat and Japanese firms JFE Steel Corporation and Marubeni-Itochu Steel. The company's manufacturing plant was set up in 2016 at the Khalifa Industrial Zone Abu Dhabi (KIZAD), with about AED 1.1 billion in investments. The plant's full annual production capacity is set to reach 240,000 tons, with 40% of production set to be directed towards exports.

KUWAIT

Kuwait Petroleum Corporation (KPC) aims to boost its oil exports and increase gas production, as part of the company's 2040 growth strategy plan. KPC plans to focus on offshore oil exploration as well, along with developing its petrochemicals industry. The company is deploying new technologies for maturing fields for smart and efficient operations.

KPC is expected to add two to three new crude oil refineries by 2023. The largest of the three new refineries will be the Al-Zour refinery, which is set to begin operations by 2020, with a capacity of 615,000 b/d. KPC is contributing by around 5% to the growth of the Crude Distillation Unit (CDU), as part of the projects that are planned to be executed between 2019 and 2023. Meanwhile, KPC is expected to lead international new capacities with the addition of an 830,000-barrel capacity by 2023.

Kuwait National Petroleum Company (KNPC) is planning to reach a maximum refining capacity of 1.6 million b/d by 2025, down from the original target of a 2 million b/d capacity, as Kuwait is currently reviewing its ambitious oil sector growth strategy. KNPC has recently invited companies to bid for the mechanical maintenance contract for Mina Al-Ahmadi refinery and gas liquefaction plants. Mina Al-Ahmadi refinery is being developed as part of a $12 billion clean fuel project.

KPC will provide its full-range naphtha to load $16 a ton premium to the Middle East on a free-on-board basis from December 2019 to November 2020. The company is currently negotiating the offer in Singapore with Japanese and South Korean companies. The deal is 18.5% higher than an older contract that ends in November 2019, with a rate of $13.50 a ton. The company is also offering its light grade naphtha at a premium of $17.50 a ton for the December 2019 to November 2020 period, also $2.50 a ton higher than the prior year.

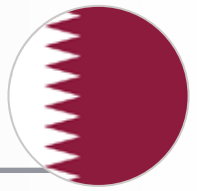
ALGERIA

Algeria's state-owned Sonatrach discussed future partnerships with Exxon Mobil. This came a week after Sonatrach sat with Chevron Corp., to confer energy collaboration, as the energy producer said it seeks boosting its output and increasing its revenues after a decline in prices hit its budget. Sonatrach gave no further details of the September 25 and 26 meetings. Sonatrach aims to collaborate with foreign oil majors as Algeria's political turmoil in February created a limbo that the country hopes to resolve soon.

Sonatrach and Chevron Corporation are reportedly discussing possible partnerships. The Algerian company wants to develop partnerships with foreign oil companies to boost output and exports. Meanwhile, a visit by a delegation from Chevron to explore investments opportunities marked the first visit from a US company amidst the ongoing political unrest. The Algerian government is planning to maintain current clauses in the energy law that limit foreign stakes in oil and gas projects, however, Algeria wants to attract more foreign investments to increase its oil and gas production.

The Algerian government is planning to maintain current clauses in the energy law that limit foreign stakes in oil and gas projects. This was the first time for the Algerian government to comment about the planned amendments to the energy law. Algeria is a member of OPEC and produces about 1.06 million b/d of crude oil. The North African country has reduced its crude production by around 24,000 to 25,000 starting from the beginning of the year, in line with the OPEC+ output cuts.

QATAR



Minister of State for Energy Affairs, the President and CEO of Qatar Petroleum, HE Saad Sherida Al Kaabi, met with CEOs and senior executives of leading Japanese energy companies at the 8th LNG Producer-Consumer Conference in Tokyo to discuss liquified natural gas (LNG) and hydrocarbon cooperation. The various Japanese customers and business partners representing LNG and hydrocarbon product buyers and stakeholders included JERA, Kansai Electric, Chubu Electric, Mitsui, Marubeni, Itochu, Idemitsu, Cosmo, LNG Japan, Iwatani, Mitsubishi, JGC, Chiyoda, Sumitomo, MUFG, Japan Bank for International Cooperation, Mizuho, Sumitomo Mitsui Banking Corporation, and a number of shipping companies.

Subsidiaries of both Qatar Petroleum (QP) and Shell have signed a shareholder agreement to establish a JV company that would provide global LNG bunkering services. The agreement was signed by Wave LNG Solutions, a QP subsidiary, and Shell Gas & Power Developments, a subsidiary of Royal Dutch Shell, with the aim of establishing a new JV that is owned equally by both parties, subject to customary regulatory approvals. The new company's principal business activities will include the procurement of LNG, setting up LNG bunkering infrastructure, storage and bunker vessels, at various strategic locations around the world, and facilitating the sale of LNG as a marine fuel to end-customers around the world.

The world's largest LNG producer, Qatar Petroleum, announced new long-term LNG deals. The company is expected to sign the deals by Q4 2019, which will see an increase in Qatar Petroleum's current 80% sales of its volumes to long-term buyers. Qatar Petroleum's LNG expansion is expected to increase its output capacity to 110 million tons per year from the current 77 million tons per year. The expansion project is expected to take off by 2024 and is currently accepting onshore contracts for tendering.

Qatar plans to select only one contractor to be responsible for building four new LNG trains or plants. The actual LNG trains will be given to one contractor, while the other work would be awarded to other contractors. The expansion plans will help boost LNG production in Qatar by 40%. Qatar's decision to build new LNG trains comes as part of the country's expansion plan for its LNG production and export complex. Qatar has been considered the largest LNG producer in the world.

SYRIA

The recovery works have started at liberated oil and gas sites in Raqqa province in northern Syria, as well as in the area between the governorate and Hama and Homs provinces.

According to the head of Al-Tabqah oil field management, Ali Ibrahim, the restoration of the fields will require a lot of work and the involvement of large companies, indicating that the oil wells and infrastructure at crude treatment plants were destroyed, while the pipelines were seriously damaged.

IRAQ

Iraq exported around 204,000 barrels of oil equivalent (boe) to Jordan during September. This came as per a memorandum of understanding (MoU) between the two countries, which stated that Jordan would receive 10,000 barrels of Iraqi crude oil daily, with a discount of $16 from the price of Brent Crude per barrel. The MoU states that Iraqi oil should cover roughly 7% of Oman's daily oil need, which are exported from Baiji in Iraq to the Jordan Petroleum Refinery Company.

India's oil imports from Iraq were boosted in August by shipping around 1.32 million b/d. India's August imports from Iraq were about a third more than July and 29% higher compared to August 2018. The main reason for that increase in August was that India's refineries replaced their imports from Africa with cheaper imports from Iraq. It is worth mentioning that the production cuts by OPEC, as well as the US sanctions on Iran and Venezuela, enabled Iraq to yield market share in India. Recently, Iraq produced around 4.8 million b/d, which exceeds its target of 4.5 million b/d.

Iraqi oil exports reached 3.576 million b/d in September, down from 3.603 million b/d in August. The country is producing less than its usual capacity of approximately 5 million b/d, as per an OPEC+ agreement to cut production and support prices. Exports from Southern Basra terminals dropped to 3.434 million b/d, down from 3.468 million b/d a month earlier. Meanwhile, shipments from Iraq's northern Kirkuk oilfields to the Turkish port of Ceyhan were around 106,000 b/d. Iraq's oil deliveries to Jordan by trucks were at 7,000 b/d, while the average sale price in September was $59.149 per barrel, with about $6.345 billion in revenue.

OMAN

Petrofac has announced that it has secured a contract to support the development of a flared gas recovery project in the Sultanate of Oman. Petrofac said that it will support Flare to Value LLC (F2V) in Oman by producing a basic engineering package to recover gas that is currently flared at three onshore locations, adding that it will focus on the fast-track execution of constructible, operable, and standardized solutions that maximize modularization and minimize interruptions to ongoing operations. Flared gas recovery and conversion to energy is a major initiative in the Sultanate, driven by a desire to capture waste gas volumes before they are flared, with the goal of generating electricity to power nearby oilfield operations.

Omani Ministry of Oil and Gas (MOG) successfully sold a cargo of blend crude via DME auctions, achieving a premium above the Official Selling Price (OSP). MOG sold the 2-million-barrel cargo at a premium of $0.25 per barrel over the December OSP. The cargo is supposed to be loaded in December. It is worth noting that the auctions included around 14 participants with 17 active bids.

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EGYPT'S NATURAL GAS EXPLORATION AND DRILLING ACTIVITIES:

A COMPARATIVE ANALYSIS FOR FYs 2016/17 & 2017/18

BY **AMINA HUSSIEN, REHAM GAMAL & TASNEEM MADI**

Egypt is a mature hydrocarbon producer, which has been performing Exploration and Production (E&P) activities for more than a century. In addition, Egypt is currently a significant natural gas producer in the African continent that is on its way to becoming a regional hub for natural gas.

The exploration activities in the 1960's resulted in the discovery of Abu Madi field, the first natural gas discovery in the country's history, in the Nile Delta. The field was discovered by Petrobel in 1967, in which four wells were drilled and put on stream later on in 1977. In 1969, the exploration and drilling activities in the Mediterranean Sea resulted in discovering Abu Qir field the first natural gas discovery in the area, according to the Ministry of Petroleum and Mineral Resources' (MoP) website.

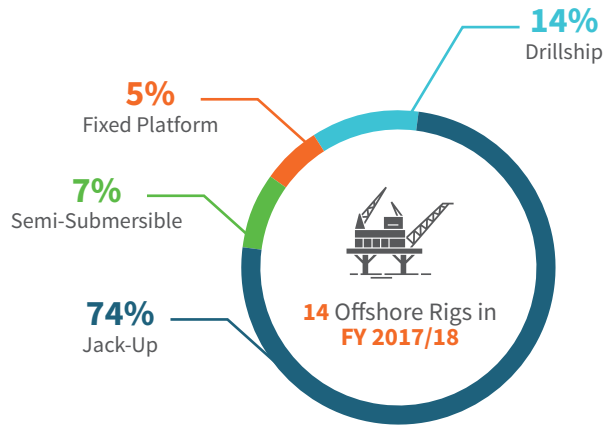
These discoveries encouraged the spread of exploration and drilling activities both onshore and offshore, reaching the offshore Mediterranean deep water that was initially explored in 1975.

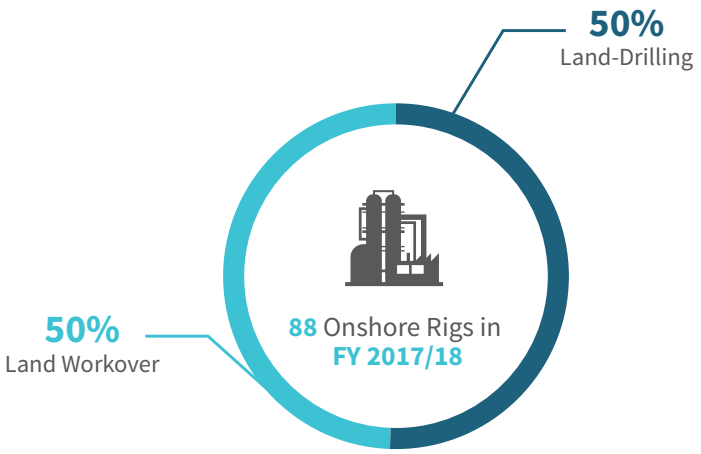
The MoP has continuous efforts to support exploration activities, including conducting expanded seismic surveys, offering international bid rounds and encouraging the international oil companies (IOCs) to invest in upstream activities.

DRILLING RIGS

Egypt has two main types of rigs: offshore and onshore rigs. The offshore rigs in Egypt are classified into two main types: (i) moveable offshore drilling rigs, as jack-up, semi-submersible, and drillship rigs, and (ii) fixed rigs/platforms. Such rigs are often located in the Gulf of Suez, the Mediterranean Sea, and the Nile Delta regions. Additionally, Egypt also has two types of onshore rigs: land-drilling and land work-over rigs. These are mainly located in the Eastern Desert, the Western Desert, and Sinai.

In Fiscal Year (FY) 2016/17, 148 rigs contributed in the drilling, repairing and workover operations, of which 15 were offshore, 67 were onshore, and 66 were standby rigs. While in FY 2017/18, the number of rigs counted for 147, divided into 14 offshore rigs and 88 onshore rigs, in addition to 45 standby rigs, according to the Egyptian Natural Gas Holding Company (EGAS) Annual Reports FYs 2016/17 & 2017/18.





Over the past few years, exploration and drilling activities in the Western Desert witnessed a boom thanks to having large crude oil and natural gas reserves. In both FYs 2016/17 and 2017/18, the Western Desert attained the highest number of drilling rigs within the region. The number of rigs within the region increased from 46 rigs in FY 2016/17 to 65 rigs in FY 2017/18, as stated in EGAS Annual Reports FYs 2016/17 & 2017/18.

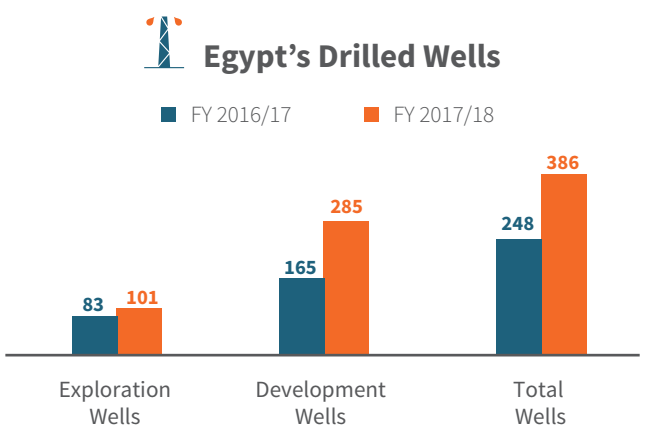
In **FY 2017/18**, the Western Desert possessed **64%** of Egypt's total rigs.

TOTAL DRILLED WELLS IN EGYPT

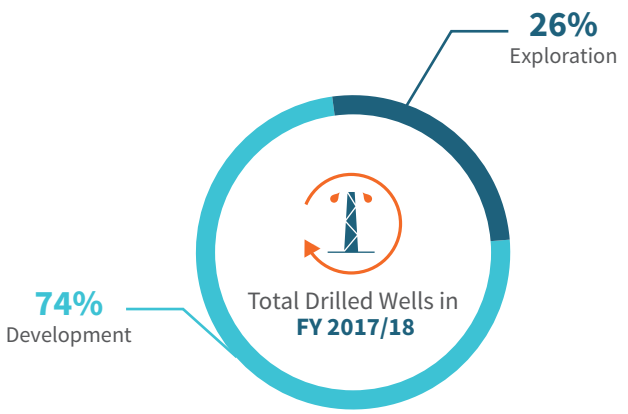
Drilled wells could be identified as either exploration wells or development wells. The two types increased separately in numbers in the two FYs 2016/17 and 2017/18. Exploration wells are drilled for exploration purposes in new areas, while development or production wells are drilled for crude oil or natural gas production in fields with proven reserves, according to the Egyptian General Petroleum Corporation (EGPC).

Approximately 101 exploration wells were drilled in FY 2017/18, with a 21.7% annual growth rate. Over the same period, the development drilled wells significantly increased by 72.73% to reach 285 wells, according to EGPC's data.

EGPC's data further showed that the of drilled wells in Egypt witnessed an increasing trend over the two FYs 2016/17 and 2017/18. The number of wells in FY 2017/18 increased by 55.65% to 386 wells, compared to that in FY 2016/17.



It is worth noting that exploration wells' share in the total drilled wells decreased from 33% in FY 2016/17 to 26% in FY 2017/18. On the other hand, a significant portion of the total drilled wells that were development wells, had shares that reached 74% in FY 2017/18 up from 67% in FY 2016/17, according to EGPC.

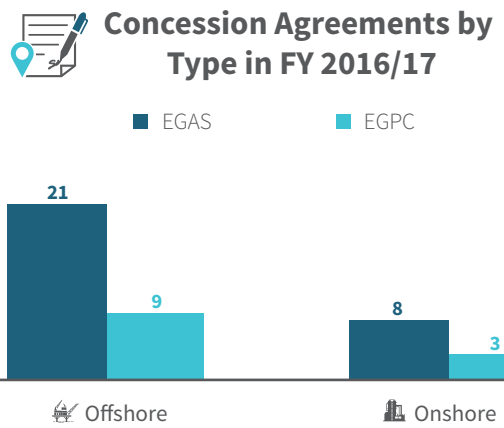


AGREEMENTS AND DEVELOPMENT LEASES

Concession agreements in natural gas activities are either signed between IOCs and EGAS, or between IOCs and EGPC under the supervision of EGAS.

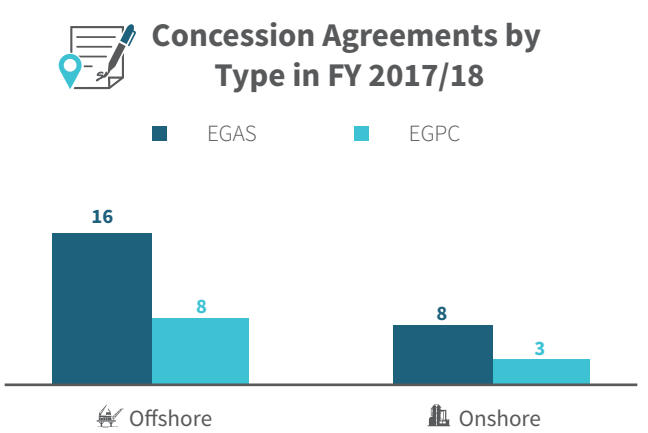
In FY 2016/17, there were 41 concession agreements valid to the end of June 2017. EGAS signed 29 agreements with IOCs, of which 21 were offshore concessions and eight were onshore ones. On the other hand, EGPC signed 12 agreements under the supervision of EGAS, which were mainly offshore concessions, according to EGAS Annual Report FY 2016/17.

Four exploration agreements of the 41 active agreements were newly signed in FY 2016/17. The four agreements are maintained to drill eight exploratory wells with financial commitment of $306.15 million. In addition, the signature bonuses reached $10.5 million, stated in EGAS Annual Report FY 2016/17.



Additionally, four development leases, in the Mediterranean Sea concessions, were signed. The total reserves from the four leases estimated at 3.5 trillion cubic feet (tcf) of natural gas and 49 million barrels (mmbbl) of condensates, explained in EGAS Annual Report FY 2016/17. The investments spent in these development leases recorded $1.55 million, while the development bonuses reached $5.1 million.

In FY 2017/18, 35 concession agreements were signed. EGAS signed 24 concession agreements with IOCs, of which 16 were in offshore concessions, while eight were in onshore concessions. Of EGAS's agreements, 13 agreements were in exploration phase and 11 were in development phases, according to EGAS Annual Report FY 2017/18.



In addition, EGPC, under EGAS's supervision, signed 11 concession agreement, all of which were in development phases. Eight agreements of EGPC's were offshore and three were onshore agreements.

EGAS announced its international bid round in May 2018. The company offered a total of 16 blocks in the bid round, including 13 blocks in the Mediterranean Sea and three blocks in the Nile Delta, according to EGAS's website.

The results of the bid round were announced in February 2019, on the sidelines of the Egypt Petroleum Show (EGYPS 2019). The bid round resulted in awarding five blocks in the two regions, according to the MoP's website.

The bid round witnessed the entrance of Exxon Mobil in the Egyptian upstream activities for the first time. The other four blocks were awarded to Shell/ Petronas, Wintershall DEA, and IEOC/BP, according to the MoP's website.

EGAS Bid Round Results in February 2019

Block	Concession	Awarded Company	Financial Commitment	Drilled Wells	Signature Bonus
3	North East El Amriya Offshore	Exxon Mobil	$ 220 million	4	$10 million
4	North Sidi Gaber Offshore	Shell/ Petronas	$180 million	3	$10 million
6	North El Fanar Offshore	Shell/ Petronas	$ 129 million	2	$3 million
10	East Damanhur Onshore	Wintershall Dea	$43 million	8	$11 million
11	West Sherbean Onshore	IEOC/BP	$28 million	4	$5 million

MAIN NATURAL GAS EXPLORATION ACTIVITIES

The Mediterranean Sea and the Nile Delta regions are two of the most promising areas of producing natural gas in Egypt. In FY 2016/17, the two regions witnessed drilling of 13 exploratory and appraisal wells, resulting in four discoveries, three successful wells as well as six dry wells with success rate of 54%, according to EGAS Annual Reports FYs 2016/17 & 2017/18.

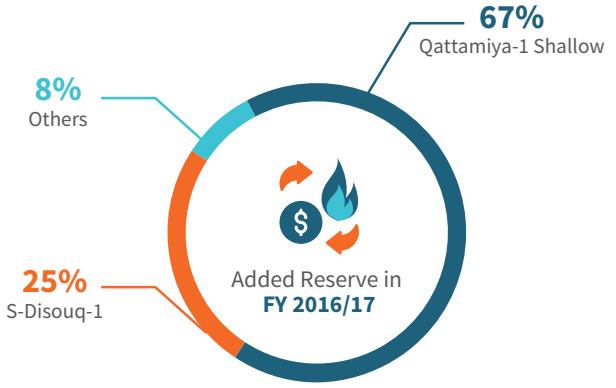
Exploration and Drilling Activities Results in FY 2016/17

Area	Company	Successful Wells / Dry Wells
Salamat Dev.	Pharaonic	W. Salamat-1
Tao Dev.	Nospco	Tao-5 ST
Zohr Dev.	Petrobel	Zohr-5
Zohr Development	Petrobel	Zohr Deep-1
S. Idku Onshore	Edison	S. idku-1
S. Al Khlila Dev.	El Mansoura	S. Al Khilala-3
El Manzala Dev.	El Wastani	Anas-1
El Matariya Onshore	BP	Mocha-1
El Matariya Onshore	BP	W. Ward Delta-2

Four Discoveries in the Med. Sea and the Nile Delta

Area	Company	Wells
N. Damietta Offshore	BP	Qattamiya-1 Shallow
Balsam Dev.	El Wastani	Balsam-6
S. Disouq	Sea Dragon	S-Disouq-1
W. El Qantara Dev.	El Wastani	Bronia-1

Of the four discoveries, one in the Mediterranean Sea and three in the Nile Delta region, added reserves of about 188.63 billion standard cubic feet (bscf) of natural gas and 2.91 mmbbl of condensate.



Katameya Shallow-1 is a major discovery, in the Mediterranean Sea, in Pliocene formation. The discovery's added reserve is about 126 bscf of natural gas. On the other hand, South Disouq-1 is considered one of the significant discoveries in the Nile Delta region. It added reserve of about 47.13 bscf of natural gas. Besides, the discovery added 2.9 mmbbl of condensate.

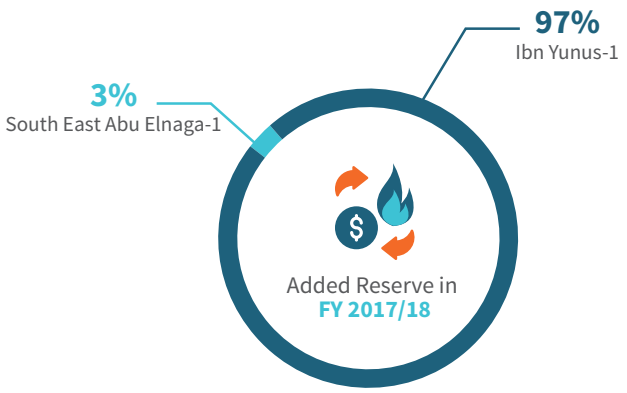
In FY 2017/18, the Nile Delta region witnessed the same number of drilled exploratory and appraisal wells. However, it resulted in two natural gas discoveries, in addition to eight successful wells and three dry wells, with success rate of 77%.

Exploration and Drilling Activities Results in FY 2017/18

Area	Company	Successful Wells / Dry Wells
Zohr Dev.	Petrobel	Zohr-8
Zohr Dev.	Petrobel	Zohr-10
Zohr Dev.	Petrobel	Zohr-11
WDDM	Rashpetco	Sapphir SE-1
North El Mahala	Total	Tarif Deep-1 T-1
South Disouq	Sea Dragon	South Disouq-4
El Manzala	Wasco	South Abu Elnaga-9
El Matariya	BP	Nafahat West-1
El Matariya	BP	Khairat DT-1
South Disouq	Sea Dragon	Kelvin-1

Ibn Yunus-1 and South East Abu Elnaga-1 both added reserve of about 53.28 bscf, decreasing by 71% in comparison to that added by the four discoveries in FY 2016/17. Moreover, the two discoveries contributed by 0.859 mmbbl of condensate.

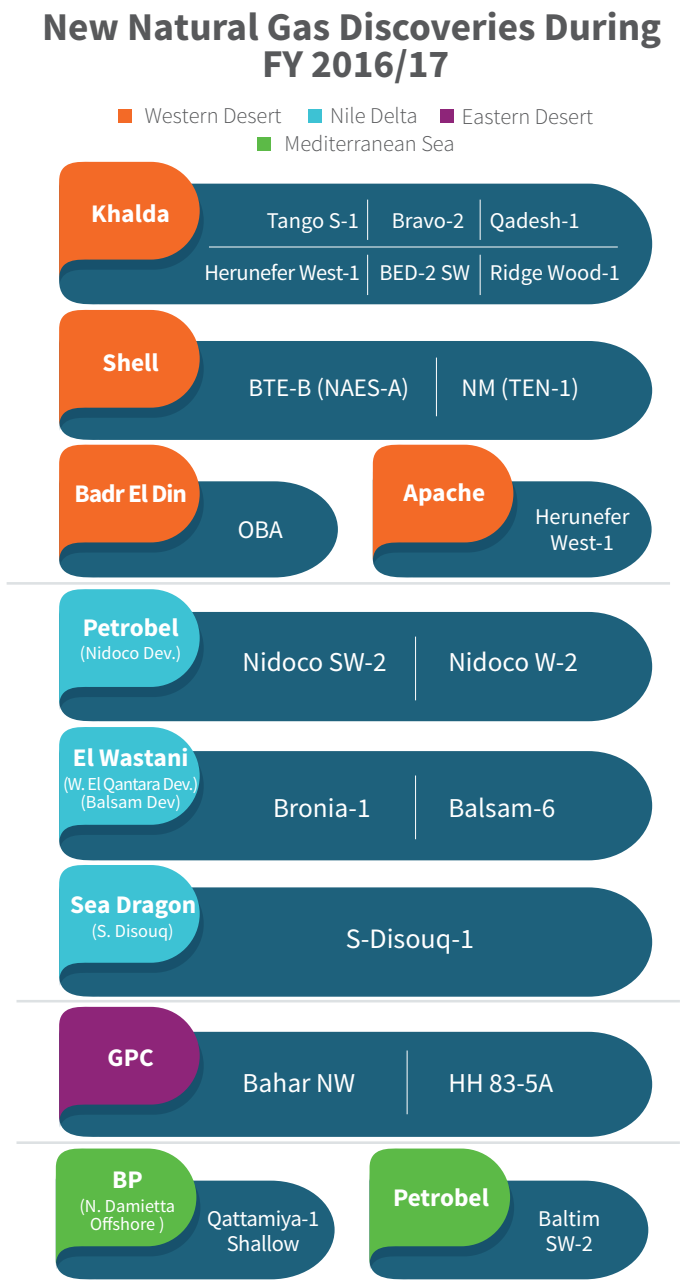
Ibn Yunus-1 is a considerable discovery in the Nile Delta region that added reserve of about 51.9 bscf of natural gas. Furthermore, its condensate reserve count to 0.756 mmbbl. On the contrary, South East Abu Elnaga-1 is a minor discovery that added reserve of 1.38 bscf of natural gas. In addition, it contributed by a humble reserve of condensate of 0.103 mmbbl.



Two Discoveries in Nile Delta

Area	Company	Wells
South Disouq	Sea Dragon	Ibn Yunus-1
North El Salhiya	Dana Gas	South East Abu Elnaga-1

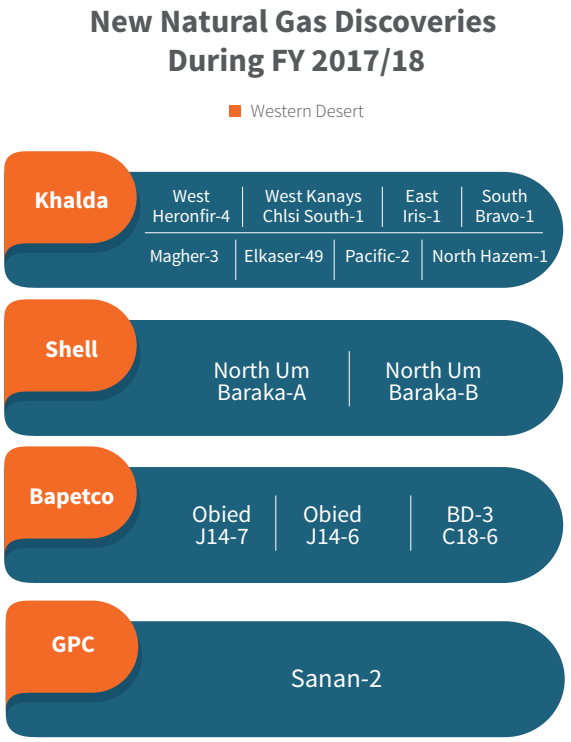
Main Natural Gas Discoveries



In FY 2016/17, 19 new natural gas fields were discovered of which two were in Mediterranean Sea: five in Nile Delta, ten in the Western Desert and two in the Eastern Desert. These new discoveries added reserve of about 2,008.3 bscf of natural gas and 19.55 mmbbl of condensate within the four regions.

During FY 2017/18, 16 new natural gas discoveries were achieved; two in the Nile Delta and 14 in Western Desert. These new discoveries put reserves of about 182.952 bscf of natural gas within the two regions.

Natural Gas Regional Projects



During FY 2017/18, the West Mediterranean area saw the implementation of the West Mediterranean project. The project targeted attracting major IOCs such as ExxonMobil, Statoil, and Chevron to operate in the region. The project cost $153 million to cover seismic surveys, processing and reprocessing of data, geological, and geophysical interpretation as well as marketing, training, and conferences.

Successful explorations and drilling in Egypt indicate a brighter future, over the coming years. Hence, many companies are working on enhancing their drilling activities and further explorations in Egypt. For instance, Khalda Petroleum Company drilled 43 development wells, including 36 oil producing wells and four natural gas producing wells during Q1 FY 2019/20, according to a ministerial press released on September 1, 2019. Italy's Eni started drilling two wells in the southern culmination of Zohr field, in addition to the 10 wells drilled in the northern culmination in August 2019, according to Eni's website.

Qarun Petroleum Company announced that the company will drill 25 development wells and 10 exploratory wells during the current FY 2019/20 . The company added that it plans to produce 41,000 barrels per day (b/d), as stated by the company's chairman, Ashraf Abdel Gawad, in a ministerial press release on February 10, 2019. Moreover, Petrobel plans to drill 10 development wells with a crude oil production rate of around 3,000 b/d, Petrobel Chairman Atef Hassan stated, in a ministerial press released on July 4, 2019.

Furthermore, the MoP is seeking to drill two wells in Atoll and Katameya fields with around $ 289 million investments, by the end of 2019, as mentioned in a ministerial press release, on September 27, 2019. The joint activities and plans between the private companies and the ministry will create more cooperation and integration between different players in the market. Through reaping the benefits of different projects, discoveries, and activities in concessions and leases, the Egyptian petroleum sector will be able to perform much better in the future.

CONSOLIDATING THE EGYPTIAN-CYPRIOT STRATEGIC RELATIONS:

AN INTERVIEW WITH THE CYPRIOT MINISTER OF ENERGY, COMMERCE AND INDUSTRY, **GEORGIOS LAKKOTRYPIS**

BY **DINA EL-BEHIRY**

The solid bilateral relations between Egypt and Cyprus, especially under the umbrella of the East Mediterranean Gas Forum (EMGF) held in Egypt in July, represent a cornerstone for developing the natural gas potential in the East Mediterranean region. Egypt Oil & Gas was honoured to conduct an exclusive interview with the Cypriot Minister of Energy, Commerce and Industry, Georgios Lakkotrypis.

IN LIGHT OF EMGF, TO WHAT EXTENT DO YOU BELIEVE THE FORUM WILL HELP DEEPEN THE RELATIONS BETWEEN EGYPT AND CYPRUS, SPECIFICALLY, AND AMONG THE EAST MEDITERRANEAN COUNTRIES IN GENERAL?

Egypt and Cyprus already enjoy excellent bilateral relations, with our two nations' partnership constantly expanding in all areas, including energy. This, of course, is not something new, although our joint efforts have now intensified – a delimitation agreement of our respective Exclusive Economic Zones (EEZs) was signed back in February 2003, whereas a unitisation agreement on the joint exploitation of hydrocarbon reserves was signed in December 2013. More recently, in September 2018, an intergovernmental agreement has been signed between the two countries concerning a direct submarine natural gas pipeline.

As such, Egypt's initiative to establish in Cairo the EMGF, a platform for energy collaboration that could eventually be elevated into becoming an international organization, certainly adds further value to our energy partnership. At the same time, it has succeeded in bringing together, for the first time ever, the Cypriot, Egyptian, Greek, Israeli, Italian, Jordanian, and Palestinian ministers of energy. As you know, such a gathering would have been unthinkable a mere few years ago and yet today the countries of the Eastern Mediterranean, as well as others who may join in the future, can utilize the EMGF to work together and coordinate efforts, with a view to efficiently exploit the region's gas potential.

In fact, the EMGF has already attracted great interest and support by individual countries such as the US and France, as well as the European Union (EU) itself.

ONE OF THE MAIN TARGETS OF THE EMGF IS TO ESTABLISH AN INTERGOVERNMENTAL REGIONAL GAS MARKET. FROM YOUR POINT OF VIEW, WHAT ARE THE STEPS NEEDED TO ACHIEVE THAT TARGET?

The EMGF, which as I have already mentioned is strongly supported by the EU and the US, is intended to facilitate structured dialogue on technical and commercial cooperation, between producers, consumers, and transit countries in the region.

Admittedly, the Eastern Mediterranean is not the easiest place to do business in, but to cope with increased competition for gas markets from both traditional producers such as Russia and emerging ones such as the US, our region's countries need to collaborate closely in order to find the optimal export options and create a stable and predictable investment environment. To this end, it is essential that all countries fully respect each other's sovereignty and sovereign rights in their respective Maritime Zones, in accordance with international law and the United Nations (UN) Convention on the Law of the Sea, as we engage in energy diplomacy to align interests, integrate and optimize infrastructure and, consequently, create the conditions for regional stability and peace.

Currently, a number of export options are under consideration, all adding up to our common goal of creating the EastMed Natural Gas Corridor to European markets. Principal among them is utilizing the region's existing infrastructure capacity, like the liquefied natural gas (LNG) plants in Egypt, the Arab Gas Pipeline and the regasification units in Greece. At the same time, new infrastructure is also being examined, such as LNG plant in Cyprus, the EastMed Pipeline, and Floating LNG.

THE EMGF MEMBERS APPROVED THE ESTABLISHMENT OF AN ADVISORY COMMITTEE FOR THE GAS INDUSTRY TO ALLOW FOR PRIVATE SECTOR PARTICIPATION. HOW CRUCIAL IS THE PARTICIPATION OF THE PRIVATE SECTOR FOR ENHANCING THE RELATIONS BETWEEN THE MEMBER COUNTRIES?

All founding members of the EMGF agree that private sector participation is crucial both in the workings of the forum itself, as well as in the regional gas market envisaged by our countries. In this regard, we have decided, during our second ministerial meeting, to establish a dedicated Gas Industry Advisory Committee that will be a permanent platform within the EMGF, supporting its activities. Soon, the first meeting of the Committee will be held in Cairo with the participation of the state-owned entities, international oil companies (IOCs), and financial institutions – in fact, a large number of companies have expressed their interest to take part in the meeting.

The point is that to facilitate our ongoing energy cooperation, there is a need to leverage private sector expertise, funding, and resources. Obviously, this involves the contribution of the oil and gas industry, investors, traders, financing entities, and other stakeholders.

IN LIGHT OF YOUR WITH MEETING THE EGYPTIAN MINISTER OF PETROLEUM AND MINERAL RESOURCES, TAREK EL MOLLA, WHAT ARE THE FUTURE COOPERATION OPPORTUNITIES THAT COULD BE CREATED TO DEVELOP THE BILATERAL TIES BETWEEN THE TWO COUNTRIES, ESPECIALLY UNDER THE UMBRELLA OF THE EMGF?

During our meeting with the Egyptian Minister of Petroleum Tarek El Molla in Cairo, in the context of October's Cyprus, Greece, and Egypt Trilateral Summit, we had an opportunity to discuss all areas of cooperation, stressing in particular the need to proceed with establishment of the EMGF. Moreover, we went over our plans to transport "Aphrodite" natural gas to Egypt for liquefaction and also agreed on the importance, for our respective countries' energy security, of creating an electrical grid between Egypt, Cyprus, and Greece based on the framework agreement signed by the Egyptian Electricity Holding Company and the EuroAfrica Interconnector Company, on May 22, 2019.

THE NEXT EMGF MINISTERIAL MEETING WILL BE HELD IN CAIRO DURING THE SECOND HALF OF JANUARY 2020. WHAT ARE YOUR EXPECTATIONS FOR THE MEETING?

At present, all EMGF member countries are in the process of discussing internally the forum's proposed statute. Hopefully, an agreement on the final statute can be reached during our third meeting, bringing us another step closer to concluding discussions on the EMGF's establishment.

In addition, we expect that by then the new Gas Industry Advisory Committee will also be in operation, thus advancing further the founding members' cooperation.

IN YOUR OPINION, WHAT ARE THE MAJOR FOOTPRINTS CYPRUS INTENDS TO DO TO ENHANCE ITS POSITION AMONG THE MEMBER COUNTRIES, GENERALLY, AND WITH EGYPT, SPECIFICALLY?

Egypt and Cyprus are currently spearheading our regional cooperation efforts, constantly taking initiatives for bilateral, trilateral, and multilateral meetings. EMGF is one such very important initiative undertaken by Egypt. Cyprus on its part, will be hosting a Permanent Secretariat for promoting our various regional cooperation mechanisms.

There is no doubt that as the countries of the Eastern Mediterranean progress their hydrocarbons activities, we all need to work closely together to take advantage of synergies and create the conditions conducive to attracting the necessary multibillion-euro investments. After all, to invest and become active in any region, the first thing sought after by the oil and gas industry is stability.

In this equation, Cyprus is a key parameter, traditionally maintaining excellent relations with the region's countries, whilst also enjoying access to European stakeholders and decision centers through our EU and eurozone membership.

EGYPTIAN PRESIDENT ABDEL FATTAH EL SISI APPROVED THE GOVERNMENTAL AGREEMENT BETWEEN EGYPT AND CYPRUS TO ESTABLISH A DIRECT NATURAL GAS SUBSEA PIPELINE. HOW WILL HAVING SUCH A BILATERAL AGREEMENT HELP DEEPEN THE TIES BETWEEN THE TWO COUNTRIES?

The agreement, signed in Nicosia on September 19, 2018, is in fact the first of its kind in the Eastern Mediterranean. It aims to promote the transport of natural gas from Cyprus' "Aphrodite" field to Egypt, by safeguarding the secure and timely development, construction, and operation of a direct submarine pipeline across our respective EEZs. Ultimately, through re-exporting "Aphrodite" gas in the form of LNG, the pipeline will allow for the transport of the first molecules of EastMed gas to the EU, thus contributing to the Union's much sought-after security of supply and diversification of sources and routes.

The agreement itself, of course, is the product of close cooperation between Cypriot and Egyptian authorities, including the two ministries of energy and the Egyptian Natural Gas Company, whilst its implementation will be overseen by a joint monitoring committee that has been established. As such, its drafting and signing have definitely reaffirmed the close traditional ties between Cyprus and Egypt, establishing, in the most formal way, our two nations' strategic partnership in the energy sector.

EGYPT OIL AND GAS
TECHNICAL COMMITTEE

EXPLORING THE BEST HSE PRACTICES

AN INTERVIEW WITH **COLBY FUSER,** EGYPT OIL & GAS (EOG) HEALTH, SAFETY, AND ENVIRONMENT (HSE) SUBCOMMITTEE CHAIRMAN

The oil and gas industry in Egypt pays a great deal of attention to the reinforcement of HSE standards, and thus the industry is taking clear steps to solidify these standards. EOG conducted an interview with Colby Fuser, EOG HSE Subcommittee Chairman and Halliburton's Vice President.

EOG LAUNCHED ITS HSE SUBCOMMITTEE IN AUGUST. FROM YOU POINT OF VIEW, TO WHAT EXTENT WILL THE COMMITTEE HELP RAISE THE LEVEL OF AWARENESS ABOUT HSE AMONG THE SECTOR'S WORKERS?

We are in the beginning phase of the committee, and we are already seeing some good impact. The committee is focused on two key factors that we feel will have long-term benefit to the Egyptian market and in particular among the workers at the frontline. First is awareness being raised around the leading indicators and how we can work with the trends that we see happening in the area across all companies; and the second is education of the nine lifesaving rules in both English and Arabic. We feel that a single unified approach with a consistent message and standards is key to changing the behaviors that we see are getting people hurt at the wellsite and in our shops. We see that leadership engagement and leading by example is a key factor that we will have to have to make this impact. The committee is very motivated and we have the support of the Egyptian General Petroleum Corporation (EGPC) and the Ministry of Petroleum and Mineral Resources.

WHAT ARE THE COMMITTEE'S ACTIVITIES FOR THE COMING PERIOD?

Our first priority is raising awareness around the HSE week, where we are working with our CSR committee, focusing on young professionals coming into the work place and sharing the importance of HSE in the home and work environments. This event will be from November 17-21.

The same awareness which we are making with the young professionals will be rolled out in Arabic and English to all workers, contractors, and sub-contractors on December 1.

WHAT IS THE COMMITTEE'S PLAN TO PROVIDE FIRM RECOMMENDATIONS FOR ACTIONS THAT HAVE AN IMMEDIATE POSITIVE IMPACT ON CREATING SAFER PRACTICES WITHIN THE SECTOR?

The committee is dedicated to contractor management and how to ensure that we have the right implementation. This was rolled out from the EGPC in February 2019, and we will be working with them to ensure the implementation is executed through audits, where our focus will be on the selection of the contractor to the monitoring of the performance. It is important that unsafe companies who do not see improvement are restricted from working in our sector.

Other activities are centered on a centralizing system to capture all leading and lagging indicators for all companies under the oil and gas umbrella in Egypt. This is a dashboard where information is shared and given visibility to all leaders, so we can ensure the right safety campaigns are launched to prevent incidents from happening. There has been some good progress made around this effort from the EGPC, and we are excited about being a part of the journey to ZERO in the future.

HOW IS THE SUBCOMMITTEE'S VISION AND OBJECTIVES ALIGNED WITH THE MINISTRY'S MODERNIZATION PROJECT?

We are working hand-in-hand with the EGPC and focused on changing the safety behaviors around process and personal safety. Our passion is to ensure that we push improvement across the upstream, midstream, and downstream businesses within the sector. Our vision is not to add or introduce anything new but to support the implementation of the actions and vision of the ministry.

AS PART OF THE MODERNIZATION PROJECT, THE MINISTRY OF PETROLEUM AND MINERAL RESOURCES LAUNCHED A PROGRAM TO TRAIN 74 ENGINEERS AND CHEMISTS FROM HSE DEPARTMENTS. DO YOU BELIEVE HAVING SUCH PROGRAMS CAN HELP ENHANCE HSE STANDARDS AND WORKERS' ABILITIES IN THE OIL AND GAS SECTOR? IF SO, HOW?

We feel that having expertise in the HSE field, with individuals who have a passion and a drive will lead us to success in the Egypt energy sector. HSE is about how we arrive to work, how we work, and how we return home safely; and it is a part of everyone's responsibility. How we see this working is through passionate and professional HSE leaders, who have the skillset, driving the organizations to the right path in the journey to ZERO. We feel that, as professionals in this role, they will have the ability to comprehend the leading indicators and apply the right campaigns so that we are preventing incidents from happening.

WHY DO YOU THINK IT IS IMPORTANT FOR THE YOUTH TO GRASP HSE PRACTICES FROM AN EARLY AGE? AND HOW CAN THIS BE BENEFICIAL LATER ON TO THE SECTOR AS A WHOLE?

When we learn at an early age the importance of safety, it then becomes a behavior; and when the majority of the population acts safely, we will see a change in the culture. Our focus with the awareness campaigns in the universities is to prepare young professionals for when they start working in the oil and gas sector and become leaders in change management. We all know the youth of today has a voice, and this is what we are counting on. We want them to be the voice of STOP; and when they see something not being done correctly to stop the work and raise awareness.

IN YOUR OPINION, SHOULD SUCH TRAININGS BE ENFORCED IN THE ENTIRE SECTOR? FURTHERMORE, HOW CAN THEY BECOME ACCESSIBLE TO EVERYONE?

Across the entire committee, we see the need to have enforcement for HSE. When people in my company do not work safely, they simply don't work for me. HSE is everyone's responsibility, and we need every person to demonstrate his or her knowledge and to execute a safe working environment and job execution. The key to this is a robust competency program and continuous education about HSE.

DO YOU THINK HSE STANDARDS ARE DIRECTLY RELATED TO THE TECHNOLOGIES THAT ARE BEING USED IN THE SECTOR?

We have engineering controls across all parts of our business and lives. For example, a safety shield is an engineering control that is designed to keep workers out of harm's way. For other technology, we see well control equipment designed to prevent hydrocarbons from surfacing with fast and precise control. We also see new technology in way of environmentally friendly chemicals. We also see technology in the new work methods and processes subjected to risk assessments and applying the proper controls, mitigating HSE incidents during the jobs.

FROM YOUR POINT OF VIEW, TO WHAT EXTENT WOULD IMPROVING HSE WITHIN THE OIL AND GAS SECTOR PLAY A ROLE IN TURNING EGYPT INTO A REGIONAL ENERGY HUB?

We are committed to a safe environment and I feel very confident that my peers also feel this way. I have seen firsthand at Halliburton that a safe environment is also an efficient environment where service quality of the jobs being performed are improved and the overall job efficiency reaches a much higher standard. As Egypt expands its leadership in North Africa, HSE is the critical component, playing a large part in the industry. The HSE journey to ZERO is best delivered with a competent workforce whose leadership has commitment to a safe working environment. I want to thank the entire EOG Technical committee and our HSE committee for their dedication and passion to make Egypt a safe place to work.

LACK OF SAFETY DRIVING TAKES A BIG TOLL ON OIL AND GAS WORKERS

BY **MAI EL GHANDOUR**

Last month, the Egyptian oil and gas sector was deeply shaken by a tragic incident that took the lives of four oil workers. The accident occurred when a vehicle carrying the workers hit an oil rig at the drilling site, leaving four dead and two others injured. This was not the first time that road safety was subject to skepticism in the oil and gas sector. Unfortunately, it might not be the last, either.

As a matter of fact, according to the National Institute for Occupational Safety and Health (NIOSH), motor vehicle crashes are responsible for more than 40% of work-related deaths in the oil and gas sector, becoming the number one cause of fatalities in the industry. Hence, it is time for oil and gas companies to take a closer look at what can be done to improve driver safety.

STAGGERING IMPACT ON THE INDUSTRY AS A WHOLE

When it comes to media coverage, these casualties somewhat become a taboo. Unfortunately, casualties in the oil and gas sector never receive the amount of coverage they deserve, which tends to underplay the fact that the greatest cause of fatalities in the industry is actually something eerily commonplace.

Safety driving is a pressing issue in the oil and gas industry in Egypt, as it is the primary cause of field accidents, QHSE Consultant, Eng. El Sayed Hathout, told Egypt Oil & Gas. It has been long misinterpreted that such accidents mainly or even solely affect midstream oil and gas, but this is not true. Lack of safety driving takes its toll on oil and gas workers, as human resource is the heart of the issue.

Accidents alter the whole supply chain. When drivers have accidents, petroleum products may be compromised and supply may be reduced. However, Hathout told Egypt Oil & Gas that this, of course, does not compare to the loss of a life, adding that a worker's life can be at stake because of driver safety issues in particular.

The recent World Health Organization (WHO) Global Status Report on Road Safety shows that Egypt loses about 12,000 lives due to road traffic crashes every year. As the oil and gas sector is one of the most dangerous sectors, it is well known that its casualties are typically higher than any other industry. Nevertheless, what is strikingly uncanny is the fact that the number of accidents worldwide is constantly on the rise. With more awareness on the subject matter, one would say that there must be some effort into reducing car accidents in the industry. However, the latest data from the Bureau of Labor Statistics shows the numbers have not been improving. In fact, the fatality rate is head-to-head with the employment rate in the sector.

Today, the oil and gas industry remains far more dangerous than any other industry, by precisely seven times more. And with crashes claiming the lives of 300 oil and gas workers over the past decade, driving continues to top the list of fatal dangers.

"Detrimental activities such as hasty driving, night driving and overloaded vehicles do not only cause accidents, but lead to catastrophes," Hathout further said, explaining that these causes might be direct, indirect, immediate or even long-term; all of which prompt the lack of a proper journey management plan.

DIRECT CAUSES

Reports show that 90% of car crashes in the oil and gas sector can be attributed to the driver's behavior. The direct causes by the driver's behavior include the lack of trainings, lack of vehicle inspection, not abiding with the rules and/or laws, expired driver's license, or driving without car insurance.

As workers in the industry are predominantly young males who are required to drive through rural areas, mishaps are likely to occur if they are not strictly following the speed limit. According to Industrial Safety & Hygiene News (ISHN), a study of fatal oil field accidents in the US revealed that among the commonalities of fatal crashes were that they were typically caused by young males who were not wearing seat belts. Incidents where belts were not in use resulted in more than 38% of fatal accidents.

The WHO Global Status Report on Road Safety also states that although in Egypt there are indeed laws on speed limit, Blood Alcohol Concentration, seat-belt wearing and helmet wearing for the general population to follow, these laws are poorly enforced. In Egypt, many drivers do not even have a commercial driver's license or receive any formal training.

Furthermore, the OSHA IMIS Database reports three out of every five "on-site fatalities in the oil and gas extraction industry are the result of struck-by/caught-in/caught-between hazards." The stats are comprised of hazards from many sources, including moving vehicles, equipment, falling equipment and high-pressure lines.

Recent press reports cite concerns about "an unusual number of basic safety errors." This can happen due to the high turnover as in some cases, many workers cross-train to take on construction jobs while being less experienced at driving. Thus, Hathout urges that drivers must be well-trained, vehicles must be

inspected, and load and tasks must be controlled through a robust journey management.

INDIRECT CAUSES

Oil and gas workers sometimes work well beyond their ability to do their jobs safely. However, these workers more often than not get behind the wheel whilst they are too exhausted to function. Drowsy driving is a fatal indirect cause that easily risks a driver's life. This can be attributed to tough working conditions such as long hours awake with no breaks, monotonous road environments, or night shifts.

According to Smith System Driver Improvement Institute, the first professional driver training company in the US, long hours are perhaps the biggest culprit when it comes to driver safety. Oil field workers might work for up to 13 hours intervals for two weeks in a row. The Centers for Disease Control and Prevention notes that this creates an unsafe work environment by demanding too many hours of service.

It comes as no surprise that the leading cause of accidents in the oil and gas industry is driver fatigue. Over the years, studies have shown that insomnia has the same effect of being under the influence of drugs. In addition to long hours, shift work and irregular workings hours are also among the indirect causes that threatens a worker's life. Workers on night shifts are shown to have more instances of insomnia and daytime sleepiness, both of which increase the risk of work-related incidents — including vehicle crashes.

On the other hand, Hathout also suggests that mental health also has a compelling impact on safety driving. Some indirect causes may be related to the driver's schedule. For instance, working day shifts and nights shifts can cause lack of sleep, not enough holidays, lack of time management, etc; all things that are deemed unhealthy for the mental state.

EXTERNAL CAUSES

Other than that, sometimes accidents are often the result of external factors.

Safety driving may be at stake because of the road itself. Drivers trying to navigate unlit roads on their way home can end up on rural, poorly maintained roads that lack firm shoulders, adequate signage, and other safety features. Meanwhile, remote worksites lack nearby housing, and many oil and gas workers must travel long distances and for many hours in their commutes to and from work.

It is important to note that work is also done in all kinds of weather conditions, no matter how they may be. This, of course, can be very dangerous to driving.

SOLUTIONS, SAFETY MEASURES AND RECOMMENDATIONS

Considering that on-the-job crashes cost employers billions of dollars every year, and a single fatality can cost the company, on average, $671,000, investing in driver training programs can quite pay off.

Hathout says that everyone in the sector is obliged to take a defense driving course, which is divided into two levels, one for those who have private cars and one is specialized for drivers, especially for those who drive trucks.

Shell Egypt, for instance, develops a number of social investment and development programs as part of its social responsibility towards host communities. As these programs focus on human capital development, Road Safety is an integral part of Shell Egypt's social investment. In light of this theme, 'Safe Driving' awareness sessions and practical training are encouraged among hundreds of school bus drivers. In addition, Shell Egypt has taken different measures to promote and raise awareness of the importance of road safety for children at public schools and to the general public. Shell has also installed 180 reflective road signs at 60 exists on the Ring Road to enhance the safety of driving at night.

On the other hand, Wayne Vanderhoof, CSP, President of RJR Safety, Inc., told ISHN that some operators and contractors implement Fatigue Management Programs. Wayne elaborated that the programs generally state that workers cannot work more than 16 hours a day without having a straight eight hours of off-time. But this is hardly implemented when the worker works 16 hours and then drives home or to a hotel up to two hours, which makes a total of 20 hours and leaves workers with only four hours of downtime. Some workers work more than 12-hour shifts on a continuous basis for weeks at a time. "This Fatigue Management Program, along with other safety procedures, are only as good as when contractor management enforces and supports the procedures and programs."

In another ISHN interview with Kari Cutting, VP of the North Dakota Petroleum Council, the VP says, "Preventing work-related roadway crashes requires strategies that combine traffic safety principles and sound safety management practices. Although employers cannot control roadway conditions, they can promote safe driving behavior by providing safety information to workers and by setting and enforcing driver safety policies. Crashes are not an unavoidable part of doing business. Employers can take steps to protect their employees and their companies."

Thus, in the end, it is necessary for the entire sector to invest more capital and more thought to safety driving. To ensure that workers have a seamless and safe driving experience to and from their worksites, training programs must become mandatory to everyone in the oil and gas sector. Furthermore, safety policies and strategies by big oil companies should serve as a guideline for other companies to follow. Meanwhile, these big companies should still tackle the issue and introduce more rigid solutions.

DRILLING WASTE MANAGEMENT: AN INDICATOR FOR ADVANCED HSE STANDARDS

BY **DINA EL-BEHIRY**

Oil and gas exploration and production (E&P) activities consist of many elements including numerous investors, complicated techniques, different work categories and procedures, grade separation, and continuous operations. These elements may lead to many risks, including spills, blowouts, pollution, discharged effluents by daily drilling operations, well treatment chemicals, etc. If effective strategic measures to minimize these risks are not implemented, severe accidents may occur with a negative impact on the workers' safety and health as well as harming the environment, according to a paper entitled 'Environmental Risk Management and Mitigation Strategies for Offshore Gas Well Drilling Projects,' by Moussa Elbisy and Ehab Mlybari in the Journal of Civil, Construction, and Environmental Engineering.

For this reason, risk management is crucial to ensure that adequate measures are taken to protect workers via the implementation of Health, Safety, and Environment (HSE) standards. "The implementation of HSE standards, in general, improves the working environment, operations efficiency, and results in [raising] employees and stakeholders' satisfaction," Taher Gado, HSE Manager at Apex, said.

For instance, with an eye on drilling operation, two major waste by-products are produced: water and drilling-related waste. Each well can generate thousands of barrels worth of drilling waste; however, the volume of that waste differs according to the depth and diameter of the wellbore. Therefore, the proper management of drilling waste is necessary to eliminate its dangers. Furthermore, many governments and international conventions began issuing regulations and standards for more enhanced drilling waste management, according to a paper entitled 'Drilling Fluid Waste Management in Drilling for Oil and Gas Wells,' that was published in the Italian Association of Chemical Engineering (AIDIC).

DRILLING FLUID IMPACT ON HEALTH, ENVIRONMENT

Focusing on drilling fluids or mud, such products are mixtures of fine-grained solids, inorganic salts, and organic compounds. These mixtures are dissolved or dispersed in a 'continuous phase' (i.e. the base fluid) which may be water or an organic liquid, according to a paper by International Association of Oil and Gas Association (IOGP), entitled 'Drilling Waste Management Technology Review.'

Consequently, there are four main types of drilling fluids: Water Based Drilling Fluid (WBDF), Oil Based Drilling Fluid (OBDF), Synthetic Based Drilling Fluid (SBDF), and Pneumatic Drilling Fluid. These four types differ mainly in their composition and application. It is worth noting that, in order to have a proper selection for drilling fluid, one must consider multiple factors such as safety, economic considerations, technical performance, and environmental impact.

Health

Exposure to drilling fluid can cause adverse health effects. The extent of being influenced by such fluids highly depends on "the physio-chemical properties of the drilling fluid as well as the inherent properties of drilling fluid additives, and are dependent on the route of exposure such as dermal, inhalation, oral and others," Hatem Alkilany, QHSSE Director and DPA at Maritime and Oil Services Company (Maridive), noted. Moreover, exposure to drilling fluids, in itself, is a function of duration and frequency, along with other factors such as drilling fluid temperature flow rate, well depth, well section and kinematic viscosity of drilling fluid which can influence the exposure level in the workplace. Building on that, there are different scenarios to drilling fluid exposure, such as sampling, maintenance, and inspection processes.

When it comes to negative impacts on health, the most common health effects from drilling fluid to a human's health could include skin irritation and contact dermatitis. Nevertheless, other health-related impacts such as headache, nausea, eye irritation, coughing, and inhaling aerosols and vapors, are not uncommon

Environment

Looking at the drilling fluid impact on the environment, detrimental harm could be caused if not cautious. The degree of damage on the environment vary depending on the type, dosage, and exposure duration to chemicals. Moreover, the physical and chemical properties of drilling fluid wastes determine the wastes' hazardous characteristics as well as environmental impact.

Furthermore, the direct discharge of drilling fluid may affect the ecosystem of the environment via direct toxic effects of drilling waste, smothering organisms, and anoxic conditions caused by microbial degradation of the organic components in waste.

It is worth mentioning that one of the most significant threats of drilling fluid waste on the environment is heavy metal. Heavy metal in drilling fluid discharge could potentially lead to bioaccumulation in aquatic organisms. "[Water-base mud] WBM drilling cuttings are the fragments of rock resulting from drillings and carried to the surface with the drilling fluids," Mahmoud Noureldeen, General manager of Green Plus Environmental Solutions, said, adding that "discharges of WBM drill cuttings can result in the covering of seafloor that provides habitat for some benthic organisms."

Additionally, toxicity is used to measure the impact of drilling fluid on the environment. Out of the four types of drilling fluid, OBDF is considered the most toxic type which has the most severe effect on the environment, and WBDF is the least toxic one.

CASE STUDY

A study was conducted in a paper entitled 'Environmental Risk Management and Mitigation Strategies for Offshore Gas Well Drilling Projects' in an area located in the semi-circular basin of Abu-Qir Bay with a depth of approximately 28 meters (m) and was around 23.6 kilometers (km) from the shore. The offshore development well was drilled to 3.325 m (around 11,000 feet (ft)) True Vertical Depth Subsea (TVDSS). The water depth at the proposed well is +/- 28.346 m (approximately +/- 93 ft) and the drilling operations were supposed to be done within 70 days.

During the drilling operation, drilling mud was used to lubricate the drilling string, cool the rotary drill bit, and carry the rock cuttings from the well bore to the surface. Then, the drilling mud would be transferred to isolated boxes from the rig to the contractor's base to be environmentally safe, hinder the entrance of undesirable formation fluids into the well bore, and control excessive pressure in the well bore to prevent blowouts.

The Environmental Impact

It is necessary to determine the significance of the drilling process's impacts on the environment to see the possibility of rehabilitating the environment after any damage during drilling operations and to see whether these impacts are acceptable, need mitigation, or unacceptable at all.

Air quality is one of the environmental sides that needs to be considered. As a result of the project activities, many emissions were produced with an effect on the offshore atmosphere. These greenhouse gas emissions included carbon dioxide (CO_2), methane (CH_4), nitrogen oxides (NOX), Sulfur dioxide (SO_2), carbon monoxide (CO), and volatile organic compounds (VOCs). These emissions resulted from many sources including marine vessels, machinery and equipment.

Another impact to consider is water quality. Drilling activities were assessed to have an impact on the environment of seawater as well as its biological life. The features that affect the seawater environment include aqueous discharges to the sea of drilling cuttings, drilling fluids, in addition to water-based mud drill stem tests. The discharged drilling fluid and cuttings contain concentration of metals which have a limited bioavailability to marine organisms because of their composition. Furthermore, oil spills may occur, and any spills without treatment will have a short-term and long-term effect on the existing marine ecosystems.

Mitigation Measures

Mitigation measures are needed in order to minimize the negative impacts of drilling fluid. For instance, many measures can be taken to enhance air quality. These measures include employing dust suppression measures and prohibiting waste burning on the site. In addition, all machines must be maintained under the manufacturer's standards to ensure operational efficiency.

When it comes to water quality, the contaminated drainage must be treated with an oil or water separator. Also, waste from sewage water must be treated as well to reduce the concentration of organic material prior to discharge. Besides, all solid wastes must be transported to shore for water disposal. In addition, prompt containment using floating booms and other means of recovery will be performed as a quick response to oil spills.

In order to mitigate the negative impacts of drilling fluid, it is better to use Barite (or Barium Sulfate) with a very low concentration of heavy metals to ensure that the mud is environmentally safe, as well as using a closed circulation system for drilling mud.

All risks related to the installation of the rig and its operational support facilities should be considered to eliminate the hazardous impacts on the environment and the working staff. It is worth noting that the hazards from spills are covered by Abu Qir's formulated oil spill contingency plan. Therefore, the main strategy adopted to minimize the occurrence of adverse impacts should include a minimal use of hazardous materials in drilling fluids, near zero discharge of effluent from drilling operation, as well as implementing safety measures and monitoring activities to ensure that contamination does not occur.

MANAGEMENT ROUTES

There are various ways to manage drilling fluid waste and protect the environment from its dangers. These ways include direct discharge to the sea, application to land, re-injection, on-site dewatering, and using an offsite treatment facility.

The selection of the proper waste management method must consider economic, environmental and operational aspects of the waste management. Choosing a proper waste treatment is a crucial step to implement before any direct discharge to sea takes place, according to Alkilany, the "sea discharge may prove to be the most economical option, considering immediate cost of disposal, but the decision must also consider environmental impact, local regulations and operational aspects such as additional equipment for treatment."

Speaking about drilling fluid cuttings, "[they] should be collected in specially designed cuttings bins and sent to the treatment site for special treatment," Noureldeen said, adding that "specially designed cuttings bins (Certified to BS 7072 standards) are filled using cuttings transfer pump in an area having a purpose-built platform equipped with appropriate spill containment. All the bins are sealed after filling on the rig. The capacity of each bin is 6.0 metric tons."

Moreover, any drilling cuttings received and did not comply with the conditions of the site license, "are either rejected and returned to the producer or they may be offloaded in the designated quarantine area while investigations are completed," Noureldeen pointed out, clarifying that "drilling waste is not received at the site unless there is appropriate equipment and plant to ensure its safe handling and containment."

Hence, accepted drilling wastes are stored in on-site tanks, and the bins are then transferred to the bin washing area for cleaning before reuse, Noureldeen explained, adding that "the bin washing area is designed in way to ensure that all wash water drains down towards the collection sump, thus preventing contamination of surrounding soil and groundwater."

Considering the vitality of protecting the workers' health from the negative impact, many measures can be implemented. The first method is through eliminating the hazardous materials in drilling fluid to reduce workers' exposure to risk during drilling operation. Also, using low toxicity drilling fluid or WBDF to reduce the carcinogenic hazards can have a positive impact. In addition, the design of the workplace should include engineering controls, such as ventilation system and enclosed drilling fluid circulation system, to minimize workers' exposure to hazardous substances.

Moreover, monitoring the level of exposure by conducting the air monitoring and skin monitoring can manage the human's exposure impacts. Furthermore, one of the most effective ways to have a significant control is personal protective equipment, like mask, rubber glove, splash goggles, rubber boots and coveralls. Such equipment acts as a protective barrier to the workforce.

It is worth noting that international oil companies (IOCs) have a vital contribution in eliminating this issue, "IOCs, represented by the IOGP, developed standards for the management of drilling waste including drilling fluids. It is a moral and ethical responsibility on the shoulders of IOCs to implement these standards as well as the local and national standards – whichever is more stringent – consistently in their operations worldwide regardless of the activeness and ability of the law enforcers to inspect the implementation," Gado commented, adding that "saying something and doing something else will give the workers the impression that their employers do not care about them and will reflect on them by ignoring the implementation of any other HSE standard."

In conclusion, drilling fluid waste management represents a cornerstone to ensure that the HSE standards are implemented appropriately. Thus, such standards will help protect the environment and the workers' health from different hazards.

MARINE LIFE PROTECTION IN THE OIL AND GAS FIELD

BY **RANA AL KADY**

GENERAL OVERVIEW OF THE ENVIRONMENTAL IMPACTS OF OFFSHORE DRILLING

To begin with, the oil and gas sector is known to have some of the most prominent and paramount projects that are often located offshore. It is important to note that Egypt is home to some of the largest oil and gas projects in the region. In fact, Egypt aims to become the regional natural gas hub in the coming years.

To elaborate, according to the Ministry of Petroleum and Mineral Resources, Egypt is looking to expand its offshore market through the development and operation of 11 exploration and production (E&P) projects by fiscal year (FY) 2019/20. Such offshore projects are expected to be set in various locations including the Mediterranean Sea, Gulf of Suez, Delta, as well as the Western Desert. The implementation of such projects is expected to increase the country's production by nearly 32,000 barrels per day (b/d) of crude oil and condensates, along with approximately 2.5 billion cubic feet per day (bcf/d) of natural gas.

While Egypt's oil and gas industry is expected to thrive even further in the future, there is an important feature that has been drastically overlooked in the implementation of offshore projects: the preservation of marine life. Offshore developments negatively impact marine life during all stages of the project. There are various endangered species living in the Egyptian offshore territory; these include turtles, sea cucumbers, coral reefs, mangrove trees, and even certain species of birds. From drilling to commissioning, the preservation and conservation of any and all living creatures must be taken seriously in order to ensure that no harm comes to such endangered species.

ENDANGERED MARINE LIFE IN EGYPT

Essentially, Egypt is home to a multitude of species of marine life. In fact, the Red Sea alone contains more than 1,200 species of fish, 800 species of mollusks, 600 species of crustaceans, 200 species of coral reefs, and 300 species of birds; of such species, 17% of the entire world's marine life is located in the Red Sea alone. For this reason, it is absolutely crucial to ensure that the life cycle of all living creatures continues without negative human intervention in natural phenomena.

While there is an abundance in marine life species along the coasts of Egypt, it should be noted that there is a rapid and steady decline in the number of marine creatures and their respective habitats. As a matter of fact, there has been an overall decline in the number of fish species by nearly 23% over the course of the 21st century. While this value may not necessarily be alarming to many, the truly perturbing fact is that this decline is expected to continue unless strenuous actions and legislations are implemented. For this reason, it is imperative to make others aware of the potential implications of offshore oil projects to minimize the harm caused to any and all marine life.

To elaborate, all living creatures can be categorized into two main categories: invertebrates (animals without backbones or a skeleton) and vertebrates (animals with skeletons and/or backbones). On one hand, vertebrates are considered to be inclusive of mammals, birds, and fins (i.e. fish species). On the other hand, invertebrates include species such as insects, molluscs and crustacea (i.e. crabs and shrimps), echinoderms (i.e. sea urchins), etc. In Egypt, it was found that there are 43 endangered species of vertebrates and 3 endangered species of invertebrates.

As a whole, marine biodiversity in Egypt has reached nearly 5,000 species; this is not inclusive of the hundreds of predicted unrecorded species yet to be found in the volatile underwater environment. Therefore, it can be noted that there are multiple species that are on the very brink of extinction and they must be preserved to ensure the ecosystem is not disturbed in anyway by manmade interruptions.

OFFSHORE DRILLING AND ITS IMPACT ON MARINE LIFE

There are many ways in which deep-sea drilling impacts the marine environment. Typical deep-sea drilling activities can have deleterious effects throughout the main phases of the project, including exploration, production, and decommissioning. While the environmental impact of exploration typically takes place onshore, production-related activities affect marine environment via drill cutting, drilling fluids, and anchor chains. However, the most impactful phase of the project on marine environment is the decommissioning phase; this is mainly due to the fact that contaminants and by-products could be released in the sea bed at over 1,000 meters below sea level.

Also, what may seem like minor inconveniences to others are actually major inconveniences for marine life. For instance, in order for any drilling to take place, sufficient lighting of the underwater area is required via electric lighting or gas flares. By installing artificial lighting at sea bed level – where there is a lack of light – predatory creatures are attracted to hunt prey that depend on the darkness of the sea bed for survival; this human intervention alters the ecosystem as prey will be left to be hunted or flee from their present habitats. Usually, this example includes large squid and fish species hunting smaller fish and plankton.

Another example of how offshore drilling could affect marine life is through the emissions released from operational gen-sets. To be precise, the gen-sets operating on the offshore rig platforms produce greenhouse gas emissions that are released into the atmosphere. This phenomenon, in turn, affects birds flying overhead either for migratory or hunting purposes. The smoke from the chemicals released affects the air quality, which forces birds to alter their flight paths and/or look elsewhere for food. While this may not seem to affect marine life, the fish that are usually hunted, now accumulate and feed on other smaller species; this indirectly alters the ecosystem of underwater species.

Artificial lighting is only one example of many features of offshore drilling that negatively impact marine life, such as noise levels from drilling, habitat invasion, fluctuating temperatures, and even changing water content from waste by-products. For this reason, it is important to ensure that routine environmental inspections are regularly carried out to mitigate any unnecessary environmental complications.

REGULATIONS AND CONCEPTS TO CONSERVE AND PROTECT THE ENVIRONMENT

Currently, there are various strategies and plans enforced by the Egyptian Environmental Affairs Agency (EEAA) under the umbrella of the United Nations Environmental Program (UNEP). To be specific, the "Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean" is an action plan created to ensure the protection and conservation of any and all forms of marine life via stringent protocols. In general, permits and approvals must be attained directly from the EEAA before oil and gas companies get the greenlight to start on projects that may have negative impacts on the environment.

The main aims of the convention are to assess and mitigate marine pollution, enhance the marine environment, contribute towards a more sustainable environment, protect natural and cultural heritage, and strengthen ties between Mediterranean coastal states. In fact, Article 30 of the convention specifically aims to combat harmful substances deployed into the sea.

For instance, deep-water oil and gas projects often lead to the production of crude oil emulsions (i.e. the mixture of oil, water, and gas products). Emulsions could fatally affect marine life and even damage their respective habitats. As suggested by Oil and Gas Consultant, Mahmoud Shawkat, "Technically, Hydrocarbon production is usually associated with water where emulsion exists. This needs treatment before dumping into the sea or recycling for water injection to get rid of the residual oil. This is one part; the other is deep-water drilling is challenged with surface hole drilling where collecting the return mud is difficult and needs RMR technology. Otherwise, dumping to the sea is the end result; thus, marine life become victim of those dumped chemicals." For this reason, if properly handled, emulsions can be properly gathered and disposed of efficiently via separation of the water from the oil, treatment of the water, and its correct disposal.

Consequently, there have been cases in the past that, when properly analyzed, can be used as useful lessons to learn from and avoid in the implementation of future projects. For example, in 2010, an oil spill occurred north of the Red Sea. However, due to delayed action to clean up the spill, the spill had reached nearly 20 kilometers (km) along the coast, which made it more difficult to control and contain. Despite this, there are laws that have been previously implemented and then amended to ensure Egypt's preparedness for situations in which

unforeseen oil spills or sea pollutions of any kind occur. To be precise, Law Number 4 of 1994 contains Article 55 in which it is mentioned that in the event of an oil spill, the relevant administrative authorities should be notified immediately to take the necessary actions to keep the incident under control. Therefore, it can be concluded that the regulations enforce the handling of pollution to guarantee the preservation of the marine life ecosystem.

RECOMMENDATIONS AND CONCLUSION

In terms of recommendations, there are many steps that could be taken into consideration to preserve and keep marine life ecosystems intact. For instance, before any project begins – whether onshore or offshore – an environmental expert must carry out an Environmental Impact Assessment (EIA). An EIA allows the oil and gas company to understand the risks that could be avoided throughout all stages of the project. When carried out efficiently, an EIA can also reduce liabilities that a company could have, especially when coming into contact with endangered or threatened species; not only that, but the company will also be provided with a detailed report with recommendation on how to approach the project in an efficient manner without compromising the ecosystem of marine life.

It is only once officiated permits and licenses are granted should the company proceed with the project. According to Deepwater Drilling Consultant, Youssef Sallam, “In order to ensure that no environmental liabilities occur, it is the responsibility of the Environmental Engineer or expert to ensure that the project at hand complies with the relevant governmental authority to seek approval against national environmental codes and regulations. Each zone in Egypt has its own set of regulations that must be complied with.”

In conclusion, marine life ecosystems are often overlooked as they are not seen as the top priority of a project, with regards to offshore-based projects. Therefore, steps must be taken to establish that all ecosystems are preserved and protected regardless of the project’s size or importance. In doing so, not only will the preservation of endangered species be controlled, but the future of the environmental ecosystems is protected from pollution via waste, air, or even water.

OSHA: PUTTING PROCESS SAFETY MANAGEMENT INTO MOTION

BY **DINA EL-BEHIRY**

For many decades, the oil and gas sector has witnessed the occurrence of many accidents. The mounting number of these incidents rang the alarm bells for the sector's experts to work on ameliorating the standards of Health, Safety, and Environment (HSE) in order to eliminate these catastrophes.

With an eye on the "S" part of HSE, it was found that there are two types of safety incidents: process safety and occupational safety. Process safety is considered more dangerous than the occupational one as it results in fire, explosions, and releases, which in return affect the whole HSE system, according to a paper entitled 'Effective Implementation of Process Safety Management.' Since the business's success is contingent on lowering risks, an effective process safety management (PSM) becomes an imperative need to abate unsafe practices and prevent disasters.

Therefore, many PSM systems were created. One such system is the Occupational Safety and Health Administration (OSHA), which was created by the US Congress under the Occupational Safety and Healthy Act of 1970. OSHA set standards for managing hazards associated with work processes to ensure the availability of safe and healthful working conditions for the sector's workforce.

Another PSM system is the Center for Chemical Process Safety (CCPS). The CCPS was created under the supervision of the American Institute of Chemical Engineers (AIChE), and it was adopted by several companies to control their processes.

OSHA, CCPS: THE BIGGER PICTURE

Each PSM system includes a set of elements. The implementation of these elements varies according to the criteria of the executing organization.

When it comes to OSHA, the Clean Air Act Amendments (CAAA) specified 14 elements that OSHA requires employers to implement, according to a 'Process Safety Management' paper by the US Department of Labor (OSHA 3132).

The first element concerns employee participation, which requires employee involvement in the development and execution of the PSM program, especially when it comes to hazard assessment. The second is process safety information, under which

the employer has to compile information related to chemical hazards, as well as the equipment and technology involved in processes. The third is process hazard analysis that requires the employer to conduct accurate analysis of hazards using analysis techniques, with identified teams and recommended measures to mitigate such hazards. The fourth is the development and implementation of written operating procedures for processes over all phases of operation. The fifth focuses on training, as employers are mandated to provide all involved contractors and employees with appropriate training before beginning any process to ensure safe work practices. The sixth concerns contractors; all contractors involved directly or indirectly in processes must be evaluated to affirm that they have the appropriate capabilities as well as a safety history. In addition, all contractors involved in the process must receive proper training prior to commencing operations.

The seventh element is pre-startup safety review, which focuses on performing a detailed review of any new or modified system to ensure that the design is suitable, the construction adheres to the design specifications, the availability of operating procedures, that training and process hazard assessment are complete, and all process safety information is accurate. The eighth focuses on mechanical integrity which entails developing and implementing a methodical program for performing appropriate maintenance to discover any deficiencies in equipment.

The ninth involves hot work permits, which includes developing a formal program to prevent fire and explosions from occurring while conducting hot work, including welding, cutting, brazing, grinding, etc. The tenth is management of change, which institutes documented procedures that aim to ensure safe system operation when changes occur to the system.

The eleventh element entails incident investigation to ascertain the causes behind incidents and develop recommendations to prevent them in the future. The twelfth is emergency planning and response, under which employers put in place plans to face emergencies that may arise in the facility. The emergency plan has to include notification procedures, escape routes, alarm systems, and plant-wide training. The thirteenth concentrates on compliance audits, which involves evaluating a PSM program with an implementation extent of three years at least. The audit process must certify that the plant is in compliance with the standards. Finally, trade secrets, which allow employers to protect their processes that are considered as trade secrets.

With an eye on the CCPS system, it includes 20 elements. Some of which are similar to the OSHA elements and others are not. For the dissimilar elements, the first one is about process safety culture, under which the CCPS system focuses on developing and sustaining the organization's culture to determine the manner in which process safety is managed. Another element is maintaining process safety competency to encompass three interrelated actions, which are continuously improving knowledge, ensuring the availability of appropriate information, and the application of what has been learnt. For stakeholder outreach, it is a process for seeking out individuals or organizations that can be affected by the company's operations, establishing a relationship with community organizations, and providing accurate information about the company and its facilities. Another dissimilarity is the conduct of operations; conduct of operations is the execution of operational and management tasks in a structured manner which is closely related to the organization's culture. The CCPS also includes measurements and metrics to establish performance and efficiency indicators to monitor the effectiveness of the management system. A final dissimilar element is management review and continuous improvement to determine whether management systems are performing as intended and producing the desired results as efficiently as possible.

PSM IN EGYPT

The Ministry of Petroleum and Mineral Resources pays great attention to the enhancement of the HSE standards. That is why key industry leaders began discussions about the importance of improving the process safety system within the sector's companies to be in line with the ministry's vision and cope with the international standards for a more sustainable future. As a result, OSHA system was selected to be the main standard followed in Egypt.

Additionally, the Ministry of Petroleum launched a program including 74 young engineers and chemists from the HSE departments of several oil and gas companies. The participants managed to enroll in the training program after passing qualification tests. Moreover, they managed to finalize the first phase of the program.

Launching such programs aims to enhance the abilities of the oil and gas sector's young professionals and support their talents, which is considered a main pillar in the Modernization Project.

As a reinforcement initiative to the vision of the Ministry of Petroleum and the Modernization Project, Egypt Oil & Gas launched the HSE Subcommittee. The HSE Subcommittee aims at ensuring that HSE standards are incorporated across the Egyptian oil and gas sector, as well as raising the level of awareness among the sector's workforce.

Since slips, falls, and other incidents are likely to occur in the oil and gas workplace, it is vital to ensure that work environments are safe for all employees, and following a specific standard will guarantee that.

PROCESS SAFETY CAPABILITY MODEL:

AN ASSESSMENT TOOL FOR PROCESS SAFETY PERFORMANCE

PREPARED BY **DINA EL-BEHIRY**

The level of maturity differs among organizations. Based on that, mature organizations do things orderly, while immature ones strive to accomplish things in that manner, but do not always succeed. That is why the maturity level of organizations contributes greatly in setting their goals, especially for process safety improvement. Thus, to measure an organization's ability to achieve its goals, the company relies on Key Performance Indicators (KPIs). KPIs, in essence, assess vital monitoring based on risk control systems, which further affirm a company's continued effectiveness.

Hence, when an organization faces a series of deficiencies within critical risk control systems, significant accidents take place. The occurrence of major accidents indicates that there is a gap in the risk control system; whereas such a system is supposed to be a safeguard within the process safety management system.

Therefore, many models were implemented to improve process safety management, one of them is the Process Safety Capability Maturity Model (PSCMM). The PSCMM aims to assess process safety KPIs implementation processes.

The PSCMM is explained in a paper entitled 'A Quantitative Assessment Tool for Process Safety Performance by Implementing A Proposed Capability Maturity Framework.' The paper was published in the International Journal of Safety Science, Volume 03, Number 01 in 2019, by Walaa Shehata, Fatma Gad and Ahmed Bhran from the Department of Petroleum Refining and Petrochemical Engineering, Faculty of Petroleum and Mining Engineering, Suez University, and Hamdy Faroun from Zeit Company.

METHODOLOGY

a) Process Safety Capability Model

The proposed PSCMM is a framework that provides oil and gas organizations with improvements recommended to increase their process safety capability.

The model mainly targets highlighting the strengths and weaknesses in the process safety performance implementation process. In addition, the model focuses on activities needed to launch a continuous improvement program within an organization. The model can also be used as a guide to improve process safety performance in an organization.

The PSCMM consists of two stages; the first one is Performance Assessment Score (PAS), and the second is Continuous Improvement.

PAS is a tool used to assess process safety performance, which depends mainly on analyzing the effectiveness of each stage in the implementation procedures of process safety. PAS uses numerical terms to express the results of the assessment. There are three components forming PAS, which include dimensions in the present work, aspects of each dimension, and template with scale for determining numerical values for different aspects as a measure of the effectiveness in each dimension.

The assessment method is based on four dimensions which are scope, quality, time, and implementation team. In order to measure the effectiveness of the implementation process in the system, each dimension is characterized quantitively on a discrete scale from zero to 10. It is worth noting that in the implementation process, some dimensions matter more than others, especially those which include different aspects like scope and quality. For instance, in this study, seven oil and gas experts (health, safety, and environment (HSE), maintenance, production, marine, facilities, operation, and asset integrity managers) weighed the dimension's effectiveness. The experts voted with 35% for scope, 35% for quality, 15% for time, and 15 % for implementation team. The PAS users can select other percentages based on the organizational circumstances.

The continual improvement process, the second stage of the PSCMM, plays an important role in helping organizations to develop and putting them on a maturity ladder. The higher the organization's maturity, the lower the variances between actual and targeted results. High maturity levels help organizations take the advantage in raising process safety efficiency, decrease cost and reduce development time.

b) Develop Process Safety KPIs

The PSCMM used in this study is used to assess the effectiveness of process safety KPIs. KPIs are used to analyze the functioning of risk control systems to assess the safety performance of oil and gas organizations. Each risk control system contains too many elements to be measured, yet main items need to be considered, such as the performance indicator of each risk control system.

Under the PSCMM, PAS values are compared with the calculated KPI values of the risk control system for each program to determine whether these values match. If the values match, the KPI of the risk control system is effective. If not, the safety performance needs to improve.

CASE STUDY

An industrial case study is used to assess the applicability of the PSCMM. The data was collected from the database of Global Maintenance System (GMS) owned by an oil and gas joint venture (JV) company that operates numbers of offshore and onshore oil fields. The company is certified as conforming to ISO 9001:2008, ISO 14001:2009 and OHSAS 18001:2007. The data mainly describes the total issued work orders, pending work orders and under execution work orders for each risk control system. The scope of the study is to, first, locate the organization in the maturity ladder and uncover the weaknesses of each risk control system using PAS tool. Second, to apply KPIs for risk control systems, calculate the systems' performance indicators, and carry out the gap analysis. Finally, to evaluate the effectiveness of the process safety KPIs implementation method.

After carrying out the analysis throughout the above-mentioned steps, the analysis indicated that the risk control program is incomplete although the management system is certified as conforming to ISO 9001:2008, ISO 14001:2009 and OHSAS 18001:2007.

The study proposed the PSCMM to monitor risk control systems by developing process safety performance indicators, setting targets, noticing its deviation and raising an alarm to the senior management for corrective actions. The failure of the organization to manage the risk control systems indicates that the organization is in a systematic decline of conditions and safe operations.

CONCLUDING REMARKS

Many oil and gas companies found out that there are many reasons behind inefficient implementation of process safety KPIs. The most important one is that there are no effective tools to assess the functioning of the process safety KPIs implementation.

Therefore, the main objective of this study is using the PSCMM as a framework for evaluating the process safety KPIs implementation. What distinguishes this model is the systematic assessment of the effectiveness in all steps of process safety KPIs, as well as having numerical measures that can help in improvement.

THE SAUDI ARAMCO ATTACK EXPLAINED

BY **MAI EL GHANDOUR & TASNEEM MADI**

A burgeoning Middle Eastern conflict is putting the world's energy security under threat. After Saudi Aramco, the world's largest oil producer, was hit by drones, the global supplies were bound to be disrupted and prices to skyrocket. The conflict has many ambiguous and cascading effects that are yet to be explained.

EFFECTS ON THE MACRO AND MICRO LEVELS

On September 14, Saudi Aramco's Abqaiq plant suffered its deadliest attack, where 50% of the country's global supply of crude oil was obliterated. An Aramco statement said that 5.7 million barrels per year (mmbbl/y) of crude was suspended by the attack, which is more than half of the Kingdom's output and about 6% of global oil supply, as mentioned in the Daily Mail Online on September 2019.

Abqaiq, the Kingdom's largest oil processing facility, was said to be the world's most important piece of oil infrastructure, built to generate about 7 million barrels per day (mmbbl/d) of oil, to be shipped to foreign markets.

Aramco produces one in every eight barrels of crude oil globally. In 2018, the company produced 13.6 million barrels per day of oil equivalent (mboe/d), including 10.3 mmbbl/d of crude oil (including blended condensate). Furthermore, the company's net refining capacity as of December 31, 2017 made it the fourth largest integrated refiner in the world.

It is worth noting that Saudi Arabia is the second largest OPEC member country. Saudi exports value reached $294,544 million in 2018. Petroleum exports recorded $194,358 million, which represents more than 65% of the total Saudi exports. Crude oil exports recorded about 7,371.5 b/d, and other petroleum products exports reached 1,971.2 b/d in 2018.

Due to geopolitical tensions, the Kingdom's vulnerable economy, and Aramco's attacks, Fitch Ratings downgraded Saudi's long-term foreign-currency issuer default rating to 'A' from 'A+'.

THE AFTERMATH

The strike on Aramco was a symbolic blow against the Kingdom's oil riches and the centerpiece of Crown Prince Mohammed bin Salman's plans to revamp the Kingdom's economy.

Oil prices rose after the attacks, but prices began to decline after Saudi Arabia said it would restore production losses by the end of September, predicted by the Energy Minister Prince Abdul-Aziz bin Salman. In the beginning of October, the Saudi Minister of Energy did in fact announce that Saudi Arabia restored its gas production. Since then, Saudi Arabia's ethane gas production has now reached 900 million standard cubic feet per day (mscf/d), while current local demand stands at 940 mscf/d. The reduction in ethane production was 4.5%, as cited in the Saudi Press Agency (SPA).

DISPUTES WITH HOUTHIS

A rebel group based in Yemen called the Houthis claimed responsibility for the attack. The Houthis' history dates back to the 1990s, when a group called Shabab al-Muminin (the Believing Youth) worked to raise awareness about the Zaydi branch of Shiite Islam.

The Houthis power appeared in 2015, when they participated in a civil war that severely ruined Yemen against Hadi supporters, who are backed by a Saudi-led international coalition.

The Houthis stated that the Kingdom's intervention in the Yemeni war more than four years ago is the reason that triggered their attack. The Saudi-led bombing warfare has exacerbated the world's worst humanitarian crisis and devastated the Yemeni land beyond repair.

ARE THE HOUTHIS LINKED TO IRAN?

Aramco's incident is not the first time that Houthis have attacked Saudi Arabia. In fact, the extremist group's attacks have become more frequent in recent months, leading to Saudi accusations that Iran has prodded the rebels into opening a new military front.

The Houthis have acknowledged their alliance with Iran but denied acting on Tehran's orders. A Houthi military spokesman, quoted by the rebel al-Masirah news channel, said the group's attacks on Saudi Arabia would expand and become "more painful as long as its aggression and siege continue."

A weapons shipment in the Arabian Sea was intercepted in February, 2013. The shipment was yielding rifles, rocket launchers, anti-tank guided missiles, and munitions, which appeared to have passed through a route from Iran to Yemen. The nature of the attack reflects that it was not organized nor supported by Yemen. Moreover, two anti-tank guided missiles in Yemen appear to have been manufactured in Iran during 2016 and 2017.

Iran refused the accusations regarding arming the Houthis. The remains and wreckages of the drones and missiles used in their attacks are too sophisticated to be produced domestically by the Houthis and have never been seen in Iran as well. Here comes the question: Is there any possibility that Iran might be designing, testing, and producing missile systems for the Houthis secretly?

EXPECTATIONS

The Saudi Minister of Finance, Mohammed Al Jadaan, stated in an interview with Reuters that the GDP will be much lower than expected, without giving any forecast for GDP growth rates in 2019. The International Monetary Fund (IMF) declared that the Saudi economy could grow by 1.9% in 2019, less than 2.2% in 2018.

Brent crude was estimated at $60 per barrel just before the attack. However, such shortfall could send oil prices possibly spiking toward $100 a barrel.

While, the Institute of International Finance (IIF) predicts that the uncertainty in the price of oil for the rest of 2019 and 2020 remains high, and despite the high uncertainty resulting from the drone attack in Saudi Arabia, the price of Brent oil futures ending December 2020 remained unchanged at $60 a barrel.

With growing animosity between Iran and Saudi Arabia, along with a war-torn Yemen in the neighborhood, the Gulf is now teeming with tension. Robert McNally, a former national security aide on energy matters for President George W. Bush, was quoted saying, "Until the attack, the oil market had been complacent about geopolitical risk and was even focusing on the possibility that President Trump could ease oil sanctions on Iran," McNally wrote. "The question is how much of a premium will be added to the oil price."

HYDROCARBON FLOW MEASUREMENT

According to DNV GL's most recent annual Energy Transition Outlook, the MENA region will supply the majority of the world's hydrocarbons until at least 2050. A key focus area for the industry will be to ensure safe and efficient operations for decades to come. Accurate measurement of gas, oil, and multiphase flows can have significant contribution to ensuring profitable operations. **ARE YOU PREPARED?**

The accurate measurement of gas, oil, and multiphase flows is one of the challenges for companies along the entire hydrocarbon value chain worldwide, and Egypt is no exception. In the upstream sector, allocation measurements can get complex due to unstable production processes, wet gas, or multiphase flow conditions. Operators in the midstream sector face fiscal metering challenges on a large scale due to the sheer number of their assets and the challenges of keeping these installations accurate and compliant with contract requirements. At the end of the value chain, the large gas users, such as the feedstock and petrochemical industries as well as gas-fired power plants want to be ensured of correct billing for what is delivered.

CAN YOU ANSWER THESE KEY QUESTIONS?

1. There is a tremendous pressure on OPEX and CAPEX these days. How can you make sure the solutions you are implementing are fit for purpose and how do you minimize the risk?

2. With a wide range of existing and emerging metering technologies, how do you determine what is suitable for the hard and often specific conditions you are facing?

3. Operating conditions are often non-universal, in terms of flow rates, pressures, temperature, viscosities, salinities, and more. This renders it difficult to share experiences with others. How do you find an independent partner that can advise on your way forward?

DNV GL is a trusted global provider of verification and advisory services along the entire oil and gas value chain. Our experts help clients all over the world to overcome flow measurement challenges.

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INTEGRATED PROTECTION AND DETECTION

A HOLISTIC APPROACH FOR CRITICAL INFRASTRUCTURE PROTECTION

BY FRANK BEYER, ILF CONSULTING ENGINEERS

The physical, electronic and operational security of critical infrastructure is subject to a wide range of threats. A significant increase in attempts to manipulate the related operation technology (OT) systems can be observed. The attacks against a Ukrainian power grid can be taken as an example of what such attempts look like. They are usually a combination of several coordinated activities, with the aim not only to provoke maximum damage to a system and to destroy the security of supply, but also to hinder response and recovery/restoration works as long as possible. Another example is the attack against a safety integrated system of a process plant using a tailor-made malware. This shows that not only the basic process control systems, but also the emergency shutdown systems are the subject of dedicated attacks.

Sophisticated attacks often bypass traditional security measures and have the potential to disrupt the production process, cause spills or product contaminations, destroy process equipment and endanger human life. Isolated technological, administrative or organizational measures cannot stop such attacks. A holistic approach is required to protect assets, detect attacks, and restore normal operation.

Such an approach to secure the facilities should cover at least the following aspects: development of an integrated security management system, provision of a robust system design, definition of required physical security measures, and development of cyber security measures for information technology/operation technology systems.

The approach starts with an in-depth system evaluation of all assets belonging to the critical infrastructure and the physical, electronic, and organizational measures in place or planned to protect these assets. Such a review, in addition to all the technical facets, also includes a verification of related policies, operation and maintenance procedures, administrative procedures, security rules, response plans and recovery procedures, as well as the business continuity plan.

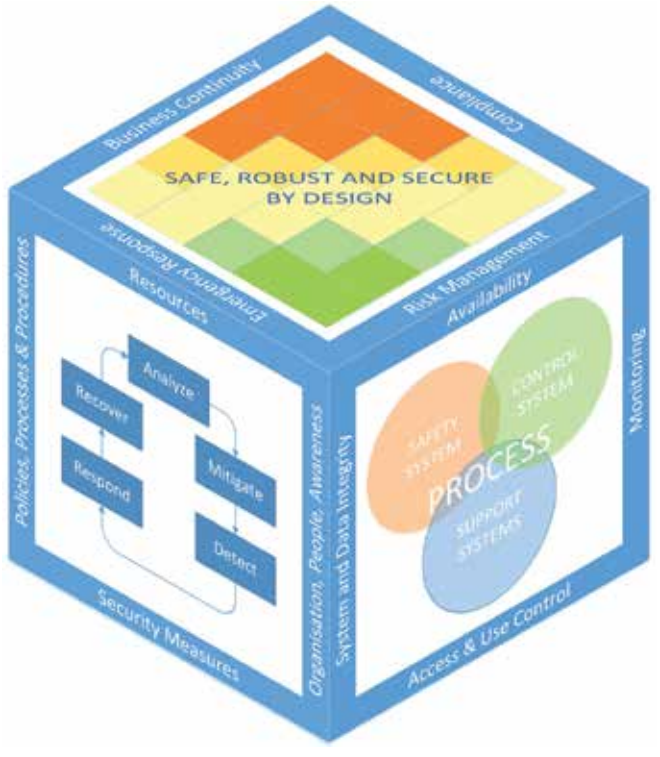
The protection line will only be as strong as the weakest link in the chain. A sophisticated cyber security system would, for instance, be useless if clear access regulation to the critical infrastructure is not in place.

An up-to-date asset inventory and a complete system documentation are prerequisites for a risk assessment and the definition of required security measures. If no (up-to-date) asset inventory or system documentation exist, a dedicated internal project may be required to implement an asset inventory system and to update all relevant documents. If not yet available in digital format, this should be ideally combined with a document digitalization project.

Usually all political, environmental, socio-cultural, technical, and economic risks are part of a safety risk assessment; for example: quantitative risk assessment (QRA), hazard identification (HAZID) studies, and hazard and operability (HAZOP) studies, as well as security incident reports.

In light of critical infrastructure protection, it is necessary to amend these standard approaches in order to tackle physical and cyber-physical attacks against it. Known attack goals, techniques, their impact on security and safety, as well as the probability of detecting the attack, should be considered in an attack-tree as a guideline for the system design. In particular, politically motivated and state supported attacks are often characterized by the availability of significant financial and human resources to cause substantial damage to a critical infrastructure.

It should be noted that the approach to protect critical infrastructure has to cover not only the operation period but also has to include all project phases, starting from first feasibility studies through to front-end engineering design (FEED), implementation, and commissioning.



The approach shall be supported by a security master plan that addresses corporate social responsibility (CSR), cooperation with the intelligence community, risk and hazard management, and response planning (including public security forces). In addition, the master plan must consider the implementation of security measures that allow for detection of threats and the coordination of responses in time, disaster recovery, and business continuity planning, as well as the training of all involved parties to assure a secure operation.

INTEGRATED SECURITY MANAGEMENT SYSTEM

A security management system has to be implemented to coordinate all components, internal processes, and all aspects of corporate security.
An integrated approach is required to manage the related risks, resources, policies, procedures, performance reviews, the continuous improvement process, and interfaces with other (management) processes, such as: definition of roles and responsibilities, location, and technical installations to be covered; definition of expectations, goals and frame conditions, and integration with existing security systems and elements; definition of scope and area of application, physical/technical as well as cyber security; definition of policies, procedures, measures, and work instructions; performance review and continuous improvement; and training of employees, contractors, etc.

By conducting a business impact analysis, an alignment of the security management system with emergency response plans and business continuity plans has to be developed. This process entails to: identify business- and safety-critical processes; define priorities for system and data recovery; identify resources required to operate a specific system/provide a specific service; define minimum requirements for emergency operation and select the most suitable response strategy; define processes and technologies that a computer emergency response team can use to identify, categorize, investigate, and remediate adverse security events; document procedures, plans, measures, etc.; and finally, prepare test and training plans.

As a result, an integrated security management system will be developed and will come into force for the entire lifecycle of the critical infrastructure.

ROBUST SYSTEM DESIGN

A safe and robust system design is key for certain resilience of the critical infrastructure against a wide range of threats. The review of an existing design, or the development of a new design, mainly relates to: geographical area/corridor, the relevant separation distances/zones, and evaluated environmental impacts; location of/distances between all facilities and achievable response times; all relevant protection systems, e.g. relief systems, fire and gas detection systems, firefighting systems, and alarm management system; and emergency response/ recovery/fall-back strategies.

For the development of a robust system design it will be necessary to enhance the standard design guidelines by adding the following engineering guidelines: defense in depth; simplicity over flexibility; redundancy, diversity, and contingencies; implementation principles; secure supply chain; staff security; test requirements for the physical/cyber security systems, as part of the security management system; configuration and operation principles, principle of least privilege, monitor systems and networks, and response/recovery/fall-back definitions.

In light of the ever-growing risk of cyber and cyber-physical attacks, special attention shall be paid to the design of industrial control systems and safety instrumented systems, including associated networks.

PHYSICAL SECURITY MEASURES

The physical security of critical infrastructure is a prerequisite for protecting it against various threats. Based on the results of the system evaluation and the risk and hazard assessments, it might be required to implement protective structures, third-party intervention, access control and intrusion detection systems. These systems shall be designed to ensure that all aspects – including the requirements of the response teams – are properly considered in the physical design. Additional technical security systems (like video surveillance systems) shall be designed and implemented as another measure to support the overall security concept.

By using distributed fiber optic sensing systems for third-party interference (TPI) detection, even the entire pipeline corridors can be covered. The TPI detection system informs the operator and the security team about any relevant event and indicates the location on a map (e.g. based on GIS data) with an accuracy of a few meters.

CYBER SECURITY MEASURES FOR IT AND OT SYSTEMS

A cyberattack will try to use any vulnerabilities in the OT system, as well as in the communication and IT systems, to manipulate process and safety components in order to disrupt the operation process or destroy equipment.

Attack goals, well-known from the common office environment (IT system), are extended by further items related to the OT equipment. The possibility of an injection of malicious code, already on firmware level or with the shared library used for the compiling of the machine code, must be eliminated. A possible sending of fake sensor data or process control commands to controllers and OT applications, or a decalibration of sensors, need to be excluded. The protection of OT against tampering, unauthorized reconfiguration, or disabling must be ensured.

Servers and workstations within control systems run standard operating systems like Windows or Linux. Normally these common operating systems have standard security programs and services like host based/ built-in firewalls. However, manufacturers of control systems and applications often fear possible performance degradation, which leads them to deactivate these functions. Patching of operating systems in industrial environments cannot be carried out easily during normal operation, compared to the patching of operating systems in office environments.

Unlike IT networks with a component lifetime of no more than five years, requested lifetimes of OT components are in the range of decades, varying from 15 to 25 years. OT software and hardware will therefore be outdated after a certain time, e.g. due to the end of maintenance support. In combination with discontinuous patching, these systems become an easy target for cyberattacks because of the vulnerabilities and holes in such outdated software and hardware.

Any cyber security measure shall be part of the security management system and shall support the requirements of the permanent adaptation/improvement of security with appropriate tools. The focus will be on the prevention and detection of cyberattacks, as well as on the support of initiation of countermeasures. Also, a recording of all activities, regardless if an attack is successful or not, is required.

In order to achieve a reasonable level of cyber security, both organizational and technical measures need to be implemented in order to ensure the integrity and availability of all (passive and active) components that are part of safety, instrumentation, control and automation, communication and IT systems. It also includes measures and technologies required to monitor support systems.

The technical measures shall also cover: the requirements for the network design (network separation, data flow control, network devices, time synchronization, and security management); the hardening of all relevant IT and OT components (asset and configuration management, vulnerability management, patch management, user authentication and authorization, intrusion detection systems, log management system, security incident, and event management); the definition of all interfaces between the internal zones as well as to external networks (secure remote access); and the detailed back-up and recovery concept.

All organizational measures resulting from the risk assessments as well as being part of the integrated security management system, need to be implemented in the IT/ OT systems. These measures are very similar to the known requirements of a common office environment. The relevant policies are to be defined, a security officer needs to be nominated, and security checks on personnel are required.

The entire supply chain has to be secured in order to ensure that no counterfeit hardware and software is procured, and that the hardware and software are not contaminated by malware during production and manufacturing.

Basic principles include: software development lifecycle program in place; only personnel involved in the software development have access to the information, rooms, hardware, and software; applications are executed with least privileges; applications process and store only information relevant to the task; strong input validation is implemented; static and dynamic code analysis is performed by developers regularly; application captures all data about abnormal conditions; and application fails in a secure or safe way.

VERIFICATION OF THE HOLISTIC APPROACH

All security system parameters and functionalities should be verified on a regular basis during the engineering phases by design review meetings, and during the implementation phases by predefined test procedures. The test procedures need to be extended accordingly and shall cover all components of the security system, the organizational measures, plans, and work instructions defined in the security management system, the emergency response plans, and the physical and IT/OT security measures. In each of these tests, the effectiveness and practicability of the implemented measures shall be demonstrated (e.g. by a penetration test). Already during a factory acceptance test, an integrated security test procedure shall be established to verify the performance of the entire security solution. The physical protection measures will be subject to the commissioning and the site acceptance test.

Prior to the start of operation, training programs tailored to the specific installation and the security management systems are required. Only after this training can the final verification of the security management systems be completed.

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CLIMATE CHANGE AND GREENHOUSE GASES

Nowadays climate change is one of the most serious problems of our generation. It is already happening and represents one of the greatest environmental, social and economic threats facing the planet.

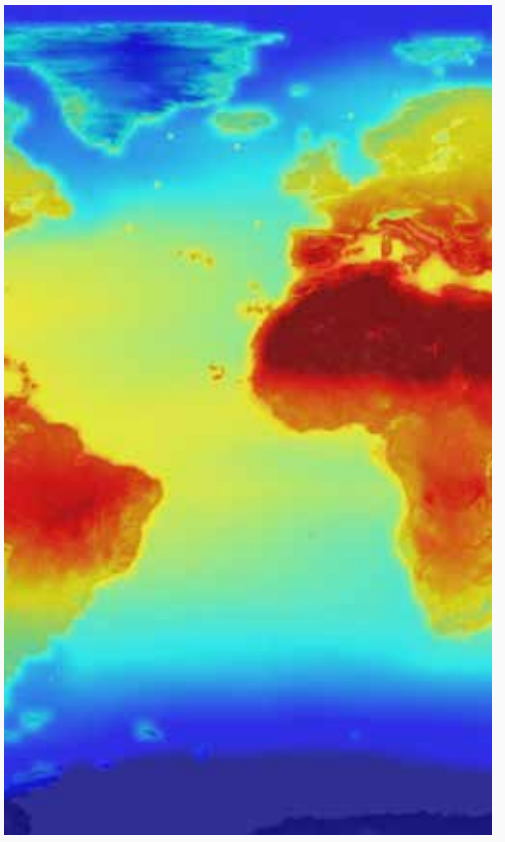
Greenhouse gases (GHGs) such as carbon dioxide (CO2), methane, and nitrous oxide exist naturally in the atmosphere. Their presence contributes to the greenhouse effect that makes life possible on our planet. The sun powers the earth's climate, radiating energy at very short wavelengths, whereas roughly one third of the solar energy is reflected back to space and the other two thirds are absorbed by earth's surface. To balance the absorbed incoming energy, the earth must radiate the same amount of energy back in longer wavelengths that are responsible for warming the planet's surface. Without the natural greenhouse effect, the average temperature at earth's surface would be below the freezing point of water.

Human activities, especially since the industrialization of the 1800s, have increased the concentration of GHGs in the atmosphere, contributing to adverse climate changes. Fossil fuels usage for energy production is one of the main drivers of climate change. CO2 roughly makes up 95% of aggregate energy related GHG emissions from most countries.

These emissions increase the warmth of the earth's climate system, which has already led to observable effects on the environment. Glaciers are shrinking, ice on rivers and lakes is breaking up earlier, plant and animal ranges are shifting, and trees are flowering sooner. Effects of global climate change that scientists had predicted in the past are now occurring; such as loss of sea ice, accelerated sea level rise, and longer, more intense heat waves.

There are new techniques that are used to mitigate the effects of GHGs such as capturing CO2 from using of fossil fuels and safely storing it underground or reinjecting CO2 into oil wells to help boost crude oil extraction. GHGs inventories are one of the most important tools in assessing the effectiveness of policies aiming to address climate change. All countries including Egypt are required to submit national reports such as national communications and biennial update reports that contain information on GHG emissions /removals data to comply with the United Nations Framework Convention on climate changes (UNFCCC).

In conclusion, I think that our governments should prioritize combating climate change as they will save a lot of resources that would be consumed to adapt to the impacts.



SHIMAA SAYED KASSEM
Head of Environmental Protection Department at the Egyptian General Petroleum Corporation (EGPC)

THE LEADERS OF THE FUTURE

In preparing the next generation for leadership roles, we find that some departments suffer from the lack of competencies, which required the decision makers to address the importance of training and preparing employees from the beginning of their careers. This requires a special effort starting from the hiring process to the evaluation of individuals beyond their first working day.

So far, we have to ask what are the officials doing to prepare the current young generation while maintaining existing managers and withholding the information gained from their management experience. Yes, we are facing a real problem, and this is what I have imagined recently. After doing some research, I have found the procedures implemented through the administrations on a daily basis are sufficient to reveal the progress taken in the administration system. However, we still need practical expertise that is used to diversify these procedures. My argument can be divided into the following.

First, after contacting different departments in the general form of the documentary cycle and updating the database, we need to know what do we lack. We need to unify the general framework of each department, its nature, its role in productivity and its impact on other departments.

Second, we are in dire need of selecting competent professionals and in a hurry to prepare them to be nominated as ideal and distinguished workers. In order to do so, employees are placed under the necessary tests until they are prepared enough to fulfil their jobs. This, however, raises the following question: Are we ready to provide all the necessary needs to meet privileged workers' needs and not only grant them periodic benefits? Are we in a position to determine uniform measures of the general form that is supposed to be provided to workers?

Third, collective responsibility, which is the assigning of responsibilities to workers and the dissemination of the culture of rights, duties, periodic assignments, functional rotation, and continuous training, shows competency and supports innovation and mental and practical development of the worker in mutual coordination with the worker's needs of development (process - scientific in the field of his institution).

The extent to which the organization can be digitalized is based on the human element, as the organization is re-encoded with its human resources. The standardization of the differences is solved by the numerical coding before it is aggregated and statistically aggregated, to help make the decision and set a minimum and maximum limits and criteria to activate the unified administrative framework and make maximum use of the human element.

SAFAA SOLIMAN
Director of Information and Media Department at Egyptian General Petroleum Corporation (EGPC)

EGYPT OIL&GAS RESEARCH & ANALYSIS

Annual Inflation Headline CPI

AUG 2019	SEPT 2019
7.50%	4.80%

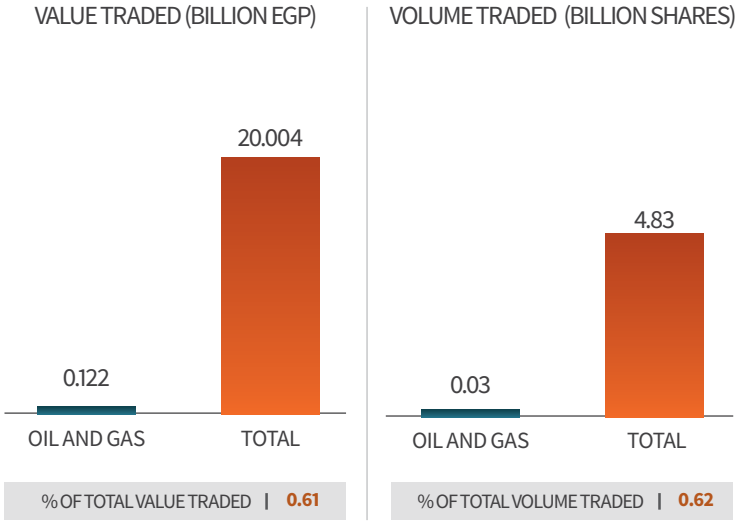
Net International Reserves ($ billion)

AUG 2019	SEPT 2019
44.97	45.12

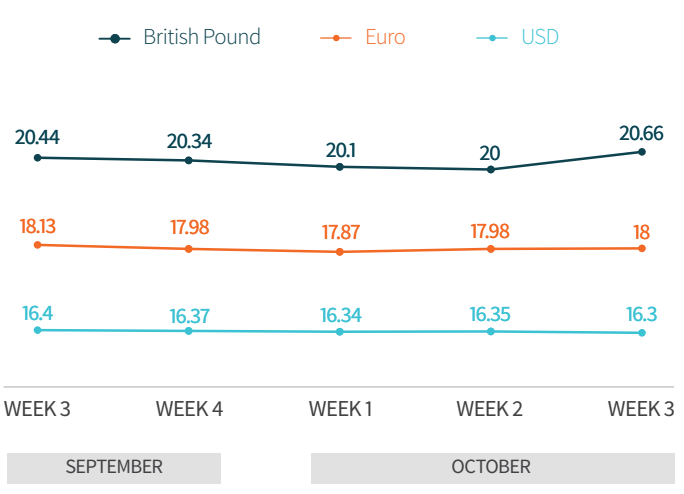
Non-Oil Private Sector PMI (Points)

AUG 2019	SEPT 2019
49.4	49.5

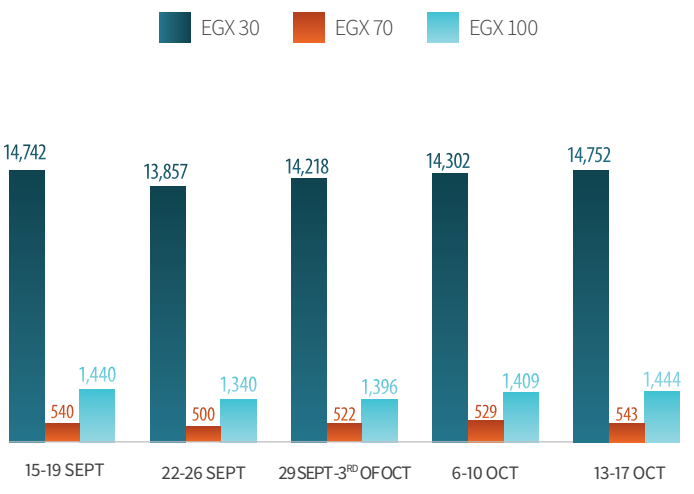
Value and Volume of Shares Traded for Petroleum Sector in September 2019



Exchange Rates



Capital Market Indicators



Performance of Petroleum Companies in the Egyptian Exchange in September 2019

National Drilling

CURRENCY	CLOSE PRICE
USD	4.96

YTD PRICE CHANGE (%) ▲ 9.01

Alexandria Mineral Oils Co.

CURRENCY	CLOSE PRICE
EGP	4.22

YTD PRICE CHANGE (%) ▼ 32.37

Egypt Gas

CURRENCY	CLOSE PRICE
EGP	57.97

YTD PRICE CHANGE (%) ▼ 20.78

Sidi Kerir Petrochemicals

CURRENCY	CLOSE PRICE
EGP	9.23

YTD PRICE CHANGE (%) ▼ 46.09

Source of Raw Data: : CBE, CAPMAS, Egyptian Exchange, Emirates NDB

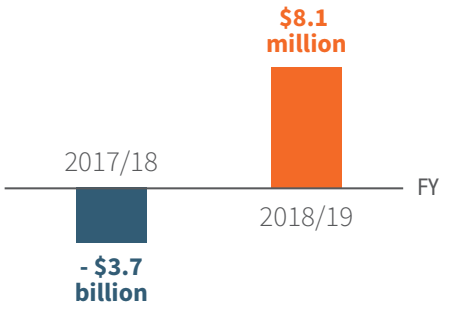
Natural Gas Prices Decreased for Three Types of Factories in October

	Old Price ($/ mmBtu)	New Price ($/ mmBtu)
Cement	8	6
Metallurgy	7	5.5
Ceramic	7	5.5

EGP 0.25 per Liter Cuts in Fuel Prices in October

	OLD PRICE		NEW PRICE
95 octane fuel	9	-2.7%	8.75
92 octane fuel	8	-3.12%	7.75
80 octane fuel	6.75	-3.7%	6.5

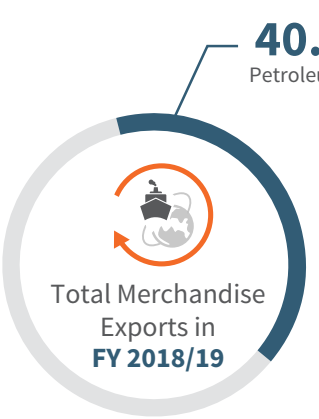
Petroleum Trade Balance (YoY)



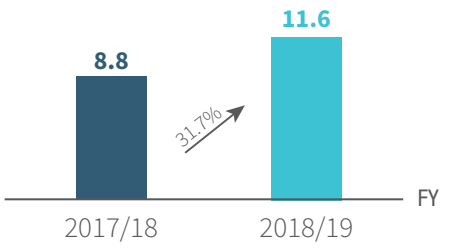
ENI Plans to Drill 20 Wells

2019	2020
11	9

The Mediterranean, Nile Delta, Western Desert and the Gulf of Suez regions



Petroleum Exports ($ billion) (YoY)



Baltim 1st Well Brought Online in September

Drilled by **Petrobel**

Initial Production **100 mcf/d**

Production after Development Phase **500 mcf/d**

9B Phase Project Accomplishments

Drilling & Production

Total Drilled Wells **6**

Production in Q1 2020 **390 mcm/d**

The First 3 Wells

Starting **Q4 2019**

Production **220 mcf/d**

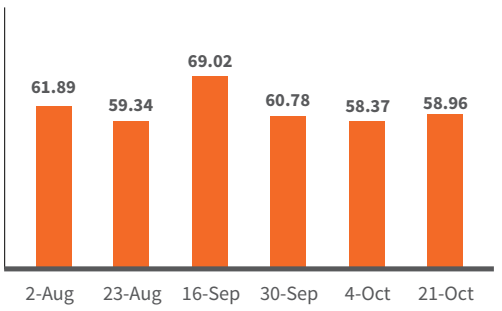
Products Sold to the Companies

Natural Gas **290 mcf/d**

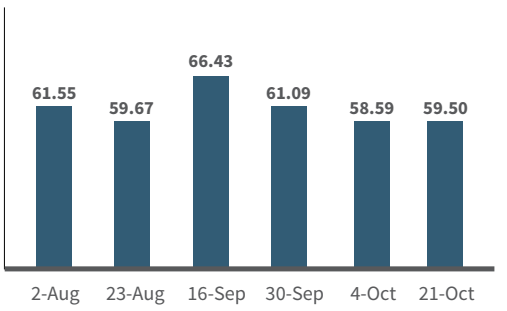
Condensates **3,500 bbl/d**

Total Expenditures **$345 million**

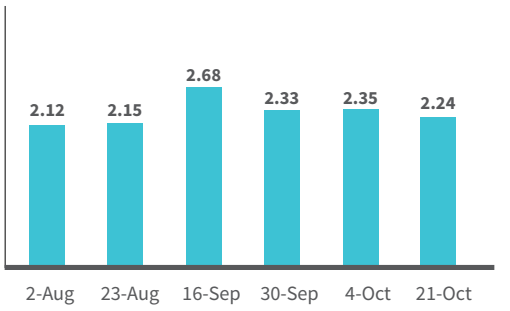
BRENT PRICES



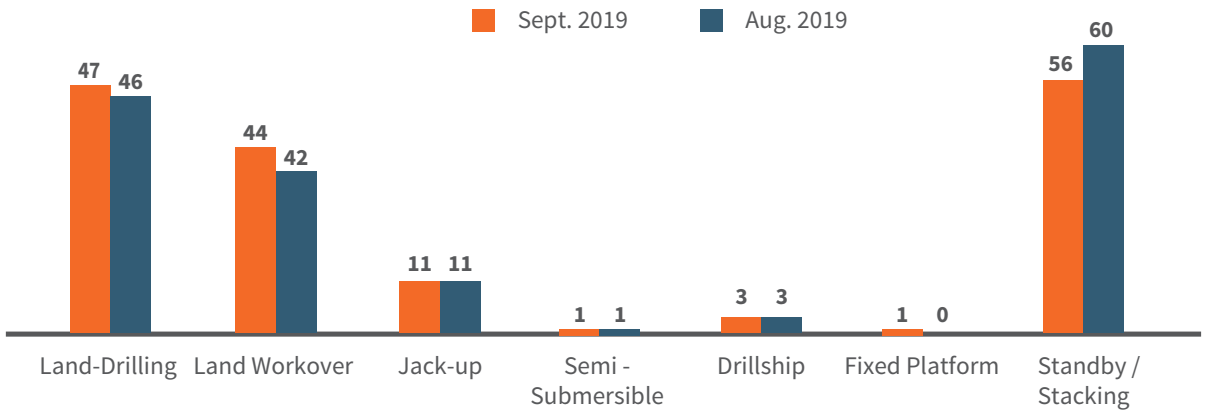
OPEC BASKET PRICES



NATURAL GAS PRICES



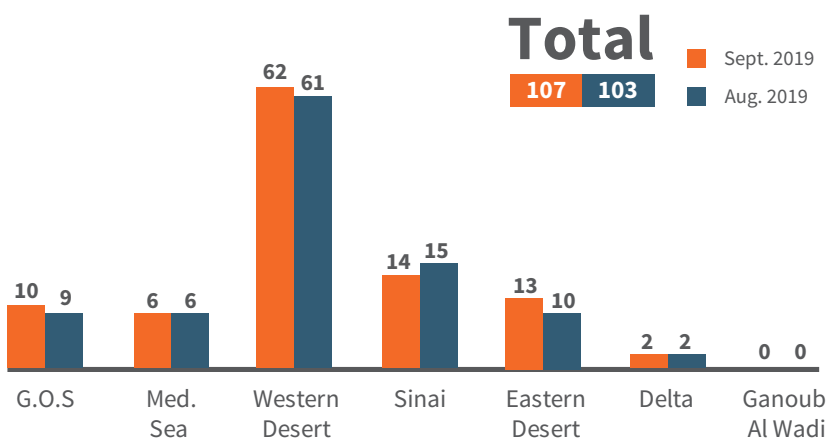
EGYPT RIG COUNT PER TYPE Sept. 2019



Total

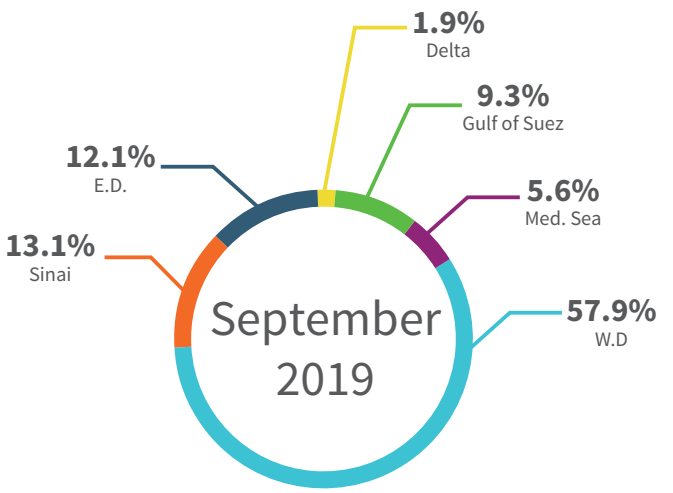
163	163

EGYPT RIG COUNT PER AREA Sept. 2019



The difference between the total of rigs per area and per type is due to the Stand By / Stacking number.

Distribution of Rigs



Egypt Production Sept. 2019

Total

539,364	B/D
6.321	BCF/D
6167	MCF/D
80,110	B/D

Numbers are calculated per day on average.

	CRUDE OIL	GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	432	3.889	3794	30,445
EASTERN DESERT	67,672	0.011	11	70
WESTERN DESERT	296,107	1.190	1161	37,401
GULF OF SUEZ	126,047	0.087	85	1,852
DELTA	177	1.145	1117	9,775
SINAI	48,719	0	0	568
UPPER EGYPT	210	0	0	0

Drilling Update Sept. 2019

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS
EASTERN DESERT	GPC	HSW - 1X	EXP	ST - 9	5,945	1.525 M$
	GPC	EPG - 2X	EXP	ST - 9	9,236	1.851 M$
	DUBLIN	MESEDA H-19	Development	SNOS - 5	4,665	1.200 M$
SINAI	PETROBEL	112-183	Development	ST - 3	9,324	3.010 M$
WESTERN DESERT	PETROSILAH	NSD 1-8	Development	ST - 7	9,060	1.300 M$
	KHALDA	BERENICE - 11	Development	EDC-61	11,610	1.500 M$
		AG- 145	EXP	EDC-47	10,780	2.170 M$
		BARAKAT DEEP - 1X	EXP	EDC-17	4,720	1.700 M$
		ACTIS- 1X	EXP	EDC-54	2,649	2.400 M$
		NU NORTH EAST - 1X	EXP	EDC-17	12,500	1.900 M$

We take energy forward

We're committed to making energy safer, cleaner, and more efficient for people and the planet. By combining industry-leading technologies and services with operations in over 120 countries, we're collaborating with customers to transform the future of energy—everywhere.

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