Egypt's Leading Oil And Gas Monthly Publication
July 2018 - 40 Pages - Issue 139
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EGYPT OIL&GAS NEWSPAPER

BIG DATA
ANALYSIS FOR OIL & GAS OPERATIONAL GAINS

EXCLUSIVE INTERVIEW

New Projects Coming through; an Interview with Hussein Fouad El Ghazzawy, Schlumberger's Former VP and Managing Director

RESEARCH & ANALYSIS

THE PETROLEUM SECTOR: Fuel of Egypt's Economic Engine

INTERNET OF THINGS: Unlocking Optimum Profitability in the Petroleum Sector

OIL PRICE FLUCTUATIONS: Can Egypt's Economy Stand the Strain?

CYBERSECURITY IN THE OIL AND GAS SECTOR: Problems and Solutions

Under the High Patronage of **HE. Eng. Tarek El Molla**
Minister of Petroleum & Mineral Resources - Arab Republic of Egypt

Under the Egyptian Oil and Gas Sector Modernization Program

2ND UPSTREAM OPERATIONAL EXCELLENCE CONVENTION

December 2018

Sky Executive Resort

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ABSTRACT CONTENT

- Description of the proposed paper summarizing the scope of business upon which the paper will be based

ABSTRACT CONTENT

- September 1, 2018 – Abstract submission
- September 15, 2018 – Notification of acceptance
- November 1, 2018 – Presentation submission

ABSTRACT CONDITIONS:

- Must be technically factual and includes lessos learned
- Should avoid commercialisation
- Must be written in English
- Should be submitted in electronic format and be a maximum of 500 words

Please send your Abstracts to:
ayman@egyptoil-gas.com

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EDITOR'S NOTE

As technology continuously evolve at a rapid pace, innovation and technical expertise remain as a core pillar for the success of oil and gas operations. Given the Ministry of Petroleum's efforts to modernize the whole sector, Egypt Oil & Gas has dedicated this issue to the most prominent technologies worldwide that can positively affect the petroleum industry.

We had the pleasure to speak to Hussein Fouad El-Gazzawy, former Vice President and Managing Director at Schlumberger Egypt, who commented on the company's latest projects and on Schlumberger's role in applying new technologies. As for our monthly report, we bring a timeline of the oil and gas sector's participation in the country's GDP throughout the most recent fiscal years.

Additionally, you can find insights on cybersecurity and learn about the vulnerability of computer systems, as well as how to properly secure them. We also bring you a full explanation on the usage of Big Data and its different applications in the oil and gas industry's upstream, midstream, and downstream sectors. You can also find information on the prospects of the Industrial Internet of Things when applied to the sector, in addition to the promising benefits of quantum computing. In a global perspective, we present you the latest OPEC decisions and expert's opinions on the future of the oil prices.

We fully enjoyed preparing this technical issue and we hope you enjoy reading it as well. As always, thank you for your readership and support.

EDITOR IN CHIEF

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INSIDE THIS ISSUE

EGYPT OIL&GAS NEWSPAPER

EGYPT'S LEADING OIL AND GAS MONTHLY PUBLICATION

EGYPS EGYPT PETROLEUM SHOW

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El-Molla Remains as Petroleum Minister

Tarek El Molla was sworn in on Thursday 14 June by President Abdel Fattah El Sisi as the Minister of Petroleum and Mineral Resources. El Molla will be serving under the new Prime Minister Mostafa Madbouly who replaced Sherif Ismail last week. The Ismail cabinet resigned on June 5 in a routine move that follows the swearing-in of a president. Minister of Electricity and Renewable Resources Mohamed Shaker also remained in his position. Osama Ali Asran was appointed as Shaker's deputy.

Egypt Signs $200M Funding Agreement with EBRD

Egyptian Minister of Investments and International Cooperation, Sahar Nasr, has signed a $200 million agreement with Eric Rasmussen, director of natural resources at the European Bank for Reconstruction and Development (EBRD), to provide finance to the Suez Oil Processing Company (SOPC). The signing was attended by the Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, and the head of SOPC, Mohamed Eliwa. The fund will finance a project that includes installing a new vapor recovery unit (VRU), renovating the old coker unit, as well as a number of energy efficiency investments. The project aims to improve SOPC's operational performance, utilization rate, and environmental footprint, according to the EBRD.

Egypt to Reach Petroleum Products Self-Sufficiency in 3 Years

Egypt will achieve self-sufficiency in petroleum products in three years, Egyptian Minister of Petroleum, Tarek El Molla, has announced. Reaching self-sufficiency does not mean halting crude oil imports, El Molla said on the sidelines of the signing ceremony for the European Bank for Reconstruction and Development (EBRD)'s fund agreement. The minister explained that Egypt will keep importing crude oil to be refined. A portion of the refined products will then be directed to cover the demands of the local market, while the surplus will be exported. El Molla pointed out that Egypt's natural gas output reached 5.9 billion cubic feet per day (bcf/d) due to the increase of Zohr field's production.

Tharwa Petroleum to Drill in North Sinai's Noor Concession

Tharwa Petroleum Company is waiting for official approval for exploration and production (E&P) in the Noor concession in order to start drilling work, a source at the company said. Upon signing the agreement, the company will take over the concession sites and begin digging an exploratory well to determine the indicators for the concession areas are positive or negative. Following this, the company will decide on the number of wells to be drilled in the following stages and provide estimates about reserves, the source pointed out.

Egyptian Petroleum Products Consumption Falls 16% YoY

Egypt's consumption of petroleum products fell by 15.97% year-on-year (YoY) to reach 2.815 million tons in March 2018, compared to 3.35 million tons in March 2017. The country's output of crude oil, condensates and butane slightly increased 4.5% YoY to 2.829 million tons during March 2018, up from the 2.706 million tons produced in March 2017, according to a report by the Central Agency for Public Mobilization and Statistics (CAPMAS). The Egyptian Minister of Petroleum, Tarek El Molla, previously said that Egypt will achieve self-sufficiency in petroleum products within three years.

EGPC to Borrow $850M to Repay IOC Debts

The Egyptian Ministry of Finance approved issuing local currency guarantees for two loans to help the Egyptian General Petroleum Corporation (EGPC) repay debts owed to international oil companies (IOCs). The guarantees will be granted to cover a $750 million loan from the National Bank of Egypt (NBE), Banque Misr, and Commercial International Bank (CIB). Additionally the guarantees will cover a $100 million credit facility by CIB. The Ministry of Petroleum will repay debts of $200 million to several IOCs in June 2018.

Egypt's Natural Gas Production Increases by 20.5% YoY

Egypt's production of natural gas increased by around 20.64% year-on-year (YoY), reaching 3.437 million tons in March 2018 compared to 2.849 million tons in March 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that consumption of natural gas in Egypt rose by around 9.3% YoY to 3.551 million tons in March 2018, up from the 3.249 million tons consumed during the same month in 2017. Natural gas output rose by 7.71% in March 2018, up from the 3.191 million tons produced in February 2018. Natural gas consumption increased by 9.3% in March 2018, compared to the 3.249 million tons consumed in February 2018.

Butane Imports Decrease by 1.29% YOY in March

Egypt's year-on-year (YOY) butane imports decreased by 1.29% in March. The country imported 273,100 tons of butane in March 2018, down from 278,700 tons imported during the same month in 2017, according to a report by the Central Agency for Public Mobilization and Statistics (CAPMAS). The report also shows that Egypt's YOY butane consumption dropped from 387,900 tons in March 2017 to 354,400 tons in March 2018, recording a 8.64% decrease. Meanwhile, the country's production of butane rose by around 5.4% YOY reaching 161,400 tons in March 2018, compared to the 153,100 tons produced in the same month of 2017.

El Molla Visits Zohr Field

Minister of Petroleum Tarek El Molla has visited Zohr gas field to follow up on operations and ensure that production will reach 2.7 billion cubic feet per day (bcf/d) in 2019. El Molla pointed out that Zohr field's output has tripled since the beginning of production in December 2017 to reach more than 1bcf/d of natural gas. The field is projected to add another 1bcf/d of natural gas before the end of 2018, which, along with other gas projects, will contribute to help the country achieve natural gas self-sufficiency by the end of this year. During the visit, the minister listened to an explanation by Atef Hassan, head of Petrobel, about the work achieved since the discovery of the field in August 2015.

Egypt Pays $75 a Barrel to Import Fuel

The Egyptian government announced in an official document that fuel imports cost $75 per barrel. The government has a total cost of around EGP 103.798 billion, the difference between import costs and selling prices in the local market. Egypt allocated EGP 89 billion for fuel subsidies in the budget of fiscal year (FY) 2018/19, compared to the EGP 120 billion allocated in FY 2017/18 budget in order to ease the budget deficit to be 8.4% of GDP. The 2018/19 budget expects global oil prices to reach $67 billion per barrel, while the 2017/18 budget expected oil barrel global prices to be $55.

Egypt's Diesel Consumption Drops 6.69% YOY

Egypt's diesel consumption fell 6.69% year-on-year (YOY) in March 2018. Figures published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that Egypt used 1.214 million tons of diesel in March 2018, down from 1.301 million tons of diesel in March 2017. Meanwhile Egypt's diesel production increased by 2.04% YOY reaching 600,000 tons in March 2018, compared to 588,000 tons of diesel produced in the same month of 2017. Diesel output rose by around 16.73% from the 514,000 tons recorded in February 2018, while consumption increased by 19.49% from the 1.016 tons consumed in the preceding month.

Egypt Produced 1.6M Tons of Diesel in Q1 2018

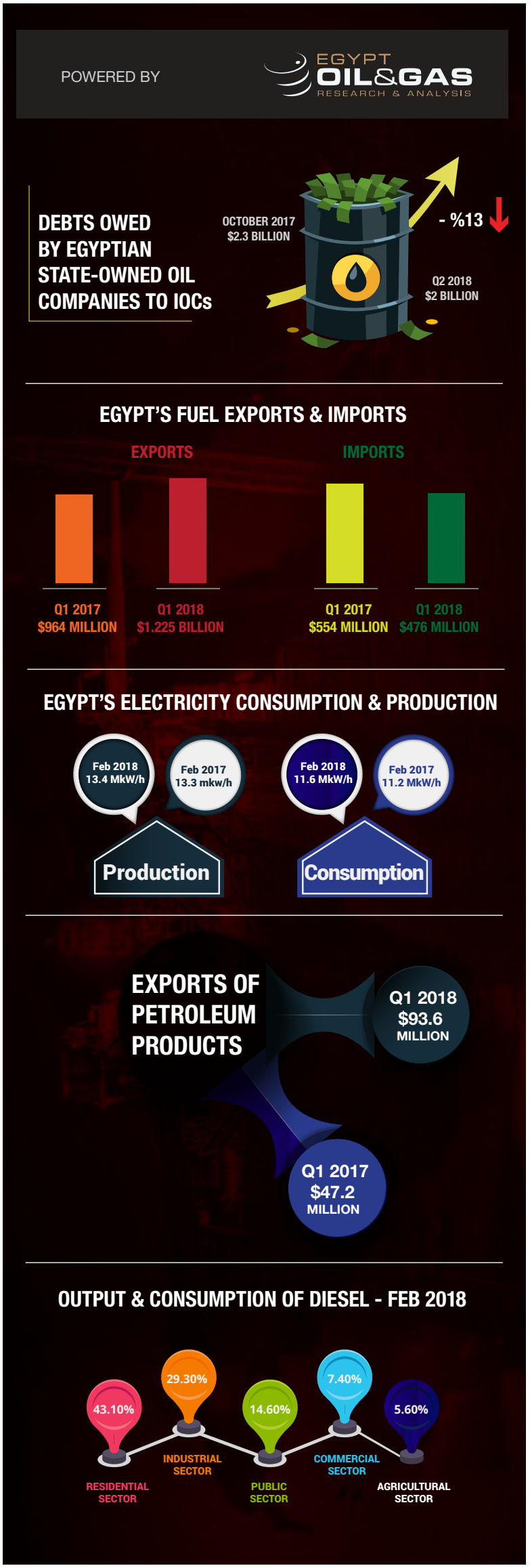
Egypt produced around 1.6 million tons of diesel during Q1 2018, head of the Egyptian General Petroleum Corporation, Abed Ezz El Regal. Domestic production supplies 70% to 75% of Egypt's demand for diesel, while imports cover the remaining 25% to 30%, Ezz El Regal added. Ezz El Regal said that developing the refineries will increase the rate of domestic production. In addition, increasing the country's production of crude oil, which fuels the refineries, will also contribute to raising diesel output, he added.

Electricity Ministry Arrears to EGPC Reach EGP 107.5B

Debts owed by the Egyptian Ministry of Electricity to the Egyptian General Petroleum Corporation (EGPC) have reached EGP 107.667 billion. This is compared to the EGP 90 billion it owed during the first half of 2017. The ministry's debts have risen because electricity generating power plants use around 60% of the country's total natural gas consumption, as well as liquid fuels. Governmental institutions owe EGPC a total of EGP 216.205 billion. The Ministry of Civil Aviation is indebted to EGPC with EGP 7.9 billion, while the Ministry of Transportation owes EGP 3.878 billion.

CAPMAS: Slight Raise in Annual Electricity Production and Consumption

Egypt's electricity consumption increased by 3.57% year-on-year (YoY) to reach 11.6 mega kilowatt per hour (MkW/h) in February 2018, compared to 11.2 MkW/h in February 2017. The country's electricity production rose by 0.75% YoY from 13.3 mkw/h in February 2017 to 13.4 MkW/h in February 2018, according to a report by the Central Agency for Public Mobilization and Statistics (CAPMAS). The residential sector consumed the largest portion of the country's electricity in February 2018, using 5 MkW/h or 43.1% of the country's total consumption. The industrial sector used 29.3% of the country's total electricity consumption (3.4 MkW/h) in the same month making it the country's second largest electricity consumer.



Pharaonic Petroleum Produces 600 mscf/d of Natural Gas

Pharaonic Petroleum's natural gas production has reached 600 million standard cubic feet per day (mscf/d), in addition to 11,000 barrels per day (b/d) of condensates, said company head, Hassan Abady. Abady said that the company had successfully started production at the deep water Atoll field in December 2017. The field started production at a capacity of 350 mscf/d of natural gas and 10,500 b/d of condensates, with total investments of around $1 billion. The field boosted the company's overall output to a record 116,000 b/d of oil equivalent. Pharaonic Petroleum is currently working with BP and Royal Dutch Shell to prepare operational studies for Harmtan field in order to drill three wells and establish offshore production facilities.

Egypt Allocates EGP 25B to Develop Electricity Grid

Egypt has allocated EGP 25 billion to be spent on developing the national electricity grid over the next two years, Minister of Electricity Mohamed Shaker said. Shaker pointed out that the Egyptian government approved a loan worth around $200 million to be taken from the Kuwait-based Arab Fund for Economic and Social Development. The loan will fund the establishment of three new converter stations. The Ministry of Electricity is developing a strategy that will minimize the risks of taking out loans used to invest in the sector. This development is aimed at increasing investments in energy efficiency.

Petroleum Ministry to Connect 684,000 Households to Gas Grid

The Minister of Petroleum Tarek El Molla and the president of Egyptian Natural Gas Holding (EGAS) are considering linking 684,000 households across 18 governorates to the national gas grid. The plan targets clients who have not yet signed contracts with gas distribution companies to connect their households to the grid. The 684,000 clients will pay for the connection in installments which will be added to their monthly gas bills over the next six years. The gas distribution companies will create underground and subsidiary networks to connect these clients to the grid.

Egypt Has Fourth Largest Ultra-Deepwater Gas Reserves

Egypt has the world's fourth largest ultra-deepwater natural gas reserves with 18,852 billion cubic feet (bcf), Offshore Technology reported, citing Global Data. The study projects global ultra-deepwater gas production to hit 15,985 billion cubic feet per day (bcf/d) by 2025. This is almost four times higher than 2017's 4,102 bcf/d. The countries with the ten largest ultra-deepwater reserves have 96% of total known reserves, amounting to 207 trillion cubic feet (tfc). Mozambique possesses the largest remaining ultra-deepwater natural gas reserves, amounting to 87,356 bcf. From the MENA region, Israel and Mauritania were also listed in the world's top ten ultra-deepwater natural gas reserves. The former has 28,079 bcf, the second largest reserves, while the latter holds around 10,000 bcf.

Egypt to Receive $1.5B Investment Loan

The African Export-Import Bank (Afreximbank) will provide a $1.5 billion loan to Egypt to fund investments including oil and petrochemical projects. The decision is part of Afreximbank's plan to loan $10 billion to finance development projects in a number of African countries, bank CEO Benedict Orama said. Orama added that Afreximbank also intends to boost inter-Africa trade from around $175 million in 2017 to $250 million in 2021. "The bank has carried out studies on inter-Africa trade, and we have found that it does not exceed 15%… at the same time trade with North America, Asia, and Europe exceeded 80%," Orama stated.

ANRPC Refinery Project Nears Completion

Alexandria National Refining and Petrochemicals Company (ANRPC) has finished 97% of the refinery project that will double the national production of 92-octane benzene and 95-octane benzene. The refinery will produce around 850,000 tons of 92-octane benzene and 95-octane benzene annually to cover part of the domestic demand. Capital investments of $233 million have been invested in the refinery, which will also produce butane and hydrogen. Additionally, the ANRPC is establishing an industrial wastewater treatment and recycling unit, with a daily production capacity of 1200 cubic meters. The recycled water will be used in ANRPC's production units, saving around EGP 25 million.

Petrojet Awarded $33M Contract for Dock Revamp

Egyptian petroleum company Petrojet has signed a $33 million agreement for dock revamp work in Damietta governorate. The contract, awarded by Egypt's Holding Company for Maritime & Land Transport, will see Petrojet renovate the 1,500 meter-long container docks over the next two years. The Egyptian oil company competed with five local and

SDX Energy to Abandon Kelvin-1X Well

SDX Energy has announced that Egypt's Kelvin-1X exploration well at the South Disouq concession is non-commercial due to low gas saturation. The well was drilled at a depth of 8075 feet, and "encountered 606 net feet of high quality reservoir interval in the Abu-Madi formation with an average porosity of 21%", the company said in a statement. SDX Energy intends to plug and abandon the Kelvin-1X well, and to move the drilling rig to the next drilling location in the concession: the SD-4X appraisal well.

Siemens Completes Beni Suef Power Plant

Siemens has completed the construction of the 4800 MW power plant in Beni Suef, and has conducted performance testing. The news was revealed by Ibrahim El Shahat, head of Upper Egypt Electricity Production Company (UEEPC). The presidential opening of the Beni Suef plant is yet to be decided as the opening will be attended by Egyptian President Abdel Fattah El Sisi, El Shahat pointed out. Moreover, El Shahat announced that the 1950 MW power plant in South Helwan is 85% complete, and the construction, performance tests, and business operations will be finalized by August 2018.

Apex Signs $15M Western Desert Agreements

Apex International Energy has signed $15 million worth of agreements for 3D seismic acquisition services and long-lead well equipment to develop its concessions in Egypt's Western Desert. The deals include a contract to acquire 1,000 square kilometers of 3D seismic data in the Southeast Meleiha Concession to BGP International Egypt. Both exploration drilling and seismic acquisition operations are expected to start in Q4 2018, company CEO Roger Plank said. "We started re-processing existing 3D seismic at West Badr el Din Concession in December 2017 to identify drillable prospects. At Southeast Meleiha Concession we will commence 3D seismic acquisition operations in the fourth quarter. We expect to begin drilling the first of six exploration wells before year end," Plank added.

Egypt Repays $40M to Dana Gas

Dana Gas has announced receiving $40 million in payments from the Egyptian government. The Emirati gas company has now received a total of $88.8 million in debt repayments so far in 2018. "We are pleased to receive this payment from the Egyptian government, bringing the total amount of receivables during the first half of 2018 to approximately $90 million," CEO Patrick Allman-Ward said. "The payment indicates the Egyptian government's commitment to significantly reduce its financial obligations to companies operating in the oil sector in 2018," he added.

Dana Gas to Begin Exploratory Drilling in North Arish Concession

Dana Gas will start drilling the first exploratory well at Block 6 of the Mediterranean North Arish concession before the end of 2018. North Arish is the first offshore concession to be operated by Dana Gas, and is located in the East Nile Delta concession area. The North Arish concession has promising potential to produce billions of cubic feet of natural gas, said Patrick Allman-Ward, Dana Gas CEO. He added that the company will go ahead with important initiatives, such as drilling the Balsam-8 well, at the onshore Nile Delta concession.

Rosneft to Supply Gas for Industrial Consumers in Egypt

Russia's Rosneft signed a cooperation agreement with Fleet Energy and Fleetliner Energy for supplying gas to Egyptian industry. The deal was signed by Rosneft representative Didier Casimiro and President of Fleet Energy Group Essam Kafafi. The signing was attended by Rosneft CEO, Igor Sechin. This comes as the Egyptian cabinet had approved in February amending some annexes in the 1980 natural gas law. The amendments stated that the Egyptian General Petroleum Corporation (EGPC), along with any of the public sector companies specialized on gas activities, can deliver natural gas to the residential and commercial customers upon the approval of petroleum minister. The authorization can be extended to the company's subsidiaries and partners, which is the case in Rosneft's agreement.

Apache to Drill East Bahariya Wells in 2018

Apache will start drilling new oil wells in the East Bahariya concession in the Western Desert during Q3 2018. The American company plans to start production from these wells six months after the beginning of drilling. The company is also planning to start drilling in the West Kanayes and West Kalabsha areas after collecting promising seismic data. The announcements came during a meeting between Minister of Petroleum Tarek El Molla and Apache officials in which they discussed the company's Western Desert operations. Additionally, they discussed the international bid round offered by the Egyptian General Petroleum Corporation (EGPC) for 11 areas, including five areas in the Western Desert where Apache's work is concentrated.

TAQA Arabia and Castrol Establish New Joint Venture

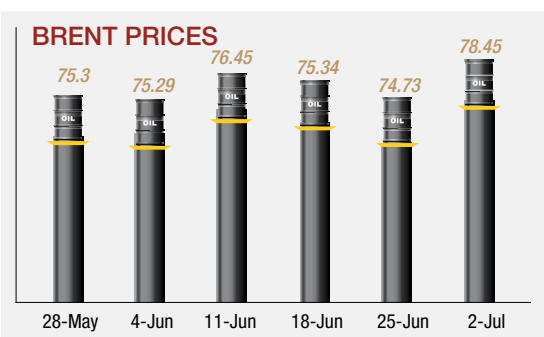
Qalaa Holdings has announced the establishment of a new joint venture between its subsidiary TAQA Arabia and BP subsidiary Castrol with EGP 20 million capital. TAQA currently has exclusive distribution rights for Castrol products in Egypt. However, the joint venture, Castrol Egypt Oil, will now become the sole distributor covering both commercial and passenger vehicles markets. Qalaa stated that TAQA owns 49% of the new company, yet further details about the size of the manufacturing outfit and potential investment value have not yet been announced.

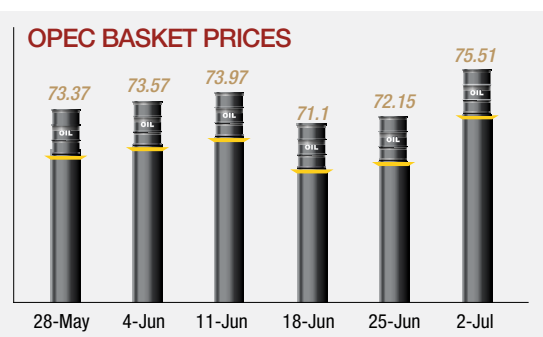
Sidpec Signs Propylene Factory Contract

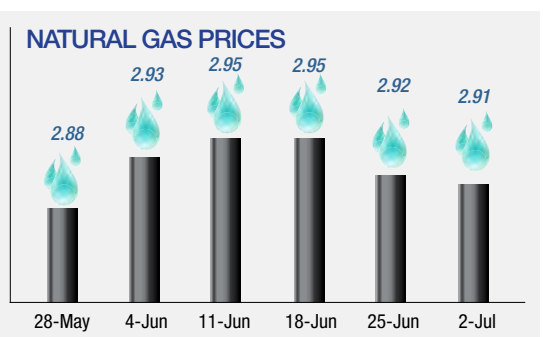
Sidi Kerir Petrochemicals Company (Sidpec) and UOP International have signed a contract for establishing a new propylene factory at Sidpec. The contracts were signed in attendance of Egyptian petroleum minister, Tarek El Molla, and Saad Helal, head of the Egyptian Petrochemicals Holding Company (ECHEM). In addition, Sidpec will sign a contract with Grace International Company to construct a polypropylene factory. The new factories will start production in 2022. When fully operational, the factories annual capacities will reach 500,000 tons of propylene and 450,000 tons of polypropylene.

Midor Signs $1.7B Refinery Deal with Technip

The Middle East Oil Refinery (Midor) has signed a $1.7 billion agreement with Technip that will see the Italian company play a leading role in the expansion of the Midor refinery. The deal was signed by Midor Chairman Mohamed Abdel Aziz and Technip CEO Marco Villa in the presence of Minister of Petroleum Tarek El Molla. The $2.2 billion project will see the refinery's production capacity increase from 115,000 to 175,000 barrels per day.







SAUDI ARABIA

Saudi Aramco signed an **unconventional gas stimulation services contract with Halliburton to aid the company's Unconventional Resources Program**. Aramco stated that Halliburton will "provide lump sum turnkey stimulation services which include major hydraulic fracturing and well intervention operations."

Aramco has increased the price of crude exports to Asian buyers to their highest levels since 2014 amid rising demand for Saudi oil. Aramco raised its price for July shipments of Arab Light crude by 20 cents, marking the third consecutive price increase for the grade, bringing it to $2.10 more than the Middle East benchmark. Aramco's Extra Light and Medium grades are also being sold to Asia at the highest prices since 2014. Premiums on heavy crude shipments are at the highest level since 2012.

Oil pipelines between Saudi Arabia and Bahrain are expected to be completed during 2018. The pipelines will stretch 118 km (73 km onshore and 42 km offshore) with a capacity of 400,000 b/d. Saudi Aramco and Bahrain Petroleum Company (BAPCO) signed an agreement in 2015 to establish the pipelines between the two nations.

UAE-based rig builder Laprell has set up a joint venture in Saudi Arabia to increase its business in the kingdom after a Saudi company acquired a 10% stake in the Laprell. Under the name Lamprell Saudi Arabia, the joint venture is a partnership with local investment company Asyad Holding, allowing Lamprell to qualify for Saudi Aramco contracts.

Aramco executive Abdulaziz al-Judaimi detailed the company's downstream plan which includes: **raising its refining capacity to between 8 and 10 million b/d, up from its current capacity of around 5 million b/d.** "We are going forward by trying to be a top leader in chemicals by 2040," Judaimi said. Aramco has also entered into a **50% joint venture with three Indian refiners to build a $44 billion, 1.2 million b/d refinery and petrochemical facility** on the west coast of India.

Aramco has entered a joint venture with Chinese state-owned Sinopec and US oil major Exxon Mobil, and is in talks with the China National Petroleum Corporation (CNCP) to acquire a stake in a 260,000 b/d refinery in Yunnan. Aramco also plans to **build a 300,000 b/d refinery with China's Norinco with the front-end engineering expected to be completed project by mid-2019.**

Amec Foster Wheeler has been awarded a contract by Sadara Chemical Company for the construction of two gas pipelines at the PlasChem Park, located in Jubail Industrial City in Saudi Arabia. Amec Foster Wheeler will design two pipelines to run from Sadara's plants to the PlasChem industrial park. **They will be used to transport ethylene oxide and propylene oxide, materials used to make detergents and plastics.**

Saudi Arabia boosted oil output to over 10 million b/d, the highest level since October 2017. The kingdom informed OPEC that its daily production rose by 162,000 b/d to 10.03 million in May. **The Gulf country previously pledged to produce no more than 10.058 million b/d in line with the OPEC sanctioned output cuts.** However, Saudi output usually rises in the summer due to higher domestic demand for fuel.

UAE

The UAE and Russia signed a declaration of strategic partnership covering various sectors including cooperation in the oil and gas industry. Further details on the agreement have not yet been released.

Abu Dhabi National Oil Company (ADNOC) planned cut crude oil allocations in July as a part of the OPEC agreement to slow production. The company plans to reduce supplies from the Murban oil field by 10%, and from the Das and Upper Zakum fields by 5%.

Canadian firm SNC-Lavalin has won a contract for with Dubai-based Florexx International Investments for the basic engineering, design and construction of an advanced topping refinery in the UAE. SNC-Lavalin will also carry out a technology evaluation and facilitate investment decisions regarding the project. The agreement includes the construction of a refinery capable of processing 100,000 b/d.

UAE's Hamriya Free Zone Authority has signed an investment agreement with Gandhar Oil Refinery India to establish an integrated refining project producing white oil, liquid paraffin, hydraulic liquid, transformer oil, rubber processing oil, motor oil and industrial oil. Saud Salem Al Mazrouei, director of the Hamriya Free Zone, **said that the zone is preferable for investments in heavy industries and petrochemicals due to its location and connection to Hamriya port.** The deal was signed due to the increasing demand for oil-based products used in cosmetics, medical supplies, rubber processing, transformers and vehicles.

QATAR

State-owned Qatar Petroleum has acquired a 30% equity stake in the Vaca Muerta shale basin in Argentina after an agreement with ExxonMobil. Vaca Muerta contains roughly 16 million barrels of oil and 308 trillion cubic feet of natural gas. Qatar Petroleum plans to increase its LNG production by roughly 30%.

OPEC

OPEC has agreed with Russia and other non-OPEC producers to raise oil output from July. The agreement came during OPEC's biannual meeting in Vienna after speculation that Saudi Arabia and Russia would push to curb the OPEC non-OPEC sanctioned production cuts in place since January 2017. **Saudi Arabia stated that the increase will be "measurable", and Saudi Energy Minister Khalid al-Falih stated that OPEC and non-OPEC producers would roughly pump a combined extra 1 million barrels per day (b/d)** in the coming months, equivalent to 1% of global supply. **Saudi Arabia will increase output by hundreds of thousands of barrels, however, the exact figures have not yet been decided. Russian Energy Minister Alexander Novak said his country would produce an extra 200,000 b/d in the second half of 2018.**

A joint statement from OPEC and non-OPEC producers **affirmed that they would raise supply in compliance with the previously agreed cuts after months of underproduction due to significant drops in output from Angola and Venezuela.**

Previous to the meeting, Iran demanded OPEC reject calls from Saudi Arabia, Russia, the US, China, and India; arguing that countries should not increase their production to compensate for Venezuela pumping 500,000 b/d below its OPEC target.

Iran's OPEC governor, Hossein Kazempour Ardebili, stated that **no reallocation of production was agreed at Saturday's joint OPEC and non-OPEC meeting or the OPEC-only talks a day earlier.**

He added that if countries stick to their allocations, **output would rise by 300,000 bpd in the first three months and up to 500,000 bpd by the end of the year - less than the 1 million bpd mentioned by Falih and some other ministers.**

IRAN

In the wake of the reimposition of US sanctions on Iran, Iranian state owned news reported **exports from its South Pars gas field rose by 149% in May,** the field also **exported roughly 1.6 million tons of non-oil products worth $754 million.**

The country is planning to increase its oil production by 460 million barrels over the next three years. Oil Minister Bijan Zanganeh, outlined the plan to increase output from 29 oilfields including in Ilam, Khuzestan, Gachsaran, Falat Qareh and Fars.

Six new oil platforms will be built at the South Pars gas field. "The six oil platforms under construction at SADRA (Iran Marine Industrial Company) company's yard will get ready for i**nstallation and pre-startup by [March 21, 2019]**," Director for Project Planning and Control at Pars Oil and Gas Company stated. Iranian companies will carry out the engineering, construction and execution; a significant amount of the parts and equipment are supplied by domestic producers.

A Chinese investment firm will spend $2 billion on building an oil refinery in the northern Iranian province of Mazandaran. The company has already been issued the license to build the oil refinery, however, the name of the Chinese firm has not yet been specified.

Pergas International Consortium (PIC) is willing to replace international companies unable to continue work in Iran due to US sanctions. PIC and the National Iranian South Oil Company signed a deal in May 2018 to develop Iran's Keranj oilfield, one week after US President Donald Trump declared his country's withdrawal from the 2015 Iran nuclear agreement. **Pergas aims to produce 655 million barrels of oil over the next 10 years from the field in southwest Iran.**

Two Russian firms are reportedly preparing bids and technical proposals to develop the Shadegan oil field in southern Iran. "Within the next two to three months, it will be certainly clear which companies have been selected to develop the Shadegan field," Jahangir Pourhang, director of the Marun Oil and Gas Production Company stat

IRAQ

Iraq has planned to sign development contracts with Crescent Petroleum, China's United Energy Group and Chinese Geo-Jadeon June 2 and 3 for six blocks awarded during its last licensing round. Geo-Jade secured a 14.67% stake in Naft Khana, and 7.15% in the Huwaiza block. United Energy Group won a 4.55% stake in the Sinbad block.

Iraq and Iran have begun a crude oil swap. Iraq has begun deliveries of crude oil from Kirkuk to Iran, while Tehran will export a similar amount to Iraqi ports on its southern border. **Between 30,000 and 60,000 b/d of Kirkuk crude will be delivered by truck to Darreh Shahr in southwestern Iran.** The two countries plan to build a pipeline as an alternative to using trucks.

Iraq's Basra Oil Company and Dhi-Qar Oil Company have signed a memorandum of understanding with Chevron for studies and seismic surveys on oil activities in the country. The agreement will aid state oil firms in their technical, administrative and financial responsibilities. The possibility of extending cooperation with Chevron to development projects is being considered.

Production at Iraq's Nasiriya oilfield will be expanded to 100,000 b/d following a government vote. In December 2017, the Iraqi oil ministry outlined plans to increase production at the field from 90,000 b/d to 200,000 b/d over the next few years with the help of international firms.

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New Projects Coming through; an Interview with **HUSSEIN FOUAD EL GHAZZAWY,** SCHLUMBERGER'S FORMER VP AND MANAGING DIRECTOR

By Mariana Somensi

Schlumberger has established a solid path of technical innovation and successful operations in Egypt. With more than 100,000 people operating in more than 85 countries, the company has Egypt's main projects included in its portfolio and is a key player to help the country achieve its plans of becoming a regional energy hub. Schlumberger's most recent projects in Egypt include a memorandum of understanding with the Egyptian Ministry of Petroleum and Mineral Resources to establish the oil and gas sector's data bank, in addition to a 3D seismic data survey on the Gulf of Suez.

Egypt Oil & Gas had the opportunity to discuss the company's investments and operations in Egypt with **Hussein Fouad El-Ghazzawy,** former Vice President and Managing Director at Schlumberger Egypt, who has recently decided to go for early retirement after 34 years of outstanding contribution to Schlumberger and to his country.

In the first half of 2018, Schlumberger has signed new agreements with the Egyptian Ministry of Petroleum and national oil companies (NOCs). Could you comment on the terms of these agreements and how they impact the Egyptian oil and gas sector?

We have signed two memoranda of understanding (MoUs) in February, on the sidelines of the Egypt Petroleum Show (EGYPS 2018). The MoU with the Ministry of Petroleum is for the establishment of a data bank. Egypt has realized the importance of having a national data bank, and there will be a consortium of various companies to work with the ministry on it. It will allow us to advertise and facilitate operations in all the new concessions in the Mediterranean, the Gulf of Suez, the Western Desert, and, in the future, the Red Sea as well. I think it is a very crucial project; it is a project concerning national security, and we are definitely excited to have the national data bank in Egypt.

The other agreement is a contract we signed with EGPC for 15 years of 3D seismic data on the Gulf of Suez. We have been drilling and exploring the Gulf of Suez for the last 60 years, but the era of easy oil is over, so we need to use the technology available, especially the 3D seismic technology, to improve the potential of exploration operations in the area.

I would also like to mention other projects that Schlumberger has recently joined, as the agreement signed with both the ministry and Ganope in July 2017 concerning the Red Sea multi-client survey. This agreement is set for the next 15 years for 2D and 3D seismic data in the Red Sea. This would not have been possible without Egypt signing the maritime border agreement with Saudi Arabia, which now allows us to explore in our own economic zone. We will invest $750 million over the course of the 15 years. We have three main international oil companies (IOCs) already signed. The multi-client agreement works simply: we invest and we acquire the data, then sell this data to investors interested in the data or in the area; which means that the three major IOCs to sign the pre-commitment agreement are interested in the data.

We initially started to acquire 2D data in mid-December 2017 and finished on March 26 this year. The data is currently being processed in preparation for the Red Sea bidding round, roughly scheduled for October this year. With these companies paying us in pre-commitment agreements, some of the money has already been invested back into Ganope. It is a win-win situation; we get some return on what we invested, and the government – which is Ganoupe in this case – also gets some money. We are very excited for the Red Sea, once the bidding round is complete, we will start acquiring 3D data. Looking at the number of wells already drilled in the Red Sea, exploration in the area has good prospects for Egypt.

The company has recently invested $60 million in Egypt. How has that been spread across your operations in the country?

That $60 million is separate from the agreements I have mentioned. It has been spent on building a state-of-the-art operational base, the second largest in the Middle East and Africa. It is built on an area of over 100,000 sq meters in the industrial area of 6th of October, with 35,000 sq meters of the area covered. It houses the latest equipment, allowing us to maintain and repair all our operational equipment in Egypt and the entire north Africa and Eastern Mediterranean regions.

This $60 million is an investment that has already taken place in Egypt, through buying the land and building the operational base. We have a training center there, for both training our people and for our customers and partners to train their people; on any given day, we have up to 600 people working there.

For us to make that investment, we had to first make a commitment, which we did in 2013 when the situation was difficult in Egypt. However, we have faith in the country, we trust Egypt's potential, so we decided to invest, and in 2016, we made our second largest investment worldwide for the operational base here in Egypt. The base had a soft opening in November 2017 and an internal inauguration in February of this year.

Could you comment on Schlumberger's most recent achievements?

We are very active in the Mediterranean. Our biggest achievement was in the end of 2017, in December. We are very proud of opening the early production facility in the Zohr natural gas field, which was designed and manufactured by us, working with Eni, EGAS, and Petrobel. This entire project was done with worldwide standard and the early production facility was done in a record time. The facility is meant to produce at least 300 million standard cubic feet (mcf), being able to go up to 400 mcf. In this project, we also applied a new technology that takes sulfur out of the natural gas in the most environment-friendly way. This technology had never been used in Egypt before.

Besides that, we also have our continuous work with BP in the Mediterranean through integrated projects as Atoll, Giza, and Fayoum, meeting all the records in terms of drilling. It is a team work and we are very proud to be part of that.

Furthermore, we are very active in the Western Desert, and one of our technologies has helped Khalda, which is Apache's joint venture, to drill a well in the fastest drilling time ever recorded in the area. The recent discovery of Eni in the Western Desert and other projects makes us see it as an area that we would like to focus on, and we hope for more activities in there.

In the Gulf of Suez, as mentioned before, we have the 3D seismic multi-client agreement. We have not had major discoveries in the Gulf of Suez in the past few years, so we are hoping this 3D seismic survey to allow the operating company to make new discoveries in the area.

Is Schlumberger planning to join new projects in the near future?

Studies have been going on in the unconventional wells of Apollonia. We were involved in the project's first steps and we look at continuing our involvement in the project. I believe the future of unconventional resources in Egypt is very bright, so we definitely have an interest in being part of it.

We would also like to be more involved in the Gulf of Suez. I think the area still holds a lot of potential, which is why we are excited about this 3D seismic agreement. In general, the reservoir recovery in Egypt is very important and the country must be more aggressive in pursuing new technologies and more enhanced oil recovery, because that will help us increase our production in the complex reservoirs of the Gulf and in its existing facilities. Extending my comments on that, I would like to mention that the fields in the Western Desert decline at a very high rate of 35% per year, which is very significant, so being more aggressive in oil recovery would also prevent the country from declining its oil production in different areas.

Considering your path in Schlumberger, what are your suggestions and comments on the future of the Egyptian oil and gas sector based on your experience?

I committed 34 years of my life to Schlumberger. I started very early when I was 22 years old. Since I joined the company, the oil and gas sector has definitely changed a lot, and, from my whole experience, I believe Egypt should invest in enhancing the competency of the people in the oil and gas sector. I have been around many places with a lot of Egyptians working in the sector. We are dominating the Middle East, we are very active in Africa, Asia, North America, and Europe – we have a lot of good Egyptian employees abroad. However, the industry needs to attract these people to work and contribute in their own countries instead of outside. Egypt does not lack manpower and talents, so Egyptian companies should take a more assertive role in pursuing exploration and production opportunities through our own human resources.

EGYPT OIL&GAS
RESEARCH & ANALYSIS

The Petroleum Sector:

FUEL OF EGYPT'S ECONOMIC ENGINE

The petroleum sector is one of the main contributors to Egypt's economic growth, as a major attractor to both public and private investments. In fiscal year (FY) 2016/2017, the sector attracted around EGP 90.1 billion, a staggering annual increase of 9.1%. In addition, petroleum imports and exports represent a significant share of the country's Balance of Payments (BOP). This report highlights the economic contribution of Egypt's oil and gas sector through tackling different perspectives from FY 2010/2011-2016/2017.

By Mahinaz El Baz, Hania El Kady

GROWTH RATE OF THE SECTOR

Although the extractives sector suffered as a result of declining oil prices and slowing global growth, FY 2016/2017 witnessed an improvement in the performance of the petroleum sector in comparison with FY 2015/2016. The rate of decline of the sector's real gross domestic product (GDP) reached 1.8% in FY 2016/2017 against 5.3% in the previous year. This could be attributed to the positive developments of the natural gas extractions and the increasing number of producing wells.

The real GDP of natural gas achieved a growth of 2.1% in FY 2016/2017 as opposed to a negative growth of 11% in the past fiscal year. Meanwhile, the real GDP of crude oil extractions kept declining during FY 2016/2017 to 6.5% against a slight decrease of 1.5% in the previous fiscal year.

The sector also witnessed a decline in the growth rate by 5.3% in FY 2015/2016 in comparison with FY 2014/2015. Natural gas was the most affected extraction activity with a decline rate of 11%, crude oil extractions decreased by 1.5%, while other extraction activities increased during the same period.

The growth rate of the oil refining sector decreased by 3.4% in FY 2014/2015 after an increase of 2.4% in FY 2013/2014. The total output of the oil refining sector for Q4 FY 2014/2015 was EGP 17.3 billion against EGP 18.6 billion for the same period of the previous year, constituting a 7% decrease, while the total output of oil refining in FY 2014/2015 was EGP 70.6 billion against EGP 73.1 billion in FY 2013/2014, a 3.4% rate of decline.

The production of natural gas and crude oil witnessed a decline of 4% and 1% respectively in FY 2012/2013. At the same time, the production of petroleum and petrochemicals products increased by 3% and their consumption by 5%.

The overall performance of the sector during FY 2011/2012 was quite poor, although Q4 witnessed a slight increase in the production of crude oil, condensates and butane. Their total production amounted to 8.68 million tons in comparison with 8.52 million tons during the same quarter of the past year, registering a growth rate of 1.9%. Similarly, the amount of production in FY 2011/2012 increased by only 1.2% reaching 35 million tons. Meanwhile, the total output of petroleum and petrochemicals products recorded a decrease of 8% in the same FY.

CRUDE OIL CONTRIBUTION TO GDP *(Current Prices/Million EGP)*

FISCAL YEAR (FY)	PUBLIC	PRIVATE	TOTAL	CONTRIBUTION OF CRUDE OIL IN GDP (%)
FY 2010/2011	69542	12024	81566	6.2
FY 2011/2012	93893.0	16726.0	110619.0	6.45
FY 2012/2013	105832.2	18915.8	124748.0	6.48
FY 2013/2014	124816.7	22136.4	146953.1	6.66
FY 2014/2015	117366.2	20345.1	137711.3	5.56
FY 2015/2016	78455.3	12985.1	91440.4	3.42
TOTAL	589,905.4	103,132.3	693,037.8	5.63

Source: Ministry of Planning, Monitoring and Administrative Reform (MPMAR)

NATURAL GAS CONTRIBUTION TO GDP *(Current Prices/Million EGP)*

FISCAL YEAR (FY)	PUBLIC	PRIVATE	TOTAL	CONTRIBUTION OF NATURAL GAS IN GDP (%)
FY 2010/2011	88817	19389	108206	8.26
FY 2011/2012	119969.0	25071.0	145040.0	8.46
FY 2012/2013	132229.2	27109.7	159338.9	8.27
FY 2013/2014	146171.4	29199.6	175371.0	7.95
FY 2014/2015	121272.1	23155.3	144427.4	5.83
FY 2015/2016	73437.7	13363.2	86800.9	3.24
TOTAL	681896.40	137287.8	819184.20	6.66

Source: MPMAR

SECTORAL CONTRIBUTION TO GDP GROWTH

According to a report by the European Bank for Reconstruction and Development, growth in Egypt continues to accelerate, reaching 5.4% in Q2 FY 2017/2018 as a result of improved competitiveness and greater investor confidence. This increase is attributed to manufacturing, trade, tourism and the mining sector recovery. The economic activity is expected to reach 5.3% and 5.5% in FY 2017/2018 and FY 2018/2019 respectively, owing to a set of factors, including the start of natural gas production from the Zohr natural gas field and the reform of business environment and macroeconomic policies.

The highest contribution of crude oil in GDP was realized in FY 2013/2014, where both the public and private sectors recorded a total of EGP 146,953.1 million. Conversely, FY 2010/2011 had the slightest share in GDP, in both public and private sectors, that totaled at EGP 81,566 million. This could be attributed to the fact that, in 2010, Egypt became a net importer of oil. Meanwhile, the real GDP of crude oil extractions continued to decline by 6.5% during FY 2016/2017 against a slight decline of 1.5% in previous year.

As for natural gas, the highest contribution of public and private sectors in GDP actualized in FY 2013/2014, recording EGP 146,171.4 and 29,199.6 million respectively. The lowest contribution of natural gas in GDP took place in FY 2010/2011, where the public and private sectors recorded EGP 88,817 and 19,389 million. This coincided with a slowdown in production and the halting of new exploration contracts from the government after the 2011 revolution that toppled former president Hosni Mubarak. On the other hand, in FY 2016/2017, the real GDP of natural gas activities increased by 2.1% as opposed to the negative growth of 11% in the preceding year.

The oil refining contribution in GDP peaked in FY 2015/2016, where public and private sectors amounted to EGP 113,909.1 million. On the other hand, FY 2010/2011 witnessed the least contribution of oil refining in GDP. The Ministry of Planning, Monitoring and Administrative Reform (MPMAR) stated its intent to raise the capacity of oil refining laboratories by 10% to reach 41 million tons per year in addition to completing nine development projects with $8.3 billion total investments, according to Asharq Al-Awsat newspaper.

PETROLEUM INVESTMENT INFLOWS

The oil and gas industry has been one of the main indicators of the health of Egypt's economic environment. In response to the fluctuations post 2011, total investment influx into the industry saw a sharp decline from EGP 12,178.5 million in FY 2010/2011 to around EGP 8,074.7 million in FY 2011/2012, according to MPMAR.

Despite economic and political unrest, crude oil investments hiked in FY 2012/2013 representing around 11.1% of total investments in the Egyptian economy. This increase was mainly attributed to the rise in public investments, which accounted for 85.9% of the total investment.

The oil refining contribution to GDP peaked in FY 2015/2016, where public and private sectors amounted to EGP 113,909.1 million. On the other hand, FY 2010/2011 witnessed the lowest contribution of oil refining in GDP. The MPMAR stated its intent to raise the capacity of oil refining laboratories by 10% to reach 41 million tons per year in addition to completing nine development projects with $8.3 billion total investments, according to Asharq Al-Awsat newspaper.

From FY 2010/2011 - FY 2015/2016, crude oil investments contributed 7.4% of the petroleum sector's total inward investments, awarded around EGP 102,742.1 million from public investment sources and EGP 23,789 million from private investment sources.

Natural gas investments account for 12.1% of petroleum total inward investments on average. It represents the biggest share among other hydrocarbon exploration and production (E&P) inward investments. In FY 2011/2012, natural gas recorded the highest share of the petroleum sector's investments, reaching 22.1% of total oil and gas inflow investments. On the other hand, in FY 2015/2016, natural gas's investment share

CRUDE OIL INVESTMENTS (Current Prices/Million EGP)

FISCAL YEAR (FY)	PUBLIC INVESTMENTS	PRIVATE INVESTMENTS	TOTAL INVESTMENTS	CONTRIBUTION IN TOTAL SECTOR'S INVESTMENT (%)
2010/2011	2745.5	9433	12178.5	5.1
2011/2012	4536.7	3538	8074.7	3.3
2012/2013	23072.8	3800	26872.8	11.1
2013/2014	21686.2	1900	23586.2	8.9
2014/2015	21087.2	2504	23591.2	7.1
2015/2016	29613.7	2614	32227.7	8.2
TOTAL	102742.1	23789	126531.1	7.4

Source: MPMAR

NATURAL GAS INVESTMENTS (Current Prices/Million EGP)

FISCAL YEAR (FY)	PUBLIC INVESTMENTS	PRIVATE INVESTMENTS	TOTAL INVESTMENTS	CONTRIBUTION IN TOTAL SECTOR'S INVESTMENT (%)
2010/2011	9235	23312.8	32547.8	14.2
2011/2012	14779.2	39512	54291.2	22.1
2012/2013	3622.8	33000	26622.8	11.0
2013/2014	3609.4	21900	25509.4	9.6
2014/2015	4189	27435.6	31624.6	9.5
2015/2016	5563.2	30190	35753.2	9.1
TOTAL	40998.6	175350.4	206349	12.1

Source: MPMAR

PETROLEUM BALANCE OF TRADE ($ Billion)

decreased to the lowest since FY 2010/2011, making up 9.1% of total investments in the sector.

Unlike crude oil and natural gas, oil refining activities had a relatively slight contribution in the total investments of the petroleum sector. In FY 2015/2016, it represented only 0.2% of the sector's total investments, while in FY 2011/2012 it recorded 4.2%, marking the highest percentage in the past decade.

In FY 2016/2017, Egypt's oil and gas sector received around EGP 90.1 billion of investments, increasing by 9.1%. It is worth noting that 73% of these investments were injected into natural gas exploration activities, while crude oil amounted to 10.2% of the total investment inwards, and other extractions represented 16.8%, according to MPMAR.

Affirming the economic importance of the oil and gas sector in Egypt, MPMAR figures highlight that from FY 2010/2011 until FY 2015/2016, petroleum investments represented more than 20% of total investments injected into the national economy.

PETROLEUM SECTOR'S FOREIGN TRADE PERFORMANCE

Egypt's oil and gas industry remains the major driver of Egypt's BOP. It ran an overall surplus of $13.7 billion in FY 2016/2017, of which $12.2 billion were actualized in November-June FY 2016/2017, following the government's decision to liberalize the exchange rate against an overall deficit of $2.8 billion in the previous FY, according to the Central Bank of Egypt (CBE).

The performance curve of Egypt's BOT - part of the country's BOP - witnessed a continuing deterioration from FY 2010/2011 to FY 2016/2017. It shifted from a surplus of $2.87 billion in FY 2010/2011 to a $4.4 billion of deficit in FY 2016/2017.

The decline started in FY 2011/2012, due to political unrests and economic fluctuations. However, FY 2013/2014 was the first year to witness a deficit in Egypt's petroleum BOT, when imports exceeded exports.

It is worth noting that in FY 2014/2015, Egypt had to halt liquefied natural gas (LNG) exports and became a net natural gas importer, with a hydrocarbon external deficit of $3.6 billion compared with a surplus of $5.1 billion in FY 2009/2010. During that period, the current account deficit was largely driven more by the negative hydrocarbon balance than by the decline in tourism, according to CBE statistics.

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CYBERSECURITY IN THE OIL AND GAS SECTOR: PROBLEMS AND SOLUTIONS

By Matthew Hoare

The recent technological boom in wireless communications, sensor applications and automated machinery is bringing untold benefits to the oil and gas industry; from enhancing remote monitoring capabilities and providing detailed analytics, to revolutionizing data storage and reducing operational costs. However, the connection of industrial control systems (ICS) and supervisory control and data acquisition (SCADA) systems to the wider digital network has exposed critical pieces of infrastructure to cyber threats.

In addition to IT networks, cyberattacks now threaten operational technology (OT) used in rigs, refineries and storage facilities. As the traditional distinction between IT and OT becomes increasingly blurred, it is imperative that the sector works to ensure that its industrial assets are protected and its digital infrastructure is secured against the evolving threats.

THREATS IN A DIGITAL AGE

The extent to which cyberattacks can disrupt the energy sector was revealed in 2012 when the Shamoon virus breached the IT systems of Saudi Aramco and RasGas. The malware infected tens of thousands of computers and overwrote their master boot records, rendering them unusable.

The reappearance of Shamoon in 2016 and 2017 suggested that the affected organizations had not taken adequate measures to protect against existing threats. “If companies had followed security practices, such as protecting passwords, or not allowing remote access tools or VPNs insides the network, then they would have been less susceptible,” Ravi Patil, technical director at cybersecurity company Trend Micro, told Gulf News at the time. “It was human error.”

Unfortunately, recent research suggests that IT and OT systems in the MENA energy sector remain highly susceptible to cyber threats. Earlier this year, Siemens published the findings of their research into the sector’s readiness to combat cyber threats to OT, and found that three-quarters of surveyed companies reported a cyberattack that resulted either in the disruption of company OT or the loss of sensitive information. More than one in 10 (11%), meanwhile, said their OT had been subject to more than 10 attacks over the previous 12 months. On top of this, the survey reveals that companies fail to detect almost half (46%) of all cyberattacks, suggesting that these figures are in fact conservative.

These figures are backed up by data published by Russian cybersecurity firm Kaspersky Lab, which showed that ICS’s in the energy sector were the most frequently attacked around the world in the second half of 2017; the company recorded 178 attacks against the energy sector, comprising 38.7% of all attacks detected over the period.

IDENTIFYING RISKS

These findings should be concerning considering the potential consequences of a cyberattack in the oil and gas sector, which range from financial and reputational damage to health, safety and environmental concerns.

Associated cyber risk varies between each upstream stage - from exploration to abandonment. The exploration process is less susceptible to outside cyberattacks than the development and production process. While seismic and geophysical studies integral to the exploration process involve the collection of large amounts of data, the risk level is minimal due to the use of closed data systems that are not connected to outside networks. In the event that these systems are compromised, there are no environmental or health risks involved, operations are not disrupted, and there are no direct financial consequences.

> “IT risk assessment and security programs are focused on ‘protecting the data,’ while OT is focused on protecting safe and reliable physical operations by assuring correct and authorized control of the computers controlling that process.”
>
> **ANDREW GINSER, VICE PRESIDENT FOR ICS AT CANADIAN CYBER SECURITY COMPANY WATERFALL**

Risks are significantly higher for infrastructure used for well development and production; not only are these assets more vulnerable to attacks but the potential consequences are more severe. The large network of connected facilities, remotely-controlled or automated devices, and distributed control systems (DCS) means that malicious actors have many more points of attack. A successful attempt to gain access to a company’s ICS, disrupt wireless networks or cause the loss of key analytics, can severely disrupt business operations, damage assets, and result in financial losses. In addition, the high drilling activity increases the likelihood of an attack causing

environmental damage, which in turn raises the risk of regulatory fines and reputational harm.

Furthermore, the long lifespan of facilities in the energy sector means that many rigs and refineries are dependent on older technology that was not originally designed with modern cyber threats in mind. Legacy technology is harder to monitor and has been sporadically retrofitted over the years, resulting in a varied collection of technologies over which it is difficult to apply a common OT security protocol.

FINDING SOLUTIONS

With the advent of the so-called 'Industrial Internet of Things' (IIoT), IT and OT systems are becoming increasingly integrated. As more OT becomes connected to the wider computer networks, applying a single overarching cybersecurity protocol for the entire system may seem like a logical solution. Despite this, there remain fundamental differences between IT and OT networks. While IT systems are primarily concerned with supporting non-industry specific functions such as sales, finance and human resources, OT systems enable the control and monitoring of industrial technology, often via automated devices and remote control. As such, there is less human interaction with OT systems compared to IT.

Andrew Ginser, vice president for ICS at Canadian cyber security company Waterfall, told Egypt Oil & Gas that attempting to apply IT risk assessment guidelines to OT systems is a mistake and vice versa - despite the increasing integration of the two systems. "IT risk assessment and security programs are focused on 'protecting the data' while OT is focused on protecting safe and reliable physical operations by assuring correct and authorized control of the computers controlling that process," he says. "These are two very different ways of looking at the world."

PENETRATION TESTING

Penetration testing refers to the periodic testing of IT and OT systems. Tests are designed to replicate a real-world cyberattack in order to locate weaknesses or vulnerabilities in company networks. However, according to a report by Ernst & Young many companies in the oil and gas sector are reticent about regularly testing their OT systems for fear of potential disruptions. "That fear is understandable but overstated," Leo Simonovich, vice president of industrial cyber and digital security at Siemens Energy, tells us. "Well-defined and scoped penetration testing, executed by an experienced security vendor specializing in ICS cyber security, poses minimal risk to the control system." For Ginser, any fears of disruption indicate weaknesses in the system. "If systems are too fragile for penetration testers, then they are much too fragile, period," he says. To get around these fears, he recommends the use of test beds – a copy of the system subject to testing. This way, the company's OT systems will not be affected if any weaknesses are found during the penetration test.

IMPROVING DETECTION

Siemens's research found that almost half of all cyberattacks against MENA oil and gas companies go undetected. Failing to detect threats means that not only is the company unable to provide an immediate response to the threat, but also it may never acquire information about the attack itself. Ensuring the company improves its visibility into its network – especially into remote sites – is therefore essential.

Despite improving awareness of the importance of network monitoring, Simonovich voiced his concern that many MENA oil and gas companies simply do not have the ability to detect cyber threats by themselves. "What is of concern is that most energy companies do not have the capability to monitor their OT cybersecurity environment on their own", he says. "If they do detect a potential intrusion, they do not have the plans or capabilities to responds effectively."

Companies should ensure that they have an intrusion detection system in place that rejects any attempt to connect unknown USB devices or laptops to the network, and logs the activity with the company's Security Operations Center (SOC). Regarding OT systems, Ginser tells us that companies can use Unidirectional Gateways and Unidirectional CloudConnect systems to extend their monitoring capabilities to OT systems.

EXTERNAL SUPPORT

While companies assume responsibility for ensuring their systems are protected against outside threats, resources exist at state-level to assist with serious cybersecurity breaches – especially when it involves critical sectors that affect national security.

According to the 2017 Global Cybersecurity Index, Egypt was ranked second in the region and 14th in the world in terms of its national capacity to deal with cyber threats. Central to the government's cybersecurity strategy is the computer emergency response team (EG-CERT), which provides emergency assistance to public and private organizations operating across a variety of sectors. It also provides cybersecurity training and raises awareness about the importance of securing computer networks against attacks. EG-CERT is primarily concerned with threats targeting IT systems – such as distributed denial of service (DDoS) attacks, the spread of malware and viruses – instead of OT systems.

However, Dr Sherif Hashem, vice president of cyber security at Egypt's National Telecom Regulatory Authority, told Egypt Oil & Gas that EG-CERT plans to set up a separate laboratory dedicated to ICS and SCADA in the future. "We have colleagues who went and engaged in training for ICS and SCADA security and we are waiting until we move to our new facility… I hope in the very near future but it depends on relocating the CERT," he told us.

Should EG-CERT broaden its remit to ICS and SCADA, companies operating in the Egyptian oil and gas sector will have an additional resource to call upon should they encounter a serious security breach affecting OT.

> "Every company in the oil and gas industry must develop an industrial cybersecurity strategy, stand up a cyber-governance model, re-examine their security fundamentals and build smart infrastructure defences that include extensive cyber training."
>
> LEO SIMONOVICH, VICE PRESIDENT OF INDUSTRIAL CYBER AND DIGITAL SECURITY AT SIEMENS ENERGY

PROVIDING ADEQUATE TRAINING

One of the more interesting findings to come out of Siemens's research is the perceived threat of company employees. Of the 176 respondents, 68% believe that untrained or careless employees constitute the biggest threat to company cyber security. While there is no data regarding the percentage of cyberattacks enabled by human error, it is clear that industry figures are concerned about the damage that can be caused from within.

While a certain level of human error can be counteracted by internal monitoring systems, it is important that companies provide all staff members with adequate training to ensure that company cybersecurity protocol is followed. Simonovich tells us that, in order to do this, companies must put into practice a holistic, top-down strategy for protecting their industrial and digital infrastructure. "Every company in the oil and gas industry must develop an industrial cybersecurity strategy, stand up a cyber-governance model, re-examine their security fundamentals and build smart infrastructure defences that include extensive cyber training," he tells us.

FUTURE-PROOFING DIGITAL NETWORKS

As ICS and SCADA become increasingly integrated into the digital architecture of MENA oil and gas sectors, companies are tasked with ensuring that their industrial technology is adequately protected against evolving cyber threats. As evidenced by recent research, it is clear that industry leaders have more to do in order to improve confidence in the sector's ability to defend against attacks.

As Simonovich tells us: "By ensuring asset transparency and rapid detection, organizations can best manage OT cyber risk and unlock the broader benefit of digitalization in the oil and gas industry."

BIG DATA ANALYSIS FOR OIL & GAS OPERATIONAL GAINS

By Felix Fallon

In 2006, Clive Humby, then the architect of a supermarket loyalty scheme, expressed the now-popular belief that "data is the new oil". He was talking about the potential value in using the massive amounts of customer data generated by the Tesco Clubcard system, but the axiom rings just as true for the oil and gas industry.

Analysis of big data is currently utilized mostly in the upstream sector, giving engineers and geologists a viable way to use the astronomical amounts of data generated by seismic imaging and other drilling and exploration technologies. However, the practice is yet to be implemented on a large scale in the midstream and downstream sectors, despite having the potential to streamline logistics, provide targeted sales models, and even uproot the business structures of the most established companies to make them more efficient, streamlined, and to generate value.

There are three principal restrictions in traditional data analysis: volume, velocity and variety. As data generation has evolved, conventional computing methods have struggled to keep up with the amount of data being received, the speed at which it is generated, and the growing spectrum of sources used for data collection.

We no longer live in the times of simple documents, personnel files and financial transactions. Improved technology means that data can be extracted from images, video, audio, 3D models, simulations, location and time-specific information. Vast databases are now required to store such volumes of data, the sizes of which exceed the capacity of traditional IT systems. As an example, a modern offshore drilling platform has about 80,000 sensors, which are expected to generate 15 petabytes of data in various forms during the lifespan of the facility.

> "Large savings in operations improve cash flows, enhance production, and improve logistics ensuring growth."
>
> **Anders Brun, partner at McKinsey Oil & Gas Practice**

The advent of readily-available big data technology earlier this decade presented the opportunity of both better understanding systems and better allocating resources; traditional computing techniques have to ignore and delete large quantities of potentially useful information which is outside of its capabilities. Big data analytics is able to categorize and process this information through machine learning and analysis software; revealing trends, correlations, and outcome probabilities otherwise impossible to reach.

In addition to the benefits it can bring to operational efficiency, big data can also make positive improvements to a company's balance sheet. Anders Brun, partner at McKinsey Oil & Gas Practice, told Egypt Oil & Gas that "large savings in operations improve cash flows, enhance production, and improve logistics ensuring growth." "Recent analyses across 12 operators show that the total potential, across upstream and downstream for an integrated player, may amount to a cash flow improvement of as much as $11 per barrel of oil equivalent by 2025… Specifically, for refiners we see potential in the range of 5% of gross margin improvements."

BIG DATA IN THE UPSTREAM SECTOR

Oil and gas companies conduct advanced geophysical modeling and simulation to support upstream operations, using 2D, 3D, and 4D seismic imaging that generates significant amounts of data (a single 3D seismic image can exceed one petabyte in size). Companies use tens of thousands of data-collecting sensors to provide real-time monitoring of both subsurface wells and surface facilities. Yet, the disparate and increasingly complex forms of information received, make it a challenge to collect, interpret, and leverage the data.

For exploration, the use of big data makes all this information accessible and interpretable; navigation, visualization, and discovery become quicker and easier. Aided by machine learning and advanced analysis software, companies can use integrated asset models to assess the viability of drilling a certain well, or exploring a certain concession, especially for unconventional resources.

Unconventional fields have many wells on a limited acreage, each with its own specific production-type curves, cost of drilling, geological formations, leasing costs, and completions optimizations. Each of these factors changes from well to well, location to location, or from one period of time to another. These variances make it difficult to compare assets using traditional data analysis.

Oil and gas operator ConocoPhillips began development on the Eagle Ford shale field in Texas in 2010 and drilled 1,000 wells in their first seven years of production. In the period from 2015 to 2017, the company utilized advanced data analytics and reduced their drilling days by 50%.

The operator had incoming data on factors such as the rates of penetration, the rotations per minute (RPM) on the drill floor, and pump flow rates; comparing these data points to operations on other rigs provided a large reference database for the Eagle Ford concession. Through the use of analytics, ConocoPhillips was able to identify and replicate optimal conditions and techniques across all of its drilling sites.

"It did not stop there as we are continually measuring, adjusting, and experimenting through several different cycles to dramatically improve drilling performance over time," ConocoPhillips Chief Information Officer, Mike Pfister, stated in 2017.

Due to ConocoPhillips's use of big data enabled, in 2017 the company pumped 15.5 million lb/well of proppant, compared with 7.5 million lb/well and 3.8 million lb/well in 2014 and 2012 respectively. "Our completion design continues to evolve, but analyzing the data over time has maximized return from our investments in the Eagle Ford," ConocoPhillips Chief Technology Officer Greg Leveille stated.

HIGHLIGHTS

Big data is used in upstream operations to ensure machinery is working effectively and to minimize disruptions.

Big data is also used in upstream operations to ensure machinery is working effectively and to minimize disruptions. Machinery used in drilling has to operate in harsh conditions for prolonged periods of time and can be susceptible to wear and damage. The machinery is fitted with sensors collecting information on performance, which is then compared with aggregated data. This data, livestreamed to engineers, means that parts can be replaced efficiently and downtime is minimized, reducing overhead production costs and saving time in identifying problematic equipment. On average, the oil and gas industry experiences up to 10% operational downtime due to unanticipated equipment failure, three times the US industrial average. The cost of an offshore well going out of commission is roughly $7 million per day.

The live streaming of complex real-time sensor data - only possible through big data technology - can help predict the success rate and environmental risks of drilling operations. Real-time weather data, combined with drilling operation data, mitigates the risks of dangerous conditions for workers. In addition, data from continuous pipeline monitoring can warn of oncoming earthquakes and help in making the decision to shut down operations.

BIG DATA IN THE MIDSTREAM AND DOWNSTREAM SECTORS

Big data analysis can bring positive benefits to the midstream sector; particularly regarding transportation, maintenance, and refining. Transporting oil and gas can pose several problems to companies; chief among them is ensuring that equipment used is in suitable condition and can transport oil and gas at the lowest possible risk. Big data can provide ways for companies to actively monitor pipelines and other infrastructure used for transportation. For example, sensors placed on pipelines can detect abnormal stress levels, allowing the company to pre-emptively take them offline, preventing accidents and other disruptions

caused by damaged machinery.

The process of refining also benefits from big data analysis. Logilube, a technology development company, uses predictive data analytic solutions for oil and gas compression. Its SmartOil system can track any change in the manually adjusted lubrication rate of refineries, ensuring compressor efficiency. “A drop of just 0.5% in efficiency can cost a natural gas compression operation $180,000 per year in lost revenue,” Logilube chief executive, Bill Gillette, stated in a 2017 press release.

HIGHLIGHTS

Greater market insight can affect operations higher up the supply chain; market analysis can help determine the best sale strategy for fuel vessels.

Despite the range of uses for big data in the downstream sector, it is currently used much less in downstream than in upstream and midstream operations.

Brun says that the prospect of its implementation in the downstream sector garners both “strong interest and strong skepticism.”

Downstream data analysis can serve two functions; in marketing, and in trading. For marketing, big data draws off retail and marketing information to better understand the customer. Electronic payment systems provide large data banks from which to extrapolate customer trends. There are opportunities in running analytics on retail websites, and through aggregating and analyzing social media posts to improve sales and end-consumer retail operations.

However, the oil and gas industry has to look to the banking and retail industries for successful use cases of consumer based big data - the potential is in optimizing the last stage of the hydrocarbon value chain, leveraging consumer data to optimize pricing and product visibility.

Through modeling commodities markets with data analytics, oil and gas companies can forecast trends, predict regulatory changes in trading, and gain market insights rivaling those of dedicated financial institutions. Greater market insight can also affect operations higher up the supply chain; market analysis can help determine the best sale strategy for fuel vessels - whether to change the selling point of a cargo or maintain possession waiting for a better opportunity given the market state at the time.

BIG DATA AND BUSINESS MODELS

The implementation of big data predictive analysis has ramifications for the structure of operations for entire companies. “Big data enables new ways of managing projects and new ways of operating leading to agile operations,” Brun stated.

“Gone are the days when information and technology was a centralized headquarter function. Today, it permeates across the organization and decision-making has moved from a hierarchical top-down flow into fluid mechanisms through lean teams and methodology,” he continued.

Big data analytics offers companies the opportunity to integrate all their disparate systems and departments through data consolidation, and make informed top-down decisions to improve performance. Having a centralized database for all sectors including production, revenue, transportation, marketing, and human resources, provides the platform for statistical analysis, modeling and insight into company-wide performance. The ability to extract trends and make predictions across different operations throughout the industry can give a company the edge needed to generate the most value out of tight profit margins.

“Some executives believe that the oil and gas operating model is about to change fundamentally,” Brun asserted. “It will take several years to get there and it is likely to be more of a linear development than abrupt and dramatic,” he added.

DRAWBACKS AND CHALLENGES IN IMPLEMENTATION

According to McKinsey research, the oil and gas industry only generates value from 1% of its data. A paper from Orbis Research states that only 36% of oil and gas companies have invested in big data and analytics, only 13% of which use the insights generated by the technology to enhance business intelligence. Partial use of big data technology and analysis, coupled with ignorance of the new technologies hitting the market are holding the industry back from capitalizing on the full potential of big data analytics.

Brun told Egypt Oil & Gas that the “application of advanced analytics is not even across all segments, and overall it is fair to say the oil and gas industry has been relatively slow in adopting the newest digital capabilities.”

Brun detailed four factors that discourage industry wide implementation of big data: first, building the “sufficient capabilities” to house the technology and drive transformative action; second, establishing an “aligned road map of priority change themes” to pinpoint the resources and areas which would benefit most from big data, companies often “fall into the ‘proof of concept trap’ in testing many digital use-cases, but not really scaling them”; third, ensuring “business led-transformation” where change come from the top down, not following the lead of IT departments; and fourth, “managing the trade-offs” of changing operating models in such a way, reallocating tasks to data analysis software while ensuring job creation on the administrative end.

Cybersecurity represents another concern for operators. “The dark side gathers more and more analytical skills” in contrast to its legal counterparts, Brun warned. “Connecting critical equipment and processes to networks, and storing critical company data in the cloud imposes new and potentially very large security risks.”.

HIGHLIGHTS

Having a centralized database for all sectors including production, revenue, transportation, marketing, and human resources, provides the platform for statistical analysis, modeling and insight into company-wide performance.

COOPERATION IS NECESSARY

The successful exploitation of big data requires cooperation among areas of a business. For example, management and IT departments need to collaborate so that a consistent company-wide digital infrastructure can be developed. From the specifics of drilling and exploration operations to trends driving the upstream, midstream and downstream industries can all be extrapolated with advanced analysis to create value and map business strategies.

“Big data can plot trends and probabilities on infinite parameters,” Brun stated. “From geological precision to extracting more out of existing assets, data had always been the key to decision-making, both for larger investments and operational decisions.”

“Big data can put companies on the path to sustainable growth, and in turn lead to greater return on investment for capital, creating a virtuous circle of positive investment environments and continued innovation.”

However, it is important to understand that digital transformation is not only about technology; people and governance are critical success factors. Transformation requires people to work very differently and be much more agile to reap the benefits of big data and advanced analysis.

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OIL PRICE FLUCTUATIONS:
CAN EGYPT'S ECONOMY STAND THE STRAIN?

By Mahinaz El Baz

Crude oil prices have reached high levels as global oil inventories have generally declined from January 2017 through April 2018. The fluctuating prices are affecting both importing and exporting countries. Exporting countries, especially the members of the Organization of the Petroleum Exporting Countries (OPEC), are facing production swings after signing the oil production cut deal and its extensions. The latest amendment on the deal was approved after OPEC's meeting on June 22.

On the other hand, oil importing countries are facing many socioeconomic hazards. Egypt, as a net crude oil importing country, is facing intensive economic pressure due to the latest increase in oil prices. The budget deficit is expected to exceed the planned 8.4% of GDP in Fiscal Year (FY) 2018/2019, according to the pre-budget report issued by the Ministry of Finance.

WHAT REALLY CAUSED THE PRICE INCREASE?

Oil is a commodity that tends to see larger fluctuations in price than more stable investments, such as stocks and bonds. There are several influences on oil prices. Experts believe that some of those factors caused the latest increase in international oil prices to the extent of exceeding $80 per barrel in April 2018 for the first time since 2014.

Kamiar Mohaddes, senior lecturer at the Faculty of Economics & Girton College at the University of Cambridge, told Egypt Oil & Gas that the main reasons behind the hiked oil prices are geopolitical risks, higher demand - due to lower oil prices in 2015-2017 and the pick-up in global economic growth - and supply shocks. All these factors have driven prices higher. "The question is for how long," he added.

Having a similar opinion, Jenik Radon, Adjunct Professor at the School of International and Public Affairs at Columbia University, explained to Egypt Oil & Gas that "global-economic-political insecurity is the dynamic at work and the main driver of oil price fluctuation."

Radon further mentioned that "predicting oil prices is not a science, as much the market law of supply and demand is not the only governing factor in the determination of oil prices. And the fluctuation of oil prices is certainly not art. Therefore it is also not possible to accurately explain all the reasons why there is a hike, let alone a sudden hike, in oil prices."

Referring to the current status of global oil demand and supply, he declared that "global demand for oil is strong, in fact it has increased, but supply is also now increasing. However, there is a significant economic insecurity at present as the US wants to re-impose an embargo on Iran, which will cut Iranian oil exports."

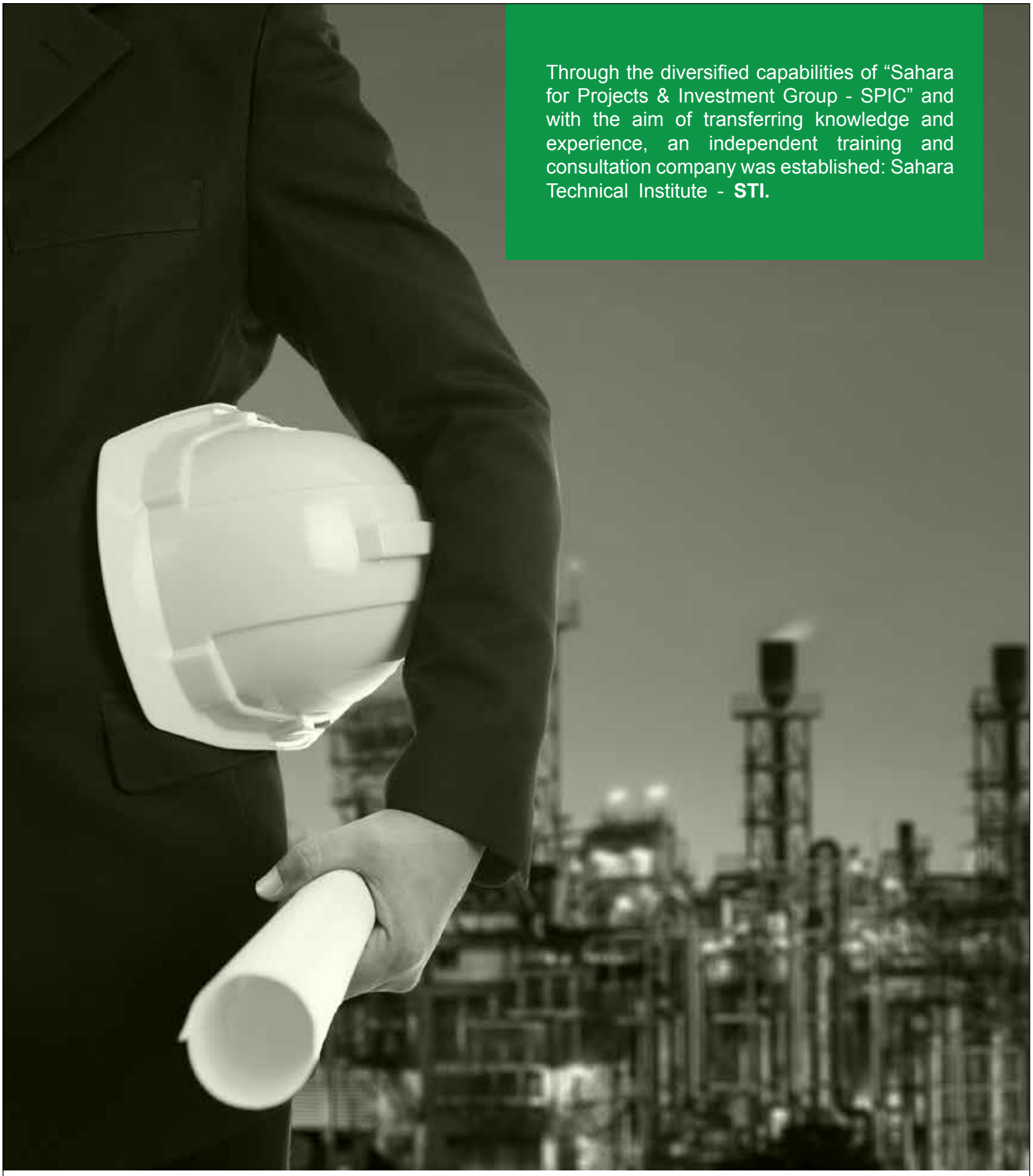
Radon believes that Venezuela is imploding, and, even in the absence of political turmoil and chaos, the country has not maintained its oil producing facilities with the consequence that oil production is decreasing and foreign investment, which could revitalize the Venezuelan oil industry, is absent. "OPEC plays, as best it can, a monopolistic game, which means it seeks to optimize prices, especially as the budgets of many oil producing nations depend on the sale of oil. Moreover, with a constantly threatening global trade war, economic insecurity and uncertainty reigns. With political economic insecurity comes speculators and those who want to simply lock in prices," he added.

Affirming Mohadde's and Radon's opinions, Kenanah Shereih, a petroleum economics researcher, told Egypt Oil & Gas that the recent "geopolitical tensions have increased and put the oil prices under pressure; increased instability in the Arabian Gulf alarming the global oil market; tensions between Saudi Arabia and Iran have emerged; intensifying Libyan conflicts, and the considered sanctions on Venezuelan oil industry from the United States. Beside that OPEC and other top oil countries including Russia have been limiting crude production."

OIL PRICE FORECASTS

OPEC's 2017 landmark production agreement has been a game changer for oil markets, as Saudi Arabia agreed to cut production (and implicitly exports) and Russia agreed to postpone the increase of its record high and steadily rising liquids output.

The OPEC deal removed more crude than originally intended from the market because of the collapse of the Venezuelan energy industry. With oil inventories



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in developed countries back to their five-year average and fuel prices approaching painful levels for consumers, Saudi Arabia and Russia have started pushing OPEC to boost output again, prompting Brent to slide back toward $75, according to Bloomberg.

On June 22, OPEC oil ministers and an ad hoc alliance with several non-OPEC producers, notably with Russia, Kazakhstan, and Azerbaijan (OPEC+), gathered in Vienna to discuss the status and future of their production limitation agreement, which was initiated in November 2016 and runs until the end of December 2018. After the meeting, OPEC announced it would pump more crude oil — a move that should help contain the recent rise in global energy prices. One day later, OPEC nations and oil-producing countries not in the cartel said they have agreed to share increased oil production a day, according to ABC News.

OPEC and non-OPEC countries noted that they would increase supply by returning to 100% compliance with previously agreed output cuts, after months of underproduction. Saudi energy minister, Khalid al-Falih, said OPEC and non-OPEC countries combined would pump roughly an extra 1 million barrels per day (mb/d) in the coming months, equal to 1% of global supply, according to Reuters.

Commenting on al-Falih's statement, Ann-Louise Hittle, a veteran OPEC watcher at consultant Wood Mackenzie Ltd told Bloomberg that "The only country that can increase production is Saudi Arabia, so its interpretation of the deal is the one that matters." A few days later, The US President Donald Trump twitted that King Salman of Saudi Arabia had agreed to increase oil production by up to 2 mb/d.

Since the Vienna agreement, experts' and industry institutions' forecasts have been divided. Some predicted oil prices to increase, while others argued that most probably it will fall, as countries are aiming to boost their production.

Mohaddes believes that in the medium term, oil prices will fluctuate in the region of $60-$80 per barrel. "But we also have to remember that global upstream oil and gas investments have been falling sharply since 2014, which will have implications for future supply and prices. Therefore, in the long run, we should expect higher prices."

Having a similar opinion, Shereih said that "as long as geopolitical crisis continue to escalate, the price of a barrel is not expected to fall. It may achieve some sort of stability in the short term in case of increase global daily production."

Radon explained that "as global-economic insecurity, with ever threatening trade wars across the globe, especially as a consequence of the turbulence of the disastrous G7 meeting in Canada, will continue, it seems fair to say that oil prices will follow suit and will fluctuate, probably with an upward spiral."

"Oil prices will certainly not stabilize and will not be driven just by the market law of supply and demand. Accordingly, as geopolitics rules, oil prices will probably continue in an upward direction unless a trade war breaks out, which will dampen demand for oil and accordingly dampen prices. So we can expect at least a moderate roller coaster oil price ride for the rest of 2018," he added.

Meanwhile, US Energy Information Administration (EIA) forecasts Brent crude oil prices to average $71 per barrel in 2018 and $68 per barrel in 2019, according to the June 2018 update of EIAs Short-Term Energy Outlook (STEO). The updated 2019 forecast price is $2 per barrel higher than in the May STEO.

On the other hand, Energy Commentator Nick Butler explained in his Financial Times' opinion article that "instead of rising to a $100 as some commentators have suggested, the price is more likely to fall towards $50 per barrel. This seems to be the level at which some US shale production becomes uneconomic. If it gets too low the Saudis and others will try to reassert their production quotas and so a reasonable bet on where the market balances would be around $50-$60."

> "Global upstream oil and gas investments have been falling sharply since 2014, which will have implications for future supply and prices. Therefore, in the long run, we should expect higher prices."
>
> Kamiar Mohaddes, senior lecturer at the Faculty of Economics & Girton College at the University of Cambridgew

HOW WILL OIL PRICES AFFECT EGYPT'S BUDGET?

Egypt's Ministry of Finance has drafted the budget for FY 2018/2019 on the assumption that oil prices will settle at around $67 per barrel. The Ministry further explained in its pre-budget report that an increase of one dollar in oil prices will cost the government EGP 4 billion in expenditures and will thus be translated into a wider budget deficit. Moreover, this increase in expenses would limit the money available to the government to finance capital and social expenses in the light of the increases in international prices, eating up the health and education allocations.

In early June, Egypt's cabinet approved the request of the Finance and Petroleum Ministries to contract with some international insurance banks against the risks of increasing oil prices. Both ministries are already moving forward with the procedures of contracting with the insurance banks. It is worth noting that the oil quantities and appropriate pricing mechanisms will be agreed upon by a working group from the two ministries. Furthermore, the working group is expected to develop a framework for a future vision to hedge against the risks caused by fluctuating oil prices and settle the target price of insurance based on international forecasts and studies.

In the same context, the House of Representatives approved the Ministry of Finance's request to pump an extra EGP 70.3 billion budget appropriations to eliminate the budget deficit in FY 2017/2018, due to the hike in oil prices.

"We expect to see positive growth effects (albeit small) for energy-importers, which have strong economic ties with oil exporters, through spillover effects. In particular, for most oil-importers in the MENA region (including Egypt), losses from higher oil prices are offset by an increase in external demand/financing by MENA oil-exporters given strong linkages between the two groups through trade, remittances, tourism, foreign direct investment and grants. These economies are on average expected to experience an increase in real output of about 0.28%," according to Kamiar Mohaddes and Mehdi Raissi's International Monetary Fund (IMF) working paper entitled "The US Oil Supply Revolution and the Global Economy".

WHAT ARE THE IMPLICATIONS FOR EGYPT'S ECONOMY?

Oil price fluctuations, in particular price increases, on oil importing countries hurts their national economies. What is spent on the importation of oil cannot be spent on other goods and certainly cannot be invested. Oil price payments are an expense which cannot be recouped or fully recovered from product price increases, according to Radon.

"In the case of Egypt, the same rule will apply. Oil price fluctuations will have a negative impact on the Egyptian economy and will dampen Egyptian economic growth outlook, which has already slowed recently. It will hurt Egyptian balance of payments as Egypt will have to use its limited dollar reserves to pay for any oil price increases. In short, the Egyptian economy will be hurt and will be in for bumpy ride, which is not good for business, let alone the people of Egypt," Radon added.

Pascal Devaux, senior economist MENA at BNP Paribas, told Egypt Oil & Gas that in oil-importing countries, an increase in oil prices entails inflationary pressure and deteriorates external balance as the import bill is increasing. Moreover, it causes an increase in cost for energy-intensive industries – petrochemicals, cement, and heavy industries – and it can have a negative fiscal impact if fuel prices are subsidized.

Offering a deeper analysis of the Egyptian case, Devaux explained that the increase in oil prices happens at the same time than the government policy to cut in subsidies for oil products. "For FY 2018/2019, the consequences of higher than expected oil prices will be negative for fiscal performances. Nevertheless, the cost for the budget will depend on the willingness of the government to limit the increase in oil prices for the consumers. The government can choose to limit the price increase in increasing allocation to subsidy expenditures, and thus the fiscal deficit," he noted.

Discussing the latest cuts to energy subsidies, Devaux mentioned that "subsidy cuts will impact inflation. This impact on inflation has consequences on interest rates as the rate policy of the Central Bank of Egypt (CBE) is linked to inflation. A higher than expected increase in oil price for consumers would slow the easing cycle of CBE."

Regarding external accounts, he highlighted that the consequences of higher oil prices are mixed. The impact on trade balance is negative as Egypt remains a net oil importer. However, it is positive on Suez Canal income and maybe on remittances as many expatriates are in oil-producing countries (GCC) and can benefit from increasing oil prices in those economies.

Oil prices change quickly according to many factors. Experts argue that geopolitical factors have played a more effective role than market dynamics in many occasions. Thus, oil-importing countries – including Egypt – should pay attention to other factors determining the prices in order to achieve the desired growth rates and have more balanced budgets.

QUANTUM COMPUTING, TECHNOLOGY OF THE FUTURE

By Youssra El-Sharkawy

Quantum computing, an emerging technology, has the potential to bring massive changes to many industries, including the oil and gas sector, in the near future, as researchers expect.

Currently, large technology companies like Google and IBM are competing to make quantum computers a reality, while scientists expect this technology to be available for ordinary people in the coming few years.

Quantum computers are not made to replace classic computers. Instead, both computing systems will be able to work with various degrees of functionality. Unlike classic computers, quantum computers are incredibly powerful and extremely fast. They can speed up algorithms and solve problems related to searching through large data sets, which comes in hand to manage the great amount of data from oil and gas operations.

WHAT IS QUANTUM COMPUTING?

Vern Brownell, CEO of D-Wave Systems - the world's first quantum-computing company, told the McKinsey Global Institute that a quantum computer is a type of computer that directly leverages the laws of quantum mechanics to do a calculation.

"The idea behind this computational scheme is to use the fundamentals of quantum physics – such as superposition and entanglement of particles like electrons- to process the information we need," Kareem El-Safty, a communications and electronics engineer who has an interest is AI and quantum information science, told Egypt Oil & Gas.

The smallest unit of data in a computer is called a bit. In classical computers, a bitcan be either 0 or 1, while in quantum computers, a bit, under the name of qubit, can be 0 and 1 at the same time. It can also have negative values, which is not possible with regular computers.

"Instead of using zeros and ones, an electron can be treated as a 1 or a 0 at the same time, thus, accelerating the processing speed. Moreover, we can make an interesting connection between a couple of electrons that if they are separated by millions of miles, they can affect each other. This phenomenon is called entanglement and we can use it for communications security," added El-Safty, who is also an instructor at Fab Lab Ismailia.

He further explained that, once the technology becomes applicable, its operations will most probably be done on the cloud. This comes as, according to the principles of quantum physics, quantum computers are required to be at temperatures cool enough to avoid individual molecules from moving and causing data loss. With the inexistence of laptops or hardware that can be frozen near zero Kelvin or –273.15 degrees, which is the temperature quantum computers would require, the cloud comes as an option. The technology itself would also be maintained by large companies like IBM or D-Waves due to the same requirement.

QUANTUM COMPUTING & THE OIL AND GAS SECTOR

Although quantum computing is still taking its first steps, scientists believe that it can solve complex challenges in the oil and gas industry and increase production.

Oil and gas exploration and production methods are highly complex and include a massive amount of data, which are time sensitive and need to be analyzed immediately. It is very difficult for regular computers to properly analyze this amount of data as most systems can only analyze few or small amounts at a time. Quantum computers come as time-saving devices that can accurately analyze the petroleum industry's big data and improve the sector's efficiency.

"The oil industry produces everyday more than 1.2 terabytes of data, some of these data are very sensitive and time dependent that it must be processed on time. With so much data, non-convex optimization problems arise and it is a real challenge for classical computers to handle it unlike quantum computers," El-Safty explained.

According to experts, quantum technologies will be the backbone of future computing as it will help with the optimization of problems and supply chain analytics. In the petroleum industry, using quantum computers will lead to a very rapid production and distribution of oil products. Additionally, scientists can use quantum algorithms to simulate new molecules to create new strong and environment friendly materials.

DISADVANTAGES OF QUANTUM COMPUTING

Researchers and scientists expect quantum computer to be able to perform all the tasks that a classical computer can. However, this is not what quantum computers are made for. Using classical operations on a quantum computer will lead to the same results a classical computer can achieve. Instead, quantum computers should be used in performing operations that are of quantum parallelism.

The biggest disadvantage of quantum computers is that it has not been totally invented yet. Scientists aspire for the huge change this technology can make in the future, but, at the same time, they still expect quantum computers to need decades before people can have them in their homes or offices.

“Like any other new technology, quantum computing is still a newborn; there is not any stable framework. Everyday a new idea comes up. But recently, huge companies started to offer cloud services directly to the crowd. It is not cheap, not portable like a laptop, but we all know classical computers started the same way,” El-Safty explained.

QUANTUM COMPUTING IN EGYPT AND MENA

Some researchers in Egypt and the Middle East have started to dig deeper into this new technology. Currently, there are academic groups in Alexandria and the UAE that are working on publishing papers on quantum computing, according to El-Safty.

“The Arab Gulf is the richest region with oil and gas and I think, due to the global warming conditions, there are some constrains about boosting the oil trend, but in case they want faster production, I think the MENA region will be the first to witness a great boost from quantum technologies,” he stated, adding, “As for Egypt, we are still immature for such a huge leap, because we do not have the required infrastructure or even the right market.”

Aya Mohamed AbuElsoud, a young researcher in quantum computing and a student in the Faculty of Computer and Information in Mansoura University, told Egypt Oil & Gas that this technology still needs a very long time to be implemented in Egypt.

“In Egypt, I think it needs years to be implemented. For example, I have been looking for anyone to help me in my research about this technology for more than two months. I only found one doctor in my faculty. Even on LinkedIn, I found only one Egyptian engineer interested in this technology, and the rest were foreigners,” AbuElsoud disclosed.

“There is not enough scientific research in Egypt. Also, engineers should be aware of this new technology, because still many of them do not know anything about it,” added AbuElsoud, who wants to join Zweil University for scientific research to continue her research in quantum computing.

Agreeing with AbuElsoud, El-Safty said that people should be aware of quantum physics and how it affects us in our daily lives.“We have to spread out the word of quantum engineering and make the scientific resources available to everyone so as to catch up with other countries. And most importantly of all is to invest in this long run shot. It will not pay off soon, but eventually it will alternate our lives as Egyptians and the whole MENA,” he added.

The benefits of quantum computing to the oil and gas industry are promising. As the technology still takes its first steps toward implementation, Egypt can catch up with researchers from around the world to develop and master the operation of quantum computers. In line with Egypt’s plans of becoming a regional energy hub, investing in research and professional capacitation in quantum engineering comes as a secure way to maintain Egypt’s position as a hub in the future.

> “We have to spread out the word of quantum engineering and make the scientific resources available to everyone so as to catch up with other countries. And most importantly of all is to invest in this long run shot. It will not pay off soon, but eventually it will alternate our lives as Egyptians and the whole MENA.”
>
> KAREEM EL-SAFTY, COMMUNICATIONS & ELECTRONICS ENGINEER, INSTRUCTOR AT FAB LAB ISMAILIA

Internet of Things:
Unlocking Optimum Profitability in the Petroleum Sector

By Omnia Farrag

When WiFi was available for customers use in late the 1990s, this was revolutionary. It benefited different industries through making communication faster, easier, and cheaper between people. However, what will happen if all the electronic devices became connected to internet including kitchens, cars, medical devices, industrial machines, and sensors? This connection is basic concept of the Internet of Things (IoT).

Many of the IoT applications are designed to make daily life easier, such as heart monitoring fitness bands or smart home appliances. IoT is also used to connect machine and devices in industries like oil and gas, power generation, and healthcare. In this case, IoT applications are usually referred to as Industrial Internet of Things (IIoT), also known as 'Industrial Internet'. The main difference between IoT and IIoT is that the latter performs more critical operations. Accordingly, system failures and unplanned downtime in IIoT applications can result in life-threatening or high-risk situations.

Industrial Internet is not only limited to devices that

HIGHLIGHTS

Digital technologies in petroleum industry can lower capital expenditures by up to 20% and cut operating costs in upstream by 3-5% and by about half that in downstream.

monitor the performance of machines and engines. It also includes machines that help the operators in managing other devices through telling them how to optimize productivity or detect a failure before it occurs.

This will help businesses to maximize profits. For example, General Electric (GE) reported that one of its customers, a power company, saves approximately $0.5 million annually through using Industrial Internet powered Asset Performance Management software. It uses this software to gain asset, plant and fleet reliability. Scottish and Southern Energy (SSE) also manage to save around $3 million per year by using Reliability Management around the clock to maintain uptime and keep the lights on.

Experts predict that IoT applications will become more popular in the coming few years. The Business Insider's premium research service expects there will be more than 24 billion IoT devices globally by 2020 with investment of $6 billion in application development, device hardware, system integration, data storage, security, and connectivity. However, these investments will pay back as the same research forecast these $6 billion investments to generate $13 trillion by 2025.This rapid widespread of IoT means that more data will be created from the increasingly connected machines, systems, and devices. As a result, the volume of critical and valuable insights to be realized and acted upon is limitless.

IIOT IN THE HYDROCARBON INDUSTRY IN EGYPT AND WORLDWIDE

Crude oil prices globally witnessed more than 50% decrease during the last four years stepping down from more than $100 per barrel in 2014 to less than $50 nowadays, according to a 2017 report entitled "Global IoT in Oil and Gas Market". This resulted in decreasing the venue of the five major oil and gas companies by approximately 15% on an average in 2016 in comparison with their profit in 2015. Experts believe that IoT applications have the potential to help the industry to maximize its operational efficiency, productivity, and improve asset portfolio in order to balance the current significant prices drop.

Oil and gas companies can resort to IoT technologies to cope up with the oil prices fluctuation. Analysts at Japanese bank Nomura believe that in the future companies might be more profitable with oil prices at $70 per barrel than they were at $100 per barrel using IoT technologies. Deloitte, a UK-incorporated multinational professional services network, saidthat extraction technologies, including IoT, suggest oil price equilibrium of $20 to $30 less per barrel. Digital technologies in petroleum industry can lower capital expenditures by up to 20% and cut operating costs in upstream by 3-5% and by about half that in downstream, according to the international consulting company, McKinsey.

Major oil companies such as Shell, Engie, Total, BP, Aramco, and Schlumberger are considered pioneers in incorporating IoT applications in the hydrocarbon industry. The lack of skilled workers, increasing number of cyber-attacks, aging infrastructure, and need to increase operational efficiency will drive to oil and gas industry to invest more in IoT applications, according to the 2017 report. The report expect IoT share in the international oil and gas industry to hit $30.57 billion by 2026.

The most common IoT technology in the oil and gas industry is data analytics or software systems that analyze the data given by IoT devices. Analytics represent 76% of IoT solution used in the oil and gas market in 2016.

In Egypt, experts believe that the Industrial Internet of Things can boost the oil and gas sector. IIoT has been introduced into the oil industry over the past few years. In May 2017, Honeywell exhibited its Connected Plant, which is based on IIoT in its Oil & Gas Technologies Symposium exhibition. According to Honeywell, this plant can help with reducing downtime, increased efficiency, and improved safety and security.

At the same time, the Swedish-Swiss multinational corporation ABB announced in Cairo last May that all the devices it manufactures will be connected to the internet. These devices include censors that monitor the machines, which help the operator to be informed with any breakdown in the same moment it happens.

BENEFITS OF THE INDUSTRIAL INTERNET IN THE PETROLEUM SECTOR

IoT can be used in the industry's three main sectors: upstream, midstream, and downstream. In exploration and production (E&P), analyzing diverse sets of physics, non-physics, and cross-disciplinary data will help in increasing production and develop exploration, Deloitte mentioned on its website. "By some projections, IoT applications could reduce production and lifting costs by more than $500 million of a large O&G integrated company with annual production of 270 million barrels," Deloitte added.

Apache, for example, improved the performance of its electrical submersible pumps and increased the company's ability to forecast fields'production capacity using IoT application. The giant American E&P company, along with an analytics software firm, used a three-step system to achieve this result. First, using data to predict submersible-pump failure with prescriptions to avoid future failures. These data are used in the second step to recommend the optimal pump configuration for the next well. In the third step, the data is to assess the fields' potential production capacity.

For midstream sectors, IoT can facilitate building infrastructure based on the industry most updated data, which will ensure better network integrity and new commercial opportunities. As for the downstream sector, Deloitte says that it can be the most benefited sector from IoT in the oil and gas industry through expanding these technologies in the supply chain and digital marketing.

Using IoT in refineries proved its efficiency as most of the refineries currently do not exert effort in analyzing the data they have. For instance, Phillips 66 started to use wireless temperature and flow-measurement sensors to monitor the accumulating unwanted metrical that reduce the equipment's efficiency. This helped the energy company to spot energy losses and track periods of best performance and identify best practices through comparing the performance of exchangers across units. This technique helped Phillips 66 to save $55,000 per exchanger.

DISADVANTAGES OF THE INTERNET OF THINGS

IoT by definition means making all the industry's devices connected to the internet, which expose these devices to the probability of being subject to cyberattacks. It might also compromise the privacy of these companies. Forbes reported that security attacks can subject the oil and gas industry to many hazards from glitches to safety measures violations resulting to causalities. Another security threats include plant shutdown, equipment damage, utilities interruption, production circle shutdown, inappropriate product quality, and undetected spills, Forbes added.

Meanwhile, the main challenge is the complexity of IoT system. Unlike the rest of the most common technologies, IoT is not standardized. There is no unified concept for tagging and monitoring with sensors. IoT involves various technologies with different architecture. This complexity increases the potential of failures pushing companies to consume time in restoring the devices and money to hire more skilled workers to deal with different IoT softwares. IoT application might be expensive as IoT providers need to conduct various interoperability tests before launching a new system. Finally, IoT is promising, yet still a new technology that will take time to develop and become more mature and reliable meaning that companies will have to try various IoT systems and updates in order to reach the most efficient system for them.

IS THE INDUSTRIAL INTERNET THE RIGHT OPTION?

Security and privacy compromise is still a problem. However, pumping investment in cybersecurity will definitely help to eliminate these threats. This is what oil companies are doing now; ABI Research expects that petroleum companies to spend $1.87 billion on cyber security by the end of this year, according to Forbes.

Installing Industrial Internet is a tempting option for oil companies as it proved to increase efficiency and profitability. Yet, likewise any other new technology, it still has shortcomings. Some of these disadvantages could be eliminated. The development of Industrial Internet can make it less complex. The market itself can solve the issue of replacing employees with IoT machines by hiring more skilled employees to run and supervise Industrial Internet software. Regarding the cost, the data provided throughout the article shows that savings and profits from IoT applications can overweigh the cost.

SHALE GAS DRILLING TECHNIQUES

The recent shift in shale gas production techniques has been achieved by combining horizontal drilling and water fracturing. In this procedure, a well is drilled to a depth slightly shallower than the level containing the gas. It is then deviated to penetrate the shale layer horizontally. The rocks in the drilled horizontal section are fractured in many places by pumping a mixture of water and special additives at high pressure to keep the fractures open. In conventional wells, this water contains a gel that increases viscosity. This viscous liquid is pumped at high pressure, which both fractures and flows out of the rocks. Prior to this, another material (such as sand) is injected, which makes it easier to open the fractures and enable the gas to flow.

These techniques are accurate and highly efficient, reducing production costs to the point where some specialists believe that the costs of shale gas production can be lower than those of conventional gas production.

The traditional technologies of fracturing were considered harmful due to their viscous residues. The adoption of the water treatment technique has been a remarkable development, and has meant that most shale production carried out today is done so relatively easily. The disadvantage of this is the increased need for more water, which may reach 5 million gallons per well.

1. Horizontal Drilling Technique

The rapid technological progress in the shale industry has resulted in it becoming dependent on horizontal drilling technology. The technology itself is not new, and is being used all over the world. Most horizontal wells are lined with steel pipes coated with cement. Whether or not they are lined, most are completed in multiple stages. This technique isolates the productive zones of the well and then fractures them down. Another technique is used to deviate the well at a specific angle from the direction of maximum horizontal geological stress, allowing the formation of transverse fractions, which raises production to its maximum limits.

2. Multi-arm Drilling Technique

A new technique for the exploitation of shale gas - multi-arm drilling - has been developed whereby several wells are drilled and completed from a single platform. This reduces the need for roads and reduces the overall effects of operations, particularly in inhabited areas, agricultural land and other environmentally-sensitive areas. In addition, this technique allows for a higher level of sophistication in the handling of materials, making them important in the process of water treatment.

HASSAN SALEM
Egyptian General Petroleum Corporation (EGPC)
Reservoir Engineering Studies General Manager

DÉJÀ VU IN THE PETROLEUM INDUSTRY

Since the world began exploiting petroleum as an energy resource, we have witnessed the importance of proactivity in each decision. Every technology and innovative tool nowadays reminds us of this fact. Like young children who believe in the monster lurking under the bed, petroleum workers in the past saw the well as a gate to hell; a monster to be wrestled with. There were no real-time monitoring tools or automatic control systems to depend on - or even early detection and intervention devices. The question now is: “how has the present improved upon the past, and how can the future be better than the present?”

A proactive approach to research and development provides the answer. All the past problems faced by the petroleum industry were solved by innovative solutions produced by creative minds. Moreover, millions of dollars were generated because technological progress enabled companies to increase production and improve efficiency. The industry will always remember those who added value: Erle P. Halliburton, who developed a new way of oil well cementing; Conrad and Marcel Schlumberger, who invented electric logs; Floyd Farris and Joseph B. Clark, who developed hydraulic fracking; and Granville Sloan Knox, who invented the blowout preventer. People were driven by their passion for research to identify a problem or opportunity for improvement, and design an innovative solution. The petroleum industry is the platform where energy meets intelligence. You can find all kinds of disciplines coming together and exhibiting their innovation to benefit the industry. Looking forward, we can now expect these same forces of progress to drive the petroleum sector forward; digitalizing the industry and implementing artificial intelligence in different applications.

The monster under the bed will remain real until we uncover it. That was the principle that held sway in the early decades of developing petroleum fields. The workers were tough but uncaring about personal protective equipment. The reservoirs were shallower and easier to develop but the production rates were limited and the results were underestimated. After employing newer technologies, we could assess the well program and the expected risks even before drilling. In the digital era, we will be able to fully scan, control and enhance the well as if you are reaching the reservoir in a submarine and have the access to control it in real-time. Big data and artificial intelligence will be the next areas to experience a boom in innovation. As many disciplines are becoming increasingly digitalized, the petroleum industry can provide a platform where they can present their latest applications and creative solutions. Sooner or later, we will begin to see automated rigs, artificial intelligence intervention tools, smart pipelines, troubleshooting robots at work sites, and intelligent control networks.

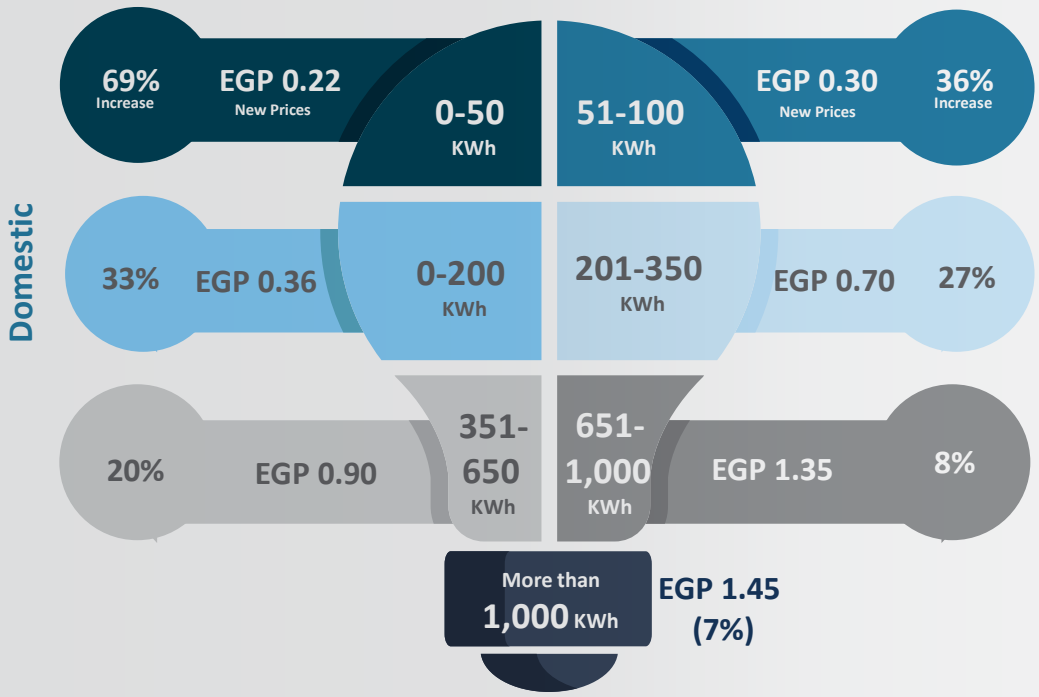
Unfortunately, some people consider research as a way to get promoted or earn a degree. But research is more than that: it is a style of living and a duty for all the disciplines and organizations which participate and collaborate in this industry. So keep thinking and keep developing: the era of digitalization is near.

OSAMA RADWAN
Research Student at Faculty of Petroleum and Mining Engineering

Economic Snapshot: Egypt's Fuel & Electricity Price Hikes

After increasing Water prices by up to 46.5% in early June, GoE announced on June 12th the new Electricity tariffs for FY 2018/19, as part of the country's fiscal reform program, raising prices by an average of 34% for industrial users, 15% for commercial users and 29% for residential users according to consumption brackets as follows:

Electricity Prices



Commercial

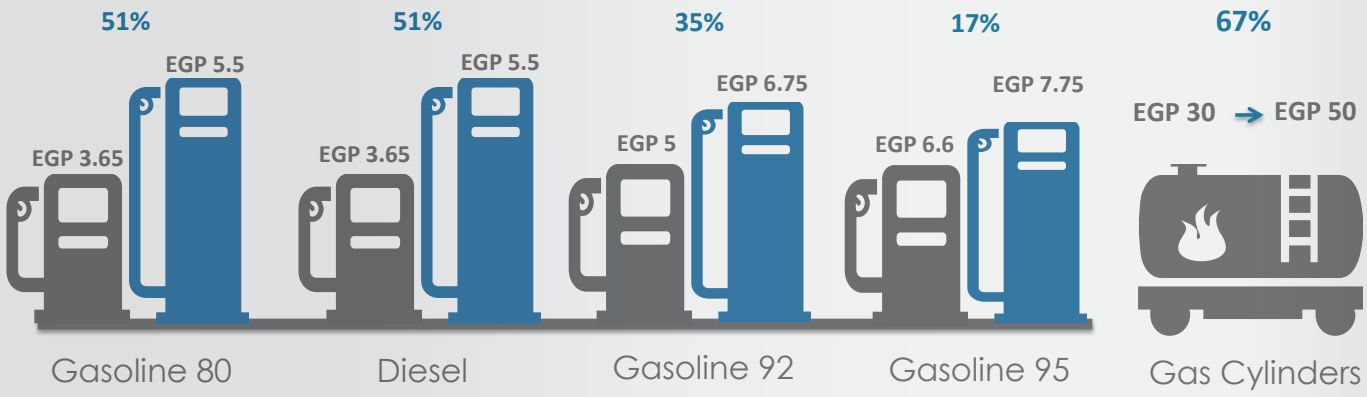
Bracket	Price	Increase
0-100 KWh	EGP 0.55	22%
0-250 KWh	EGP 1	19%
251-600 KWh	EGP 1.15	20%
601-1000 KWh	EGP 1.45	7%
>1,000 KWh	EGP 1.5	7%

Industrial

- Ultra High Voltage **EGP 0.992 (41.8%)**
- High Voltage **EGP 1.068 (40.9%)**
- Medium Voltage **EGP 1.134 (30.7%)**

Fuel Prices

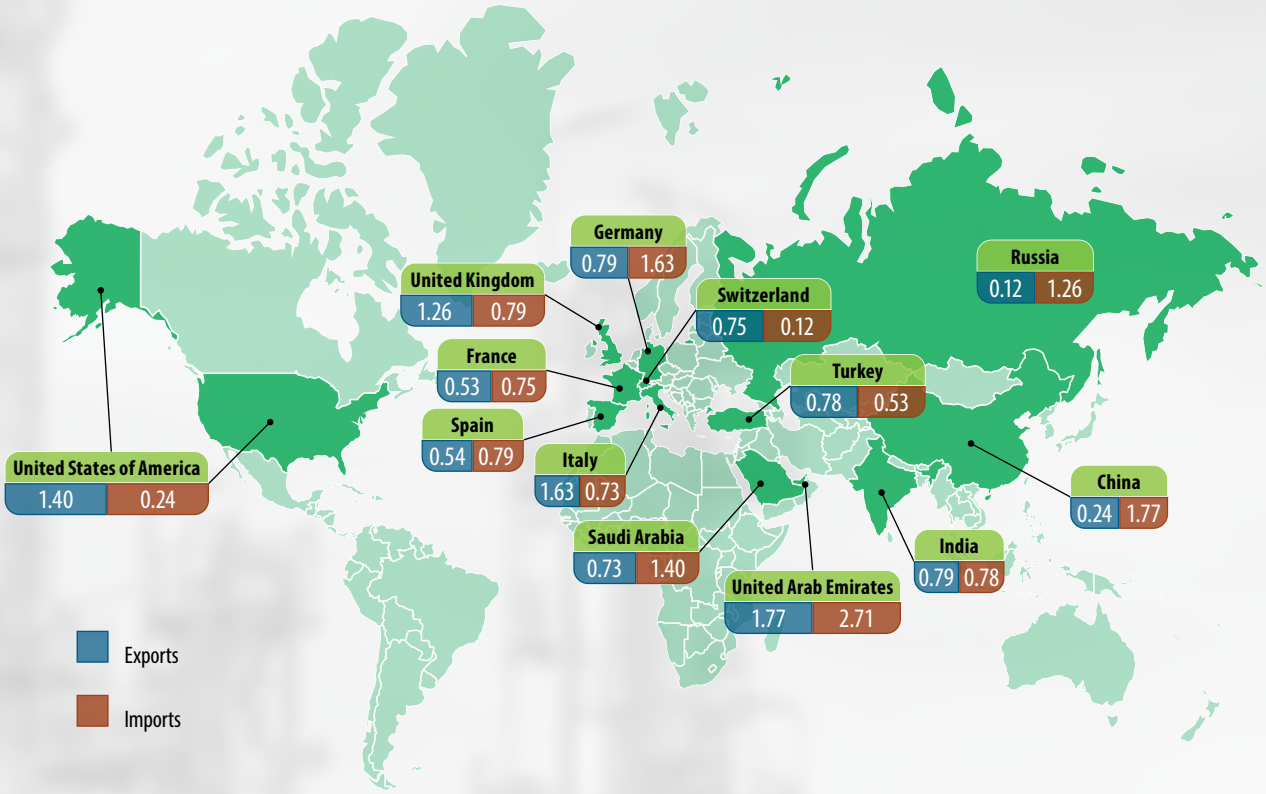
On June 16th, GoE announced the new fuel prices for FY 2018/19, raising fuel prices by up to 51%; in addition to 67% increase in LPG gas cylinders as follows:



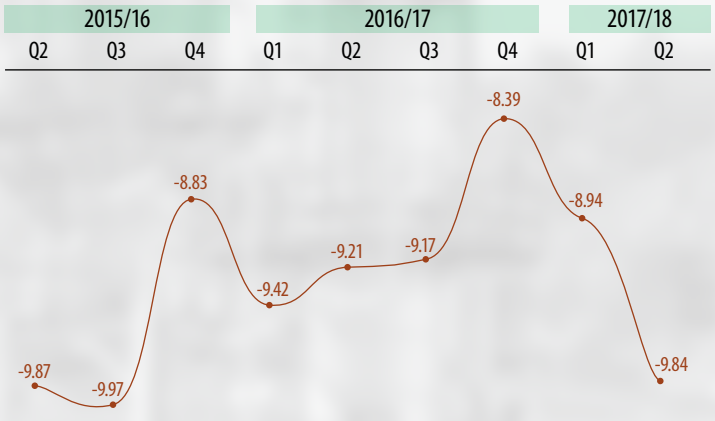
For more information: http://dcodeefc.com/

EGYPT OIL&GAS RESEARCH & ANALYSIS

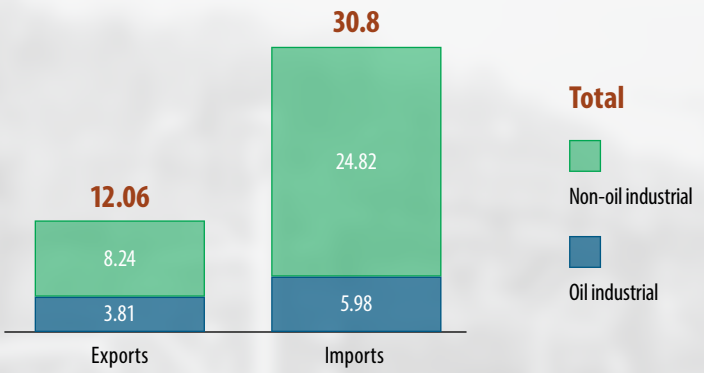
Egypt's Volume of Trade With Its Main Trade Partners H1 2017/2018 ($ bn)



Egypt's Trade Balance ($ bn)



Egypt's Exports & Imports H1 2017/18 ($ bn)



Egypt's Rank in Global Services Location Index 2017

Egypt ranks number one in the MEA region in the 2017 Global Services Location Index (GSLI), which measures the ability of countries to provide outsourcing services efficiently.

2016	2017	2017 RANK (COUNTRIES IN MEA REGION)							
16 (OUT OF 55)	14 (OUT OF 55)	1st EGYPT	2nd MOROCCO	3rd UAE	4th GHANA	5th TUNISIA	6th KENYA	7th JORDAN	8th ISRAEL

(lower values indicate higher ranks)

Source of row date: CAPMAS, Central Bank of Egypt, Ministry of Finance and A.T. Kearney.

RESEARCH BY HAGER MAGDY

RIGS PER TYPE

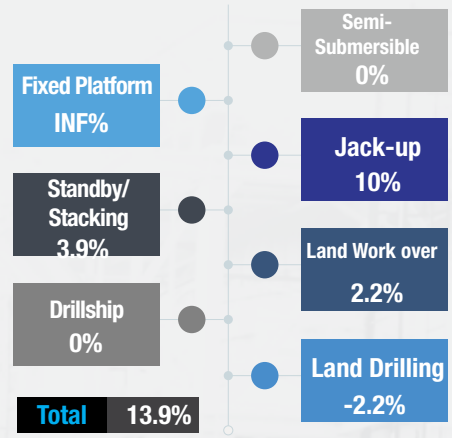
Date	Land-Drilling	Land Workover	Jack-Up	Semi Submersible	Fixed Platform	Standby/ Stacking	Drillship	Total
Oct-17	41	43	10	1	1	50	2	148
Nov-17	41	45	10	1	1	49	2	149
Dec-17	41	47	11	1	1	46	2	149
Jan-18	46	46	11	1	0	43	2	149
Feb-18	46	48	11	1	1	0	2	109
Mar-18	46	48	11	1	1	40	2	149
Apr-18	45	46	10	1	0	51	2	155
May-18	44	47	11	1	1	49	2	155

RIGS PER AREA

Month	G.O.S.	Med. Sea	W.D.	Sinai	E.D.	Delta	Total
Oct-17	10	4	64	12	6	2	98
Nov-17	10	4	63	13	7	3	100
Dec-17	11	4	65	14	6	3	103
Jan-18	10	4	68	13	8	3	106
Feb-18	11	4	69	14	8	3	109
Mar-18	11	4	69	14	8	3	109
Apr-18	9	4	69	13	5	4	104
May-18	11	4	70	13	6	2	106

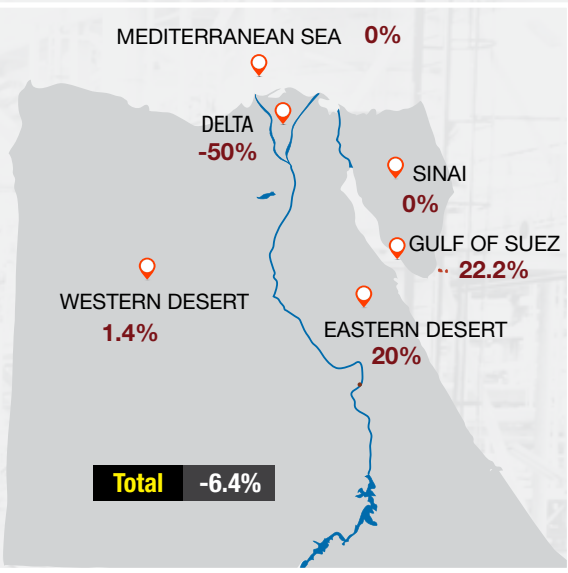
M.O.M CHANGE IN RIG COUNT PER TYPE

MoM calculations are for April & May figures.



M.O.M CHANGE IN RIG COUNT PER AREA

MoM calculations are for April & May figures.



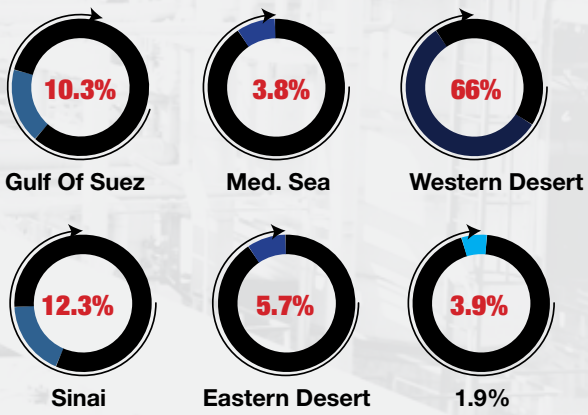
PRODUCTION MAY 2018

	Crude Oil	Equivalent Gas	Sold Gas	Condensate
Mediterranean Sea	0,018,000	17,230,001	96,487	914,187
Eastern Desert	1,978,000	22,080	124	0
Western Desert	9,929,000	7,233,188	40,506	1,259,217
Gulf of Suez	4,160,000	588,227	3,294	72,128
Delta	0,015,000	7,406,715	41,477	422,312
Sinai	1,545,000	339	2	17,128
Upper Egypt	0,005,000	0	0	0
Total	17,612,000 barrels	32,480,550 barrels	181,890 Million cubic feet	2,684,972 barrels

Unit: Barrel

*Crude total excludes Upper Egypt production

DISTRIBUTION OF RIGS MAY 2018



DRILLING UPDATES

Region	Company	Well	Well Type	Rig	Depth	Well Investments
Mediterranean sea	PETROBEL	ZOHR-11	Development	SPM 10000	14,314	27.500 M$
Sinai	PETROBEL	113-201	Development	WF-797	6,102	1.900 M$
Eastern Desert	GPC	HNW-1X	EXP	ST-9	5,415	1.200 M$
	PETRODARA	ARTA-54	Development	EDC-66	3,760	700,200 $
Western Desert	GPC	NES-10	Development	EDC-16	8,000	1.900 M$
	KHALDA	HERUNEFER N-1X	EXP	EDC-57	14,790	2.598 M$
		KENZ-55X	EXP	EDC-1	14,595	2.371 M$
		IMHOTEP S-3X	EXP	EDC-58	14,585	2.127 M$
		PTAH-15	Development	EDC-17	12,800	1.498 M$
		NRQ 255-18	Development	EDC-61	8,300	787,399 $

*DRILLING are for MAY 2018.

HELD UNDER THE PATRONAGE OF H.E. JEFF RADEBE, MINISTER OF ENERGY
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