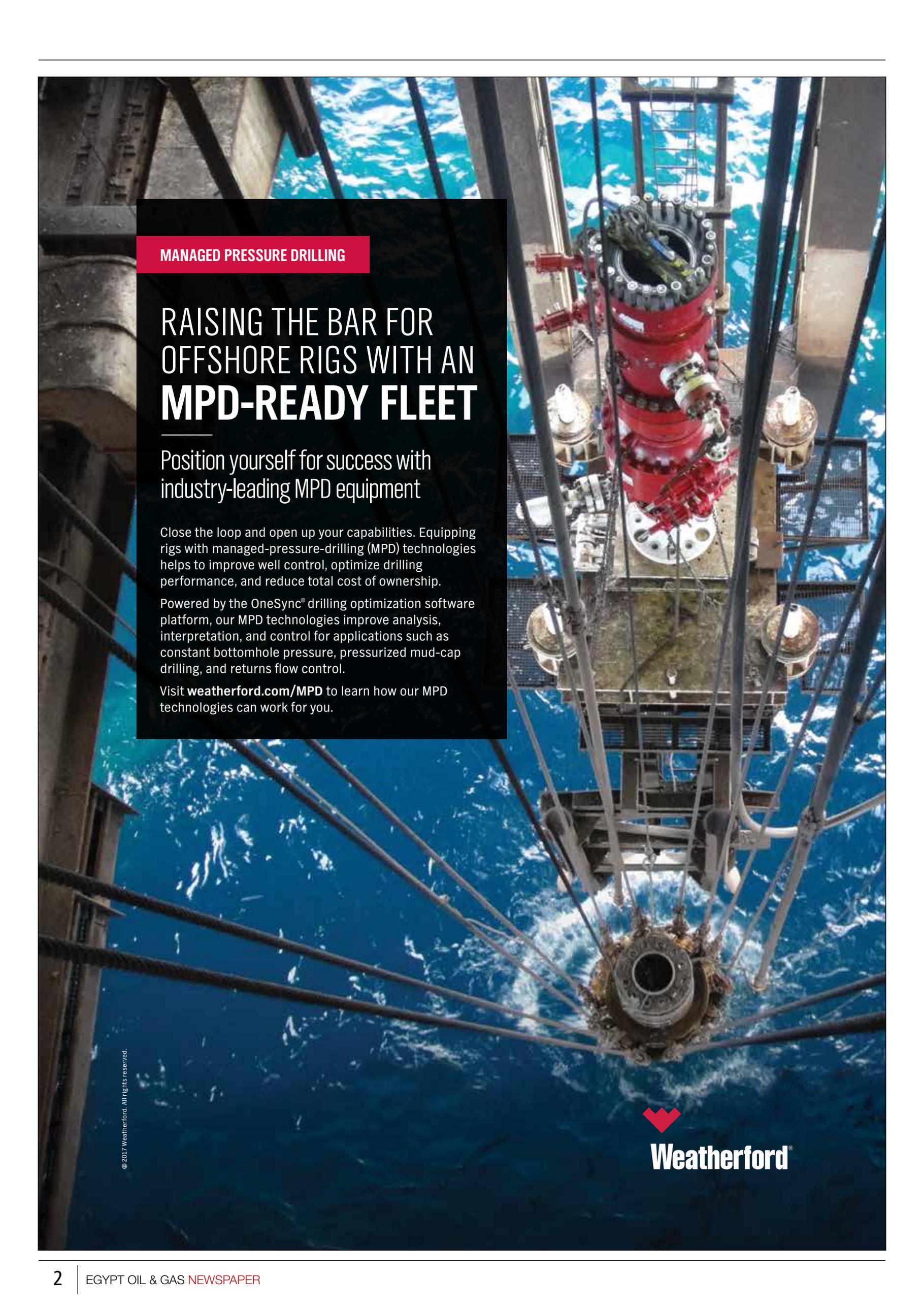




Exploring the Forward Move: **Interview with the Vice Chairman for Gas Regulatory Affairs**

- An Examination of Egypt's Gas Flaring Reduction Efforts
- Deepwater Exploration Technologies: What Do Experts Think?
- A Deeper Look into Egypt's Quest to Begin Natural Gas Exports
- Developing Egypt's Gas Grid: Obstacles and Opportunities
- The Fueling Effect of Natural Gas in Egypt's Electricity Sector



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EDITOR'S NOTE

As I write these lines we are rushing to close the issue before the Islamic New Year, partly to relax in the long weekend and partly to make sure the issue is delivered to your office before the start of the month, and the soon after 6th of October celebration.

We are very excited about this issue, as we have partnered with three pioneering entities to help bring you more diverse angle, most prominently is Wood Mackenzie, who share their insights and figures on the natural gas industry in Egypt. Relying on their regional expertise, DirectFn has also shared an analytical piece on the influence of Iranian crude on the welfare of OPEC, and finally Egypt's D Code consultancy shares their economic insights on the increasing inflation.

A core product of this month is our exclusive interview with the Vice Chairman of the Gas Regulatory Affairs. The interview breaks down the economic aspects of the law and explains how the liberalized market is expected to behave in its first years.

As we move on, the issue explores different aspects of the natural gas industry in Egypt, beginning with exploration technologies

where industry experts share their insights into the topic, to the well-debated subject of gas flaring and its associated economic costs.

Focusing on natural gas, the issue delves into downstream activities as well, where we examined the practicality of the country's plans to begin exports, as well consumption in the local market, which was discussed at length in two different articles on the country's mega-consumer the electricity sector and another on the expanding natural gas usage in vehicles.

We could not close the issue of course, without addressing Egypt's giant gas field "Zohr", which is scheduled to come online in a couple of weeks.

In efforts to diversify our scope, we asked our contributing legal expert to address the topic of international fuel trade agreements and how the US shale behavior is influencing it.

Local media has mostly featured positive figures this month, from rising foreign company investments, to growing upstream production figures, hikes in refineries production figures, to

declining diesel consumption –narrowing the gap with production and thus the country import bill. It is perhaps the first time in a while that news coverage has left us very hopeful.

Finally, and in case you missed it, Egypt Oil & Gas just launched a new website! You can now check all the latest videos, get access to our latest analytical reports, features, and market prices with complete ease.

On behalf of everyone at Egypt Oil & Gas, happy 6th of October and thank you for your readership.

EDITOR IN CHIEF



✉ nadine@egyptoil-gas.com

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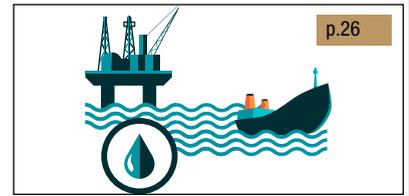
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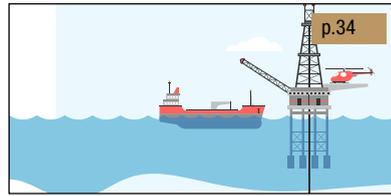
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IOC Investments in Industry Rise to \$10B

Investments in Egypt's oil and gas sector by international oil companies (IOCs) rose to \$10 billion during 2017, the Minister of Petroleum and Mineral Resources, Tarek El Molla, told Al Borsa. The minister noted that Egypt

continues to pay down its arrears to the IOCs. After a recent payment of \$2.2 billion, Egypt's arrears to IOCs shrank to \$2.3 billion, the lowest they have been since 2013, El Molla said.

ASORC Refines 3.8M Tons Crude Oil

Assuit Oil Refining Company (ASORC) refined 3.8 million tons of crude oil during fiscal year (FY) 2016/2017, according to the Head of ASORC, Nagy Abdel Ghaffar. The company produced 1.1 million tons of diesel, 41,000 tons

of butane, and 26,000 tons of gasoline. It also produced 2.1 million tons of mazut, which was provided to electric-power plants, along with naphtha and jet fuel.

GPC Increases Production by 5%

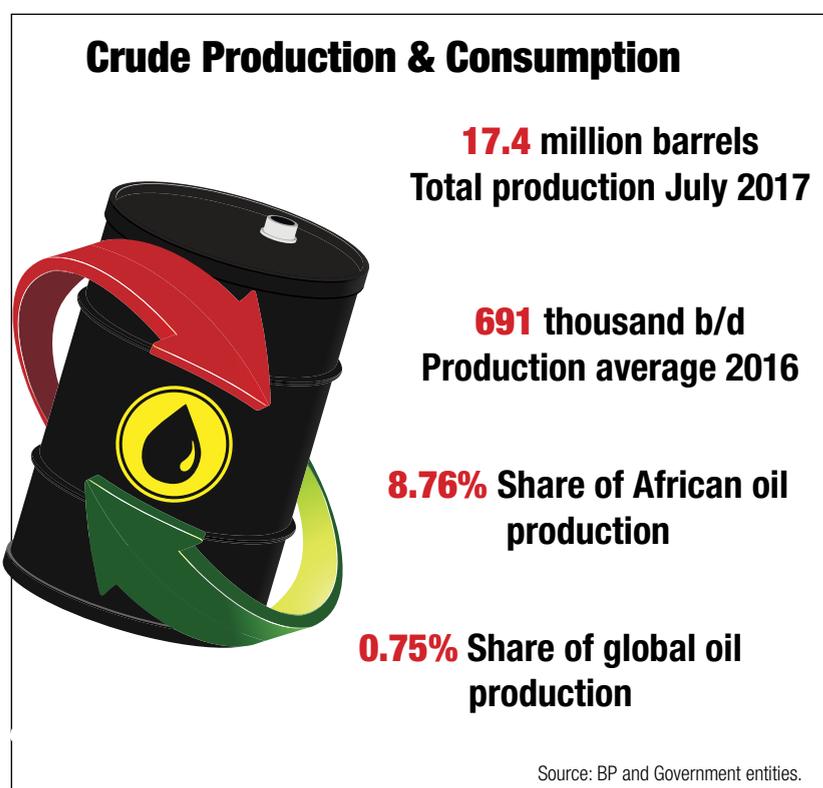
Egypt's state-owned General Petroleum Company (GPC) increased its production by 5% to reach a production rate of 86,400 barrels of oil equivalent per day (boe/d) in fiscal year (FY) 2016/2017. With the new oil and gas discoveries and the development of existing wells, GPC plans to further increase output in FY 2017/2018 to 91,700 boe/d. The company made four

oil discoveries in its concessions in the Gulf of Suez, the Eastern Desert, and the Western Dessert, boosting its daily production to 7,400 barrels of crude oil and 10.8 million standard cubic feet (mscf) of natural gas. The discoveries added approximately 173.3 million barrels of crude oil and 102.4 billion cubic feet (bcf) of natural gas to its reserves.

Egypt to Invest \$6.8B in Petrochemical Project

The Egyptian Ministry of Petroleum and Mineral Resources will invest \$6.8 billion in an integrated-production complex for petrochemicals, according to the Minister of Petroleum, Tarek El Molla. The funds will be disbursed over a period of up to five years. The complex will use approximately four million tons of Naphtha to produce

2.7 million tons of petrochemical products, such as p-xylene, gasoline, styrene, polypropylene, polyethylene, and ammonia. El Molla predicts that production from the site will more than cover local market demand for petrochemical products and the raw materials necessary for petrochemical projects.



El Sisi Invites Putin to Al Dabaa Nuclear Ceremony

As talks between Egypt and Russia over the Al Dabaa nuclear power plant progress, the Egyptian President, Abdel Fattah El Sisi, invited Russian President Vladimir Putin to attend the

official launch ceremony for the plant. As the agreement between Russia and Egypt has not yet been finalized, no date for the ceremony has been set.

Egypt, China Sign Energy Contract

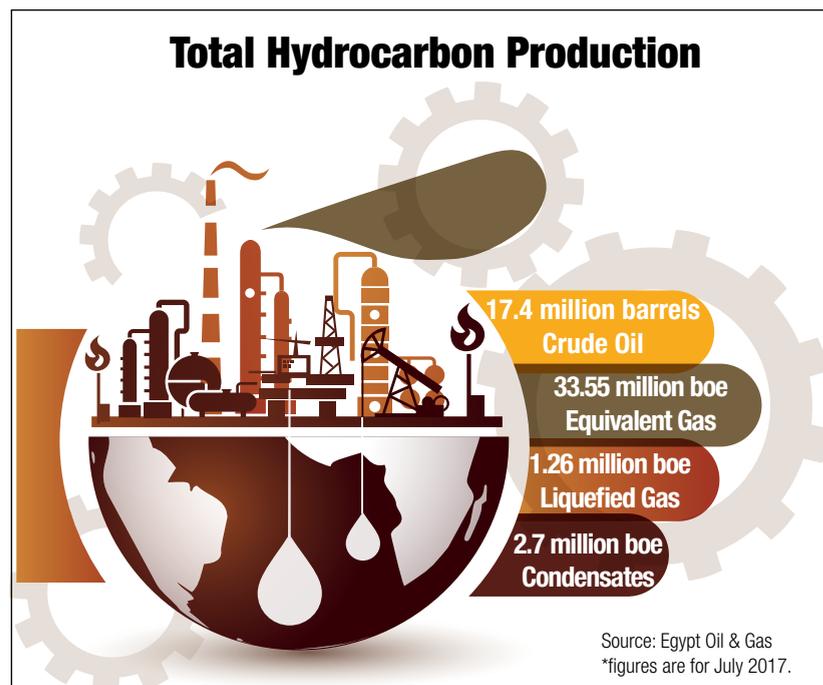
The Egyptian Minister of Electricity and Renewable Energy, Mohamed Shaker, signed an investment agreement with China to boost the capacity of Egypt's electricity grid. The agreement, worth

\$1 billion, is part of a larger Egyptian-Chinese investment partnership that aims to foster cooperation between the Ministry of Electricity and Renewable Energy and Chinese firms.

Egypt to Establish Major Solar Plant in Minya

A number of local and foreign investors were awarded a mega solar energy project in the El Minya Governorate. The plant will generate 600 Megawatt

(MW) from solar energy and will be the largest solar plant in Upper Egypt. It will be located along the Beni Mazar-Boyty road over an area of 15,000 feddans.



Banking Consortium to Fund Electricity Distribution Grid

The Egyptian Electricity Holding Company (EEHC) is seeking to raise \$100 million in financing from a consortium of banks. The funds will be used to import the spare parts necessary for the development of the electricity-distribution grid. It is seeking

letters of credit from five banks: Bank Misr (EGP 12.2 billion), National Bank of Egypt (EGP 12.2 billion), Qatar National Bank (EGP 8 billion), Arab African International Bank (EGP 4 billion), and Commercial International Bank (EGP 2 billion).

CORC Refines 4.6M Tons of Crude Oil

Cairo Oil Refining Company (CORC) refined 4.6 million tons of crude oil in fiscal year (FY) 2016/2017, according to the Head of CORC, Mohamed Hashieh. The company produced

approximately 69,000 tons of butane, 3.9 million tons of gasoline, 2.2 million tons of mazut, 874,000 tons of diesel, and 266,000 tons of jet fuel.

Number of Households Linked to Gas Grid Rises to 8M

The total number of households attached to Egypt's natural gas grid has risen to over eight million in 2017. The Egyptian Natural Gas Holding Company (EGAS) aims to increase this number to nine million households in 2018, the Chairman of EGAS, Osama El Bakly, told Amwal Al Ghad. Linking

residential and commercial units to the national gas grid will decrease butane usage and save the country money, he noted, adding that Egypt's projected self-sufficiency in natural gas by the end of 2018 will assist the government in achieving this goal.

APRC Refines 3.6M tons of Crude Oil

The Amreya Petroleum Refining Company (APRC) announced that it refined 3.6 million tons of crude oil for fiscal year (FY) 2016/2017. The crude was refined into approximately one million tons of diesel, 540,000 tons of 80-octane benzene, 1.2 million tons of mazut, 85,000 tons of butane, 188,000 tons of kerosene, 20,000 tons of basic

and paraffin wax, 54,000 tons of alkyl benzene, 5,000 tons of crude wax, 57,000 tons of private products, and 11,000 tons of toluene and medical oil, the Head of APRC, Mohamed Talaat, noted during the company's annual operations review.

Egyptian Petrochemicals Company's Production Value Reaches EGP 1.7B

Egyptian Petrochemicals Company announced that its production value reached EGP 1.7 billion during fiscal year (FY) 2016/2017. The company produced 78,500 tons of polyvinyl chloride, 78,200 tons of caustic soda, 12,000 tons of polyvinyl chloride products, and 22,600 tons of hydrochloric acid, according to

the Head of Egyptian Petrochemicals Company, Gaber Ahmed. These products, he noted, contributed to the opening of new global export markets. Streamlining operations and ensuring regular maintenance of equipment, Ahmed noted, permitted the company to increase efficiency and boost production.

Alexandria Petroleum Company Invests EGP 33.9B in 2016/2017

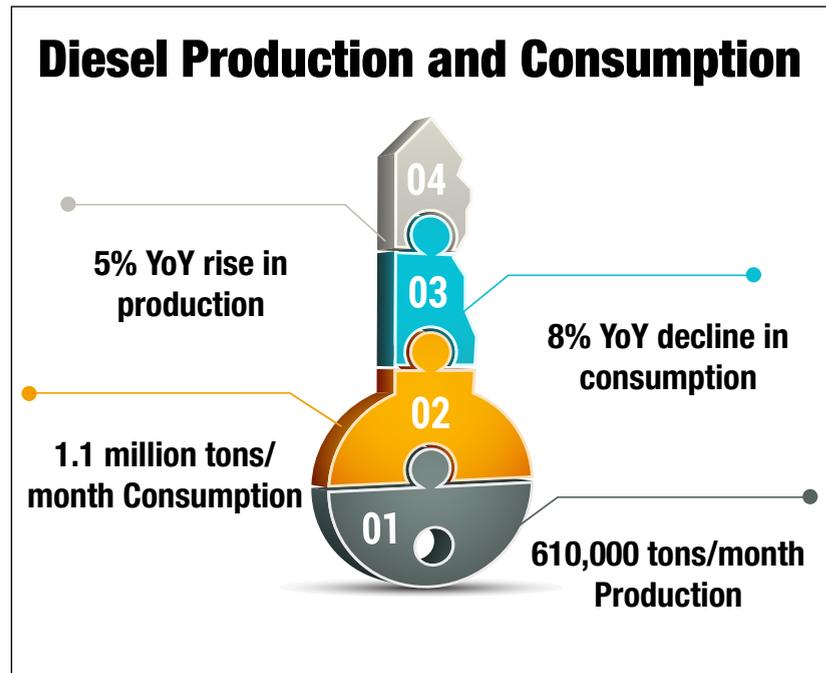
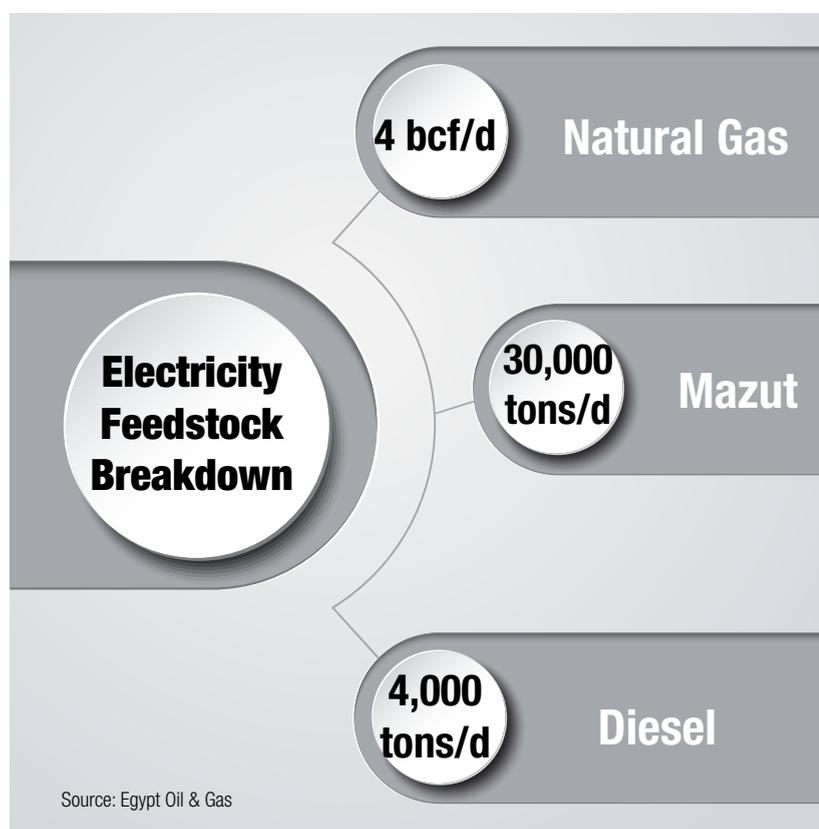
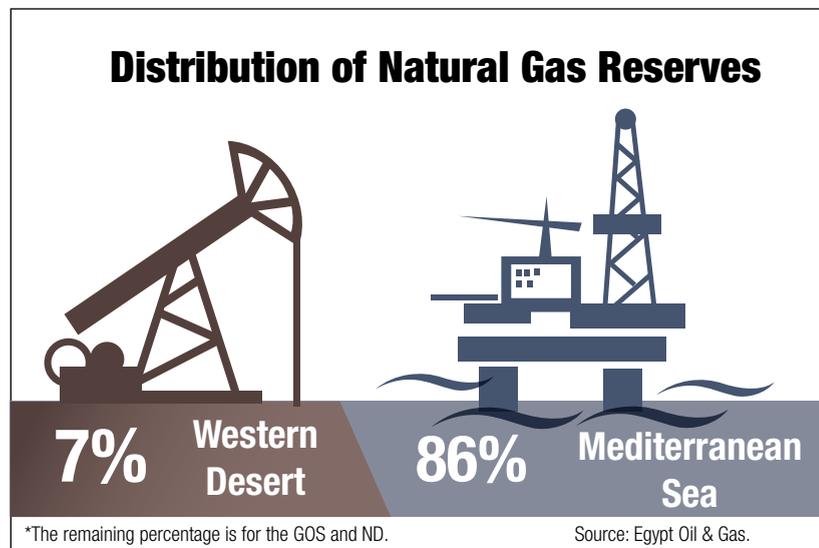
Alexandria Petroleum Company announced its latest investment figures, which amount to EGP 33.9 billion for fiscal year (FY) 2016/2017. Investments were for the production of 85,000 tons of butane, 1 million tons of naphtha, 383,000 tons of jet fuel, and

1.3 million tons of mazut, as well as its production of oils, asphalt, waxes and solvents, the Head of Alexandria Petroleum Company, Medhat Bahgat, stated. The figures were announced during a review meeting for fiscal year (FY) 2016/2017.

Diesel Consumption Falls by 8%

Diesel consumption has fallen by approximately 8%. In 2017, diesel consumption has equaled 1.1 million tons per month, compared to 1.2 million tons per month in 2016. Even as consumption has been falling, Egypt has increased production. Production

capacity has risen 5% to approximately 610,000 tons per month during 2017, compared to 580,000 tons per month during 2016, an official at the Egyptian General Petroleum Corporation (EGPC) told Amwal Al Ghad.



Condolence Note: Daa Eldin M. Kassem



Egypt Oil & Gas expresses its deepest condolences for the loss of Eng. Daa Eldin M. Kassem, Deputy CEO for Production at the Egyptian General Petroleum Corporation (EGPC) and a pillar of the Egyptian oil industry. Kassem was a member of Egypt Oil & Gas' technical committee, where he served as a steering force to enhance the industry and to aid the committee in achieving its goals. Kassem passed away on September 16 after a life of commitment and productivity.

Petrogas Sells 4.4M Tons of Butane

Petroleum Gas Company (Petrogas) sold 4.4 million tons of butane in Egypt's domestic market and boosted butane storage capacity to 134,800 tons during fiscal year (FY) 2016/2017, according to the Head of Petrogas,

Adel Al Shuwaikh. The company also added six new storage tanks in Sohag and Wadi El Qamar in Alexandria in FY 2016/2017 and plans to add five more during FY 2017/2018.

FDI in the Oil Sector Rises 135%

Foreign direct investment (FDI) rose by 135% in fiscal year (FY) 2016/2017, according to the Central Bank of Egypt (CBE). FDI increased to \$4 billion in FY 2016/2017 from \$1.7 billion in FY 2015/2016. The oil sector received

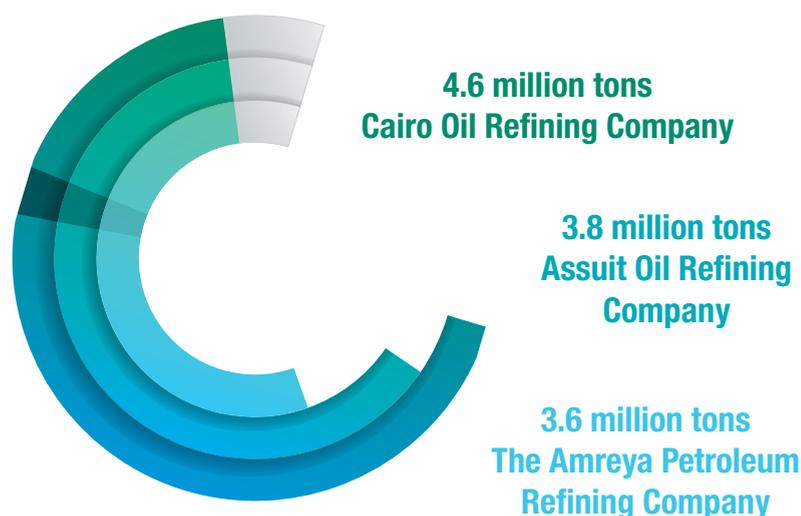
30% of the FDI in Egypt of an estimated \$13.3 billion. Egypt continued to be a net importer of petroleum products with exports of \$6.5483 billion and imports of \$11.1967 billion, according to CBE's figures.

Shaker: Egypt Moving Forward on Nuclear Plant

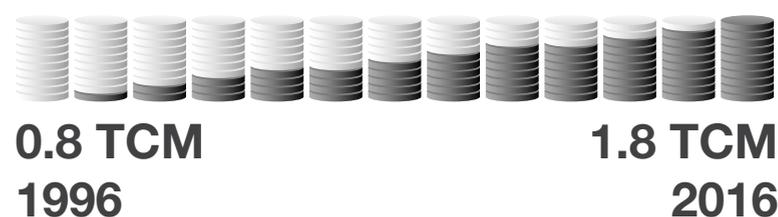
Egypt has concluded contracts to finance, supply, and maintain its planned nuclear power plant at El Dabaa, the Minister of Electricity and Renewable Energy, Mohamed Shaker, said during a speech at the International Atomic Energy Agency (IAEA) General Conference. He noted that Egypt is working with Russia to develop a civil

nuclear program to offset the growing energy demand caused by economic and industrial growth. The El Dabaa plant is projected to contain four electricity-generating plants powered by nuclear energy. Each plant will have an operating capacity of 1,200 megawatts (MW).

Refineries' Crude Processing 2016/2017



Natural Gas Reserves 1996 – 2016



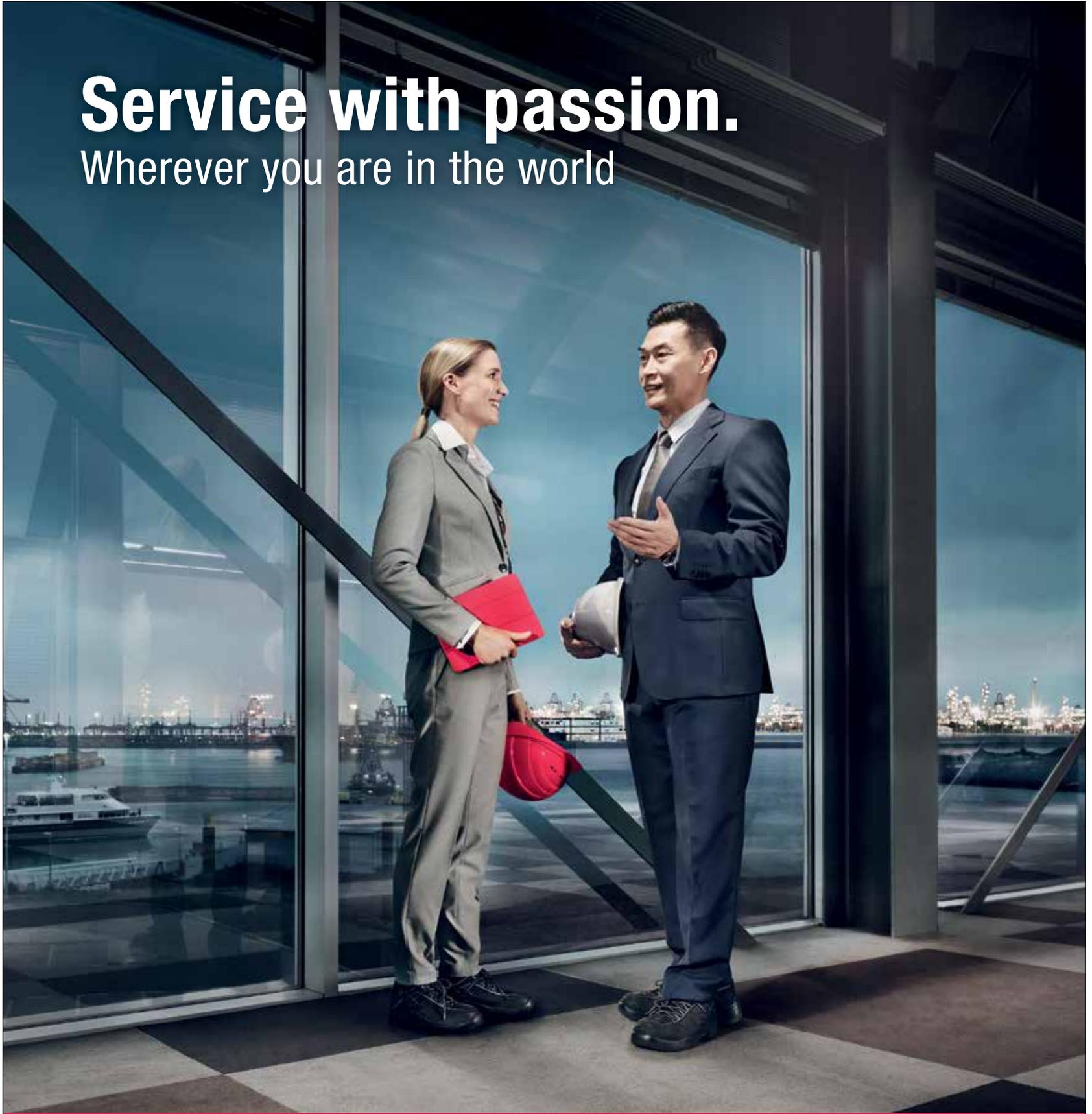
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SOPC, NPC Report 28%, 20% Increases in Production

The Suez Oil Processing Company (SOPC) and Nasr Petroleum Company (NPC) reported higher production rates for fiscal year (FY) 2016/2017. SOPC increased production by 28%, the Head of SOPC, Mohamed Eliwa, said during the company's annual operational review. Production from the firm increased to the value of EGP 1.9 billion, Eliwa noted. NPC experienced a 20% increase in production valuation in FY 2016/2017 as measured in EGP, its chairman, Nabil Fahmy stated. The company produced 2.8 million tons of crude oil for the domestic market at an estimated valued of EGP 1.5 billion.

El Molla Issues New Promotions

The Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, appointed Hesham Radwan as Head of Egypt Gas Company, Ahmed Mohamed Khalifa as Deputy President of Ruhrpumpen Egypt (an Egyptian-German company that specializes in pumping), Mostafa Taher as the new Chairman for the North Baharia Petroleum Company (Norpetco), Mohsen El Noubi as the Head of the General Petroleum Company (GPC), and Ashraf Abdel Gawad as the new Chairman for Qarun Petroleum Company.

Oil Spill Occurs North of Hurghada

An oil spill occurred in the Abu Galawa area, north of Hurghada. The incident was reported on mid-September. The spill was first reported by local dive organizers. The oil spill covered an area of more than 400 meters, Egypt's Director of Red Sea Protected Areas Directorate, Ahmed Ghallab, said. He noted that steps had been taken to contain the spill and prevent it from spreading to popular tourist spots. Egyptian authorities are investigating the cause of the spill.

EGPC to Supervise Development in Ras Fanar

The Egyptian Cabinet granted preliminary approval for the Egyptian Natural Petroleum Corporation (EGPC) to supervise the development of the Ras Fanar area. According to the cabinet's preliminary decision, EGPC will be responsible for supervising oil and gas exploration in Ras Fanar until legislation is passed to codify the development process. The preliminary approval was granted during the September 6th meeting of the cabinet. The Ras Fanar area is in the Gulf of Suez.

Misr Petroleum Adds 33 Fuel Outlets

Misr Petroleum Company added 33 new fuel outlets, bringing its total number to 1,336, according to the Head of Misr Petroleum Company, Mohamed Shaaban. Shaaban also noted that Misr Petroleum has 63 additional outlets that are close to completion. The company has adopted an expansion and development plan for its warehouse network. The plan includes establishing warehouses in Badr City, Almaks, Asyut and Shawa.

Petrochemical Complex to Begin Production in 2021

The Egyptian Petrochemicals Holding Company (ECHEM) is constructing a \$3 billion petrochemical and refining complex in the Suez Canal Economic Zone. The complex is a cooperative project with the Egyptian General Petroleum Corporation (EGPC) and Japan's Toyota Tsusho. The feasibility study will be completed by the end of the first quarter of 2018, according to the Head of ECHEM, Mohamed Saafan. Production from the new facility is projected to begin in 2021. It will produce approximately 3.5 million tons per year of petroleum products and 1 million tons of petrochemicals, like poly-propylene and ethylene derivatives.

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SDX Raises \$10M, Plans Projects in South Disouq Concession

SDX Energy announced that it raised \$10 million to boost the company's exploration of its South Disouq Concession in Egypt and fund its development programs in Morocco. SDX Energy plans to further develop the South Disouq Concession. The company aims to drill two additional

exploration wells in an attempt to recover 150 billion cubic feet (bcf) of natural gas from the concession. The company expects the wells to cost \$2.5 million each. It hopes to begin selling gas from the South Disouq Concession in the first half of 2018.

Baker Hughes GE Signs Zohr Contract

Baker Hughes GE signed a contract with Belayim Petroleum Company (Petrobel) to conduct subsea services for the second phase of development at the Zohr natural gas field. The contract is part of the Ministry of Petroleum and Natural Resources' efforts to develop gas production from

the Mediterranean Sea, according to the Minister of Petroleum and Mineral Resources, Tarek El Molla. Furthermore, officials from the company met with the minister to discuss both the company's current investments in Egypt and additional investment opportunities.

ATC Mulls Using Egyptian Refineries to Process Saudi Crude

The CEO of Aramco Trading Company (ATC), Ibrahim Gassem El Buaiain, met with the Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, to discuss cooperation and investment opportunities. ATC is considering using Egyptian refineries

to refine Saudi Arabian crude oil. The refined products could then be stored in Egypt's storage facilities for distribution in Egypt and its neighboring countries, El Buainain noted.

ADES Group Appoints New CFO

Advanced Energy Systems International Holding (ADES Group) has appointed Ahmed El Khatib as its new Chief Financial Officer (CFO). El Khatib has worked more than 20 years for BP in locations across the Middle East, North America, and Europe. His

work has included license renewals and multi-billion-dollar financial transactions. He graduated from the American University in Cairo with a MBA. He also has a MS in computer science from Howard University in Washington, DC.

DEA Names New CEO

DEA Deutsche Erdoel AG named Maria Moraeus Hanssen as its new CEO and Chairman of the Management Board, the company announced. Hanssen will take over management of the company from Thomas Rappuhn, the current CEO. The appointment will take effect in January 2018. She is currently the CEO of ENGIE E&P

and Head of the Business Unit E&P in the ENGIE Group. In this role, she manages production of more than 160,000 barrels of oil equivalent per day and oversees 1,700 employees. Hanssen has extensive oil- and gas-industry experience, having worked for Hydro ASA, Statoil ASA, and Aker ASA.

Petrojet Completes Offshore Facilities for Zohr

Petrojet completed its manufacturing and loading of offshore facilities for the deepwater Zohr field. The last component, a 14-inch jumper, has been loaded. It was completed on September 3rd in the company's

Alexandria workshops. Petrojet has completed over 8,500 tons offshore components for the Zohr field in 2017. The components were manufactured for use at a depth of 1,500 meters below sea level.

Siemens' Power Plants in Egypt are 90% Complete

Construction at Siemens' three electricity-generating power plants in Egypt is 90% complete, according to the Egyptian Minister of Electricity and Renewable

Resources, Mohamed Shaker. The plants, Shaker noted, are expected to be finished in May 2018. They are being built in Beni Suef, Burullus, and the New Administrative Capital.

ADES' Profit Drops by 11%

Advanced Energy Systems International Holding (ADES Group) experienced an 11% drop in pretax profits during the first half of 2017 due to the costs associated with its initial public offering. The company's net profit fell to \$17.3 million, a 6% year-on-year (y-o-y) decrease,

due to a one-time, \$4.6 expense incurred for its May 2017 IPO. The company said that it would invest the \$170 million it raised through its IPO in its projects in Egypt, Saudi Arabia, and Algeria, as well as to explore new markets.

COOP Profits Rise 10%

Petroleum Cooperative Society Company (COOP) witnessed a 10% increase in its profits for fiscal year (FY) 2016/2017, according to the Head of COOP, Samir Rizk. He noted that the company's profits had reached EGP 32 billion during FY 2016/2017 and that its products comprised 35% of the domestic

petroleum market. Petroleum sales accounted for EGP 26 billion. Coop sold 1.8 million tons of benzene, 3.9 million tons of diesel, and 4.9 million tons of mazut, Rizk noted. He added that the company had sold oil products worth EGP 1.7 and had achieved a 20% share of the Egyptian oil market.

Egypt Signs PPA with Elsewedy Electric

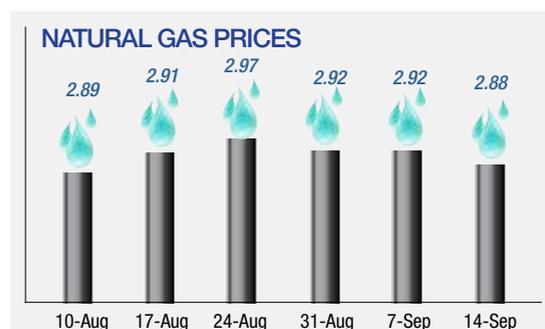
The Egyptian Electricity Transmission Company (EETC) signed a power purchase agreement (PPA) with Elsewedy Electric to develop, fund, establish, and

operate a 50 Megawatt (MW) solar plant in Benban, Aswan, under the terms of the second phase of feed-in-tariff (FIT) program.

Hanter: Shell to Maximize Hydrocarbon Potential

Shell is looking to expand its operations in the Western Desert through its partnership with Badr El Din Petroleum (BAPETCO) in order to maximize its hydrocarbon potential, Shell Egypt's Chairperson and Managing Director, Gasser Hanter, told Daily News Egypt. The company

currently produces approximately 20% of Egypt's gas production and 10% of Egypt's oil production, Hanter noted, adding that it is one of the two largest operators in Egypt's Western Desert, producing more 130 kilo barrels of oil equivalent per day (kboe/d).





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Saudi Arabia has continued to float the idea of another extension to the production cut agreement. Late last month the Wall Street Journal reported that the **Kingdom had joined with Russia to advocate a three-month extension.**

The Saudi Oil Minister, Khalid El Falih, meeting with his UAE counterpart, **announced that Saudi Arabia and the UAE were open to the idea of extending the production-cut agreement.** He also met with oil ministers of Kazakhstan and Venezuela, who also expressed their willingness to consider an extension.

With refining operations disrupted in the US, **Saudi Arabia will increase exports to Asian markets in October.** In September, Saudi Arabia slashed exports to the region, but exports are projected to resume at normal levels in October. **Saudi Arabia cut its crude exports by 520,000 barrels a day (b/d) in September but it reduced its cuts for October to 350,000 b/d.**

Saudi Aramco is also increasing its crude oil reserves in Japan by 1.9 million barrels. With this increase, Saudi Aramco's reserves in Japan will rise to 8.18 million barrels.

Saudi Arabia is developing back-up plans in case the initial public offering (IPO) of Saudi Aramco is pushed back until 2019, industry sources told Bloomberg. Earlier this month the government assured investors that its reform agenda, including the 5% IPO of Saudi Aramco was proceeding as planned. **A partial re-draft of the country's overarching economic plan, Vision 2030, stoked concern** at the beginning of the month that the kingdom was lagging behind schedule in its reform efforts.

LIBYA



Last month's disruptions at Libya's oil fields have continued into September. After militants seized multiple pipelines, the **National Oil Corporation (NOC) was forced to declare force majeure at the El Feel, Hamada, and Sharara oil fields in late August.**

Production cuts from the oilfields forced the Zawiya refinery to pare back its operations. The refinery has a capacity to refine 120,000 barrels of crude per day but was only able to

operate at 50% of its capacity due to security disruptions.

In early September, however, the **NOC negotiated a settlement with the militants who were obstructing the pipelines and production resumed.** The closures halted Libya's upward production trajectory. Libya's crude production fell by 361,000 barrels per day (b/d), approximately 35%, as output slipped to approximately 660,000 b/d.

Even after the resumption of production at Sharara oil field, **the country continues to experience production disruptions elsewhere. Militants closed the Mellita complex pipeline for 30 hours between September 7th-9th.** The temporary closure slowed production from the Wafa field and prevented the transit of 310 million cubic feet (mcf) of natural gas and approximately 12,000 barrels of condensates. According to the NOC, the disruption cost \$2.17 million.

UAE



Abu Dhabi National Oil Company (ADNOC) **announced that it will cut its crude oil output in October by 10%.** The country has come under increasing pressure for its failure to comply with the production-cut agreement that went into effect in January. In early August, it recommitted itself to the

agreement, following a meeting with Russia, Kuwait, and Saudi Arabia.

After a meeting with his Saudi Arabian counterpart, the UAE Oil Minister, Suhail El Mazroui, **indicated that the UAE is willing to consider an extension to the production-cut agreement.**

As markets remain stagnant, ADNOC is considering revamping its operations to increase efficiency. **The company is considering a public listing of more than 10% of ADNOC Distribution by early 2018.**

KUWAIT



Kuwait will raise the **price of its crude exports to Asia by \$0.35 for the month of October,**

selling its oil at a \$1.05 discount to the Oman/Dubai benchmark.

ALGERIA



To offset low oil prices, Algeria is looking to increase natural gas exports. The country **will**

increase natural gas production by 10 million cubic meters (mcm) within two months. The

natural gas will be produced from the Hassi Messaoud field.

OPEC



OPEC production fell in August as Saudi Arabia cut back its production. **The decrease was the first decline in production for the oil**

cartel since March. Excluding Nigeria and Libya, OPEC countries produced 30.004 million barrels a day (b/d) during the month

of August, down from 30.113 million b/d. This drop represented a less than 1% decrease in production.

IRAQ



Iraq's crude oil production fell to 4.32 million barrels per day (b/d) in August, according to the Iraqi Oil Minister, Jabbar El Luaibi, putting Iraq into compliance with the production-cut agreement between OPEC and major, non-OPEC oil producers. The 4.32 million b/d does not include production or shipments from the areas under the control of the Kurdish Regional Government (KRG).

Following some refiners expressing unhappiness with Iraq's announcement that

it would switch its price benchmark from the Platts' Oman-Dubai average to DME Oman for Asian-bound crude, **Iraq's Oil Marketing Company (SOMO) announced that it needed more time to consider the change.**

Tribal clashes in Iraq's oil-rich Basra region are beginning to impact oil operations. While local officials indicated that **oil output has remained steady**, Reuters' sources indicated local disturbances were beginning to impact operations. Fighting over land and

government contracts has been reported close to the West Qurna and Majnoon oilfields north of the city.

Further destabilizing oil production from Basra, **Shell announced that it is selling or relinquishing its operational stakes in the Majnoon and West Qurna 1 oilfields.** According to Reuters' sources, the company found the operating conditions in Iraq unfavorable and struggled to maintain its margins.

IRAN



Iran's exports of gas condensates from the South Pars field rose to \$6.9 billion, a 12% year-on-year increase in value, according to Ahmad Pourhaydar, Managing Director of Pars Special Energy Economic Zone for Customs Affairs. He said that most of the condensates were exported to China, South Korea, Japan, Indonesia, India, Turkey, Egypt, the UAE, and Kuwait.

Iranian exports of crude and condensates rose in August to 2.42 million barrels per day (b/d) from 2.37 million b/d in July, a 2.1% increase. Exports to China and Europe rose, but Asian exports, as a whole, declined to 1.46 million b/d in August from 1.55 million b/d in July, or nearly 6%, due to falling Indian demand.

The Iranian company, Mabna, accepted a **contract from the Syrian government to import five gas-powered units for use in Aleppo. The contract for the power plants is for EU 130 million.** The contract was announced in the aftermath of a more general agreement between Syria and Iran to cooperate in the electricity sector.

OMAN



Shipments to China represent 77.2% of Oman's crude oil exports. **Oman exported 171.90 million barrels of crude between January and July 2017. Out of that amount, China imported 132.67 million barrels.** Taiwan (14.38 million barrels), South Korea (6.4 million barrels), and Japan (5.98 million barrels) were also major importers of Oman's crude.

Oman will hold an oil and gas tender for four onshore blocks. The blocks are being reissued after the expiration of previous operational concessions. The four blocks are Block 43B, Block 47, Block 51, and Block 65. Licensing begins September 20th and bids must be submitted before the end of the year.

Oman's Special Economic Zone Authority in Duqm (SEZAD) **awarded a \$517 million contract to Boskalis Westminster (Oman) LLC to for work on the SEZAD's liquid-berth project.** Boskalis Westminster will conduct dredging and reclamation projects and construct marine infrastructure for the port.



Exploring the Forward Move: Interview with the Vice Chairman for Gas Regulatory Affairs

By Nadine Abou el Atta

Perhaps one of the most talked about topics in Egypt these days, the newly approved natural gas regulatory law, which allows the Gas Regulatory Authority to take its first official steps towards liberalizing the local natural gas market. As part of connecting the reader to the full picture, Egypt Oil & Gas has been following the updates of the authority and the regulatory law organizing its mechanisms since the inception of its concept. However, our coverage would not be complete without a deeper understanding of the Vice Chairman for the Gas Regulatory Affairs, Amira El Mazni.

First Things First

Before beginning the interview, El Mazni noted that many media outlets have confused the new regulatory law with allowing private entities to import natural gas. "Private entities have had the option to import natural gas for some time now; the new law is to regulate the sale and distribution of natural gas in the market, not its importation into the country as some confuse," she stressed.

When asked about the first steps the authority is working on, El Mazni explained "the first steps after the law approval, which establishes the Gas Regulator, are naming its board members and CEO, in parallel to the preparation of the law's executive regulation and internal procedures, selecting premises, approving the business plan, and securing the budget."

Companies and Permits

Confirming media reports on the number of companies that received initial permits to import and distribute natural gas in the local market, El Mazni stated that three companies have obtained initial permits, including TAQA Arabia, Fleet Energy, and BB Energy; in addition, to four other companies in the process of obtaining the initial approval, including Toyota. In reply to questions about her expectations on the number of companies forecasted to show interest in the coming year, El Mazni stated that there are currently ongoing discussions with a number of interested entities in the Egyptian market. Based on the outcomes of these discussions, "we expect the number applicants to increase by a couple of companies."

In regards to import permits, which are issued by EGAS and will remain the responsibility of EGAS, "eligibility for the preliminary approval is based mainly on the financial position and technical capabilities of a company, which should indicate its ability to meet its obligations toward its off takers. As for qualification for the import approval, this requires contracts with: gas/LNG suppliers, import pipeline/FSRU operator, transmission system operator and sales contracts to consumers," El Mazni noted.

The Economic Factor

When asked about the number of companies the market can ideally absorb, allowing it to reach a competitive orientation, El Mazni replied that it varies

from one market to another. "One could make all necessary measures for a level playing field, yet players are not enthusiastic enough to participate. It is a process of change depending on the market functioning and dynamics."

For the market to reach a competitive state, it should ideally open up gradually, El Mazni explained, adding that "following the subsidy reform program, and according to a plan that defines the number of stages and identifies the time for each stage, the criteria for selecting the eligible consumers, and the market share of the free market for each stage." She further added that the authority has prepared a plan for this approach, which should be approved and issued by the Cabinet.

To illustrate her point, El Mazni noted that for the United Kingdom the liberalization process took more

"One could make all necessary measures for a level playing field, yet players are not enthusiastic enough to participate. It is a process of change depending on the market functioning and dynamics."

than ten years to reach the full market maturity, while, for other European countries such as France, Germany or Italy took longer & have not yet reached the fully liquid state of the UK.

To further understand the expected local market behavior, Egypt Oil & Gas asked about the five year forecast of the private sector participation in the market. "This depends mainly on the agreed pace by which the government aims to open up the market, which will determine the exact timing of each stage of liberalization. Again, this will be done according to the plan that will be proposed by the gas regulatory body, and approved by the Cabinet of Ministers. Not only that, it also depends on the players' interest and response to this plan, [as well as required] measures. It is a collaborative process requiring all parties' participation, courage, persistence, and perseverance," El Mazni stated.

"Eligibility for the preliminary approval is based mainly on the financial position and technical capabilities of a company, which should indicate its ability to meet its obligations toward its off takers."

Tariffs, Capacity, and More

Egypt Oil & Gas learned that the tariff set is for transmission only, while the distribution tariff, which allows importing companies to use the infrastructure controlled by 16 different state companies is yet to be set. When asked about this topic El Mazni said: "The distribution tariff might remain the same as per the current LDC's agreements for the first phases of the market opening, or slightly modified. However, setting a methodology for calculating these tariffs is one of our priorities and we believe it will be a lengthy process as it will involve 16 different companies. The methodology might be the same as for transmission but the value will not. [Furthermore,] the tariff value will vary from one LDC to another being a function of the Capex and Opex of each system."

Moving on to the existing capacity, or needed expansion of thereof, El Mazni commented that "the methodology for calculating the tariffs for both transmission and distribution takes into account the future investments in expanding, extending, and debottlenecking these grids as required by the expected increased production and import quantities."

"Increased demand is identified by the grid operators when shippers book capacities few years in advance. Accordingly, grid operators develop their investment plans. That is the prime benefit of the new gas law, which is to attract investments, not only in the networks but mainly in the upstream [sector], where gas is produced. Market regulations provide a channel for upstream gas commercialization, hence encouraging further investments," she continued.

In terms of the rights of importers, when asked about the guarantees by the state to ensure that all contracted natural gas is transmitted and distributed in full without delays, El Manzi answered: "This point is considered one of the market risks. However, the law has provided for that and the network codes will consider the market participants' rights."

EGAS in the Equation

A core topic of interest in the matter is the future dealing of the Egyptian Natural Gas Holding Company (EGAS). The company to date is the sole controller of natural gas supply and distribution in

the local market; it has the obligation of meeting the needs of factories and the electricity sector. Discussion with El Mazni tapped into the topic, beginning with the lingering questions revolving around separating the function of the regulator from the competing seller.

"As per the new gas law, the regulator will be a totally separate [and] independent entity with a clear mandate and scope as set by the law," she said adding, "EGAS shall act as all the other market players and comply with all the requirements set forth by the law without any bias nor discrimination."

Reports have shown that it is not in the best interest of EGAS to reduce its supply commitments to factories beyond a certain level as in comparison to the subsidized cost for the electricity sectors payment from factories tend to be higher. When asked about these findings and the expected reduction in commitments, El Mazni relied "other countries that have applied energy reform measures have faced this situation and have adopted several approaches, ranging from upstream gas release program to downstream consumer eligibility program. The Law requires the Gas Regulator to develop a gradual market opening plan for the Cabinet of Ministers to issue."

Further elaborating on the topic, Egypt Oil & Gas asked whether factories that shift to private importers will be allowed to shift back to receiving natural gas from EGAS, for which El Mazni replied that "this reverses the process," hence it may not be allowed, adding "however, if EGAS decides to create its own separate marketing company that competes in the free market then factories could with the gradual liberalization of the market switch back to 'EGAS Marketing' but on competitive terms of price, flexibilities, and quantities."

Challenges Faced

"Market reform is a challenging, yet exciting mission for all parties involved, particularly for the initiator of this transition," answered El Mazni in reply to a question on challenges expected to be faced by the state. "The biggest challenge is the impact of subsidy reform on consumers, eventually leading to the inevitable liberalizing the gas price – [with] power generation being the major gas consumer. Currency of gas pricing is another challenge," She added.

Explaining challenges faced by different state-companies, El Mazni stated that for EGAS' the main challenges lies in existing legacy contracts; while Gasco's challenge lies in the cost reflective tariff it will receive in exchange for providing and enhancing

the quality of its services.

For the importers and suppliers, aside from payments by consumers, it is handling the market risks, that of commercial and competition, she explained adding that, consumers are no exception; their challenge is coping with variations in gas prices that reflect the market dynamics.

Moving Forward

Looking ahead, a factor that is perceived by many as an influential aspect in the future of local gas distribution has been the rising of natural gas production. Commenting on the topic, El Mazni clarified that "With all the reform in investment environment, including legislation, taking place in Egypt these days, an economic development boom is expected shortly, which in turn would require additional energy. This additional demand for gas will be met by the rise in local gas production."

An expected development boom should have a positive effect on the industry, which brings forward the question of subsidies and the expected effect of the liberalization of the market on it as well as on foreign currency reserves. Answering the question El Mazni explained that by default "price reform will reduce the subsidy bill. Market liberalization may not have direct effect on the subsidy bill. However, both approaches of market opening and subsidy reform should be aligned and synchronized. Reduced subsidies and imports due to increased local production will have a tremendous effect on the state finances."

The meeting could not be concluded without discussing investment levels, both foreign and local, for which El Mazni noted "we are already seeing increased interest. Not only in getting closer insight and better understanding of the legislation, new rules [as well as] market design. But we see opportunities for investments being identified. Interested parties include IOCs operating in Egypt, potential importers and applicants, businessmen associations and investment banks. We seek to arouse the interest of industrial investors whose demand for gas has been suppressed throughout the past few years."

In closing, El Mazni highlighted, "as soon as legislations [as well as] reforms in both the gas sector and investment environment become operational, I expect to see growth in FDI due to huge investments in exploration and production, resulting in increased local gas production and increased local investments."





Egypt's Gas Merry-go-Round

By Stephen Fullerton, Research Analyst, Middle East and North Africa Upstream, Wood Mackenzie.

Egypt's gas landscape will change profoundly over the next five years. After swinging from the world's eighth largest LNG exporter in 2009 to the world's eighth largest LNG importer in 2016, the wheel is set to turn again.

New domestic gas production will give the country breathing space to ramp down costlier LNG imports. The market could swing into surplus again, possibly as early as 2019. However, it will initially be more seasonal.

Egyptian gas demand peaks in summer, meaning the country will continue to import some LNG in the northern hemisphere summer, at the same time as ramping up LNG exports in the winter.

\$26 BILLION

New natural gas investments since 2015.

Egypt's Second Gas Boom is Being Driven by Mammoth New Developments

The Egyptian market will be inundated with new volumes of gas over the next three years. Eni and British BP's fast-tracked Nooros discovery is already Egypt's top producing field at over 1 billion cubic feet per day (bcf/d), and has provided a near-term boost to dwindling domestic supply.

The first phase of BP and DEA's West Nile Delta development came onstream in March 2017, adding upto 700 million standard cubic feet per day (mscf/d) of production. Zohr and Atoll are expected to follow soon, cumulatively adding an impressive 4 bcf/d of production by 2021. This will boost total gas supply from 4 bcf/d in 2016 to record levels of production of over 7.4 bcf/d in just four years.

This reversal of fortunes, after five years of falling production and the switch from net exporter to net importer, has been driven by stellar exploration results and higher gas prices.

1 BCF/D

Production level of Nooros field.

The Ministry of Petroleum and Mineral Resources' pragmatic approach to pricing has secured over \$26 billion in new gas field investments since 2015, at a time when investment in other regions has been slashed.

Gas Demand Responds Across Domestic Sectors

Improved gas availability has already filtered through number of domestic sectors. Utilisation rates have been increasing again at large gas-intensive industrials after years of unreliable supply and difficult operating conditions.

Nonetheless, gas scarcity is still fresh in people's minds and developers may still be cautious about sanctioning new gas-intensive projects.

Work on expanding power generation capacity is also progressing quickly. Gas is the front-runner as more than 14 GW of efficient gas-fired generation capacity is being added to the grid. New gas production will give a needed boost to displace oil products in power. Alternative projects to diversify the power mix are also making headway and are expected to play an increasing role in the next decade.

The level of demand response to both new power capacity and better fuel availability will be as critical to the gas balance as the pace of ramp-up at major new fields. Efforts on market liberalisation and subsidy removal are introducing further variables to the equation. Some of the excess gas also hinges on new discoveries beyond the ramp-up of the fields under development.

LNG Imports Remain Essential to Balance the Market

However, LNG imports are still critical to balance the seasonal gas market. Egypt has successfully fast-tracked the installation of two floating LNG import terminals to alleviate the huge gas shortfall. Since 2016, both FSRUs have been operating at a high capacity during the peak summer months.

The government has however been more careful in its approach to LNG lately. This reflects uncertainties on the pace of ramp-up of new gas production, as well as a budget under financial stress from a rapidly-soaring import bill and the devaluation of the Egyptian pound.

Some LNG deliveries have consequently been pushed back, while one of the FSRUs will be

700 MSCF/D

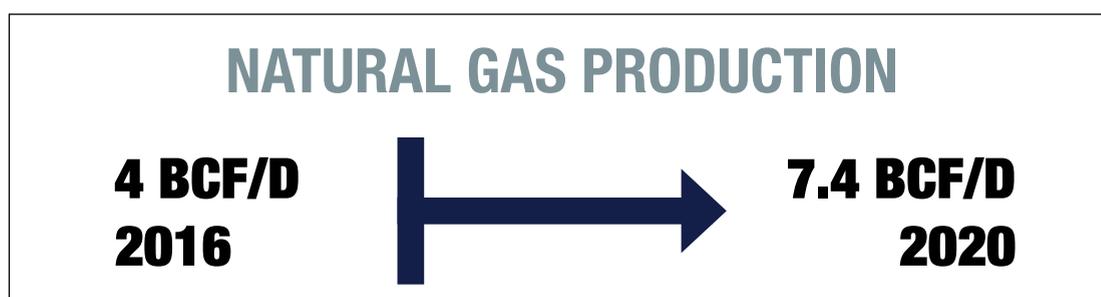
Production level of WNDD's 1st phase.

released from next year. The bonanza of LNG imports to Egypt, where trading companies have been very active, will likely come to an end soon.

Seasonal Dynamics Will Eventually Become More Pronounced

The dynamics on LNG imports and exports will become more complex during the transition period. The country has ambitions to become the regional gas hub, importing and exporting gas and LNG simultaneously. It has already done so since 2016, as several cargoes have been exported from ELNG while Egypt has continued to receive LNG imports at Ain Sokhna at the same time.

Better gas availability for domestic sectors – especially that of the power sector – could exacerbate seasonality through the demand response. Our analysis suggests that while new projects are ramping up, seasonal LNG imports may be needed to cover demand in the peak summer months, while excess gas could be available for LNG exports in the winter.



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An Examination of Egypt's Gas Flaring Reduction Efforts



By: Mahinaz El Baz

Efforts to reduce gas flaring are slowly gaining support around the world. The practice is coming under criticism due to its waste of valuable resources and negative impact on the environment. Even though reducing flaring is still not a common feature in many petroleum fields, the harmful practice could end worldwide by 2030 if pursued efficiently, as outlined by the World Bank's "Zero Routine Flaring" initiative.

In Egypt, promoting the elimination of gas flaring would be a prominent asset to the economy, as it would result in considerable savings for the economy during the current scenario of budget restrictions.

Although the country has 53.75 trillion cubic feet (tcf) of natural gas reserves, according to a senior government official, demand for energy resources in the country is on the rise. As capturing flared gas could cover 5% of the country's energy needs, according to the World Bank, gas flaring reduction is a strategic ally to satisfactorily supply for Egypt's growing need for energy.

Economic Prospect

While Egypt is a net importer of energy, it flares approximately 5.66 million standard cubic meters per day (mscm/d) of natural gas equivalent for an annual revenue loss of \$250 million, according to the World Bank, and is ranked among the top 20 gas-flaring countries in the world.

"Estimates of Global Gas Flaring Reduction [GGFR] Public Private Partnership, compiled primarily from satellite flaring data, revealed that Egypt consistently ranked among the world's top 20 gas flaring countries during the period from 2007 to 2016, where Egypt was ranked as the 11th country from 2013 to 2016, with flared gas volumes to the tune of around 350 mscf/d" Ahmed Abdul Rahman, Project Manager at ENPPI and author of 'Sustainability Improvements in Egypt's Oil & Gas Industry by Implementation of Flare Gas

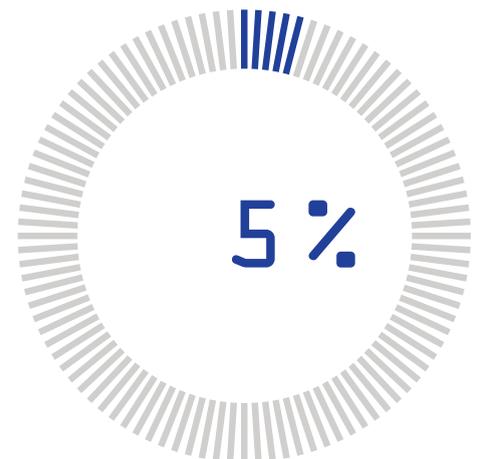
Recovery' which was published in the Journal of Cleaner Production, highlighted.

Accordingly, the recovery of the flared gas in Egypt would be of great economic and financial value, a research paper published in the Clean Technologies and Environmental Policy Journal argues. It is important to note that the calculations for Egypt were based on existing flaring sites. More precise estimations would be needed to take into account possible gas-flare contributions from newly discovered fields.

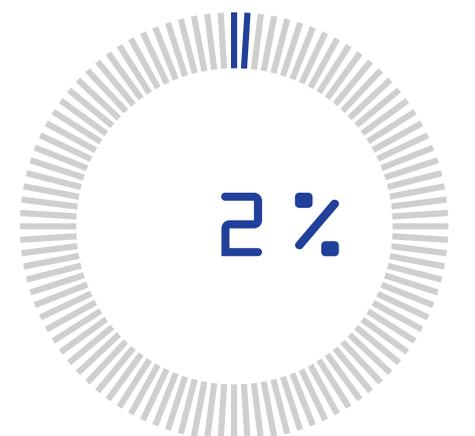
"It is a long story, but it is all about integration; technology integration and energy integration," said Aamer Yahia, Facilities Engineer III at Apache Egypt Operations, commenting on proving the economics of gas processing facilities to preserve Egypt's natural resources. "Also, the most important factor from my point of view is experience integration, to have a wider perspective while making decision from financial, economical, operations,[and] technical points of view," he added.

Egypt's trade balance would improve by \$600 million if energy imports were avoided due to better utilization of the country's existing reserves of natural gas through the reduction of gas flaring and venting, the European Bank for Reconstruction and Development (EBRD) noted in a study.

According to the EBRD, the country will need an additional \$4-5 billion in investments in order to eliminate gas flaring completely. Carbon Limits, a climate-change consultancy group, stated that more than \$2 billion in capital requirements would be needed to curb routine gas flaring by 2020 if oil production levels stay constant at 700,000 barrels per day (b/d). However, if Egypt's oil production declines to 500,000 b/d, the necessary investment would decrease to \$1 billion. Similarly, investments to reduce gas flaring from new development projects between 2020 and 2030 could rise to almost \$3.5 billion, assuming oil-production rates



Of Egypt's Energy needs could be covered from gas flaring



Of Egypt's GHG emissions come from gas flaring

remain unchanged, but these required funds could shrink to \$2.5 billion if oil production decreases. Gas experts believe that curbing flare would boost

the profit margins of oil companies that invest in the use of associated petroleum gas (APG) rather than just flaring it. International oil companies (IOCs) could secure a return on their investments to eliminate routine gas flaring if market conditions were amended and improved, Cristian Carraretto,

“Currently, a number of companies have agreed [to] reasonable prices with the state institutions and, as a consequence, flaring reduction projects have been undertaken. But it is important to recognize a sustainable price given the peculiarity of flaring in Egypt which affects investment costs.”

EBRD's Associate Director for Energy Efficiency and Climate Change told Egypt Oil & Gas.

“APG-utilization plans to achieve zero routine flaring are in place for all new operations and [...] they will seek to implement viable flaring reduction investments in their existing operations. [...] This entails pricing the APG or its products at suitable levels to ensure a fair return on the flaring reduction investments,” Carraretto noted. “Currently, a number of companies have agreed [to] reasonable prices with the state institutions and, as a consequence, flaring reduction projects have been undertaken. But it is important to recognize a sustainable price given the peculiarity of flaring in Egypt which affects investment costs,” he added.

In Egypt, Carraretto concluded, “There is a relatively positive attitude in the sector [towards curbing gas flaring], with some investments happening already and some under consideration. If more certainty is brought, I feel that many more good projects will happen in the years to come and flaring might be significantly reduced.”

Environmental Concerns

It is not only on Egypt's economy that gas flaring is taking a toll. The practice has negative effects on the environment and on human health as well. “Gas flaring is a huge contributor to climate change. The health, environmental, and economic costs are so severe that further delay is a luxury that we cannot afford,” Nnimmo Bassey, Director of Health at Mother Earth Foundation (HOMEF), said. Confirming Bassey's opinion, Yahia explained that the emission of greenhouse gasses “is the

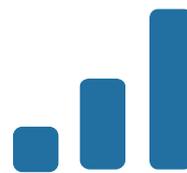
140 BCM

Global gas flaring volume



Among top 20 flaring countries

Egypt's Gas Flaring



5.66 mscm/d
Flaring volume



\$250 M
Annual loss

Source: World Bank

main challenge that harms the environment by causing global warming, ocean acidification, and changes in plant nutrition levels.”

“In order to understand the magnitude of this practice, it is important to consider the cumulative amounts of normally flared gases within all oil and gas facilities, both upstream and downstream, and onshore as well as offshore,” ENPPI's Project Manager, Ahmed Abdul Rahman, stated.

Moreover, Abdul Rahman mentioned that global gas flaring reached around 140 billion cubic meters, which equates to roughly three fold of Egypt's current daily production of natural gas, according to the data compiled by the World Bank's Global Gas Flaring Reduction (GGFR) Public Private Partnership.

Hence, more gas flaring means more anthropogenic greenhouse gas (GHG) emissions. Egypt's current level of routine flaring produces about 2% of Egypt's GHG emissions, according to

“Gas flaring is a huge contributor to climate change. The health, environmental, and economic costs are so severe that further delay is a luxury that we cannot afford.”

EBRD's Associated Petroleum Gas Flaring Study for Egypt. Thus, a reduction in or the recovery of flared gas is a crucial issue. There is a pressing need to measure the composition, distribution and volume of flared gas and to apply a suitable system for flare-gas recovery or disposal.

“Further reduction of gas flaring in Egypt can have not only significant economic benefits but will also contribute to meeting the best international environmental standards,” said Philip Ter Woort, Director of EBRD Operations in Egypt, according to EBRD's press release.

Torleif Haugland from Carbon Limits explained in a presentation at the March 2016 Cairo Thematic Workshop that, even with modest valuation, GHG benefits [from gas flaring reduction] are substantial compared to the value of recoverable gas. Utilizing APG in the local market, instead of burning it, would increase the value of GHG reduction by 21%. If the APG were linked to the national gas grid for power production, the

benefit of GHG reduction would increase by an additional 19%. Moreover, if APG were used for power generation, the currently flared gas could generate seven terawatt per year (TWh/y) or 5% of Egypt's domestic electricity demand. Using APG instead of diesel to power oil fields would reduce GHG production even more, by as much as 42%, Haugland added.

Meanwhile, Abdul Rahman argued that “the generous energy subsidies that created an untenable financial burden on the government also drove companies away from implementing measures to improve energy consumption and reduce waste, such as flare gas recovery. Hence, implementation of the government plans for phase out of energy subsidies is definitely a step in the right direction towards enticing companies to re-think their operations and start considering flare gas recovery as possible ways to reduce waste, especially for facilities that are supplied by electricity from the national grid.”

After inking the Paris COP21 Agreement, the time is right for Egypt to consider how to incorporate flare reductions into its nationally determined contributions and to further explore opportunities for attracting international climate co-financing for such efforts, according to EBRD's study. This review should also consider the monitoring, reporting, and verification (MRV) of the impact of flare reduction and possibly linkage to new regulations –including MRV requirements– for flaring. That Egypt may become a force in establishing a possible regional emissions trading scheme makes this review even more relevant. With the Paris Agreement expected to enter into force in 2020, there is some, but not much, time to prepare, the study emphasized.

Government Reduction Efforts

Flaring volumes in Egypt are equally divided between three regions: the Gulf of Suez and two separate regions in the Western Desert, according to EBRD's study. As a significant portion of the total flaring in Egypt is produced by a few fields or concessions, significant reductions can be achieved through gas-utilization investments by a relatively small number of operators and joint venture partners, EBRD's study notes. If expected flare-reduction investments occur, the relative distribution of flared gas will shift from the larger, targeted flare sites.

Scientists have demonstrated that flared gas can instead be utilized in three ways: LPG/condensate production, recycling, or power generation. These alternatives were studied technically, financially, and economically, and the results indicate that the investors' orientation and vision play a vital role in decision making, especially when a production-sharing agreement is applied, according to EBRD's study.

In addition, a research paper on the technical and financial feasibility of flared gas recovery in Egypt from the perspective of international and national oil companies, argues that recycling flared gas is one of the best ways to utilize APG in Egypt. The dedicated compressor boosts the pressure of the flared gas from roughly atmospheric pressure to the required inlet pressure of the plant, but the main challenge for this option is the high compression ratio/cost.

“In terms of technical solutions to capitalize on the recovered flared gases, a number of uses ranging from electricity generation to CNG are proven and widely available. New innovations for micro LNG and most recently mini GTL applications are now also starting to be commercialized and further

“It is all about integration; technology integration and energy integration.”

reductions in investment costs are expected with the spread of such innovative solutions,” Abdul Rahman disclosed.

The conflict of interest among investors was also tackled in the cited research paper; “[r]esults indicate that the added value itself differs from one investor to another.” In the cases studied, IOCs prefer recycling to achieve a reasonable net present value (NPV) of up to \$40 million while national oil companies (NOCs) prefer generating power to achieve a maximum net value added (NVA) of up to \$58 million in environmental and social benefits.

As for reduction efforts, the EBRD signed a Memorandum of Understanding (MoU) with the Egyptian General Petroleum Corporation (EGPC), the Egyptian Natural Gas Holding Company (EGAS), and Ganoub El Wadi Petroleum Holding Company (Ganope) under the auspices of the Ministry of Petroleum and Mineral Resources in 2015. The agreement aims to strengthen cooperation among the parties in order to

“In order to understand the magnitude of this practice, it is important to consider the cumulative amounts of normally flared gases within all oil and gas facilities, both upstream and downstream.”

reduce the level of greenhouse gas emissions and air pollution, help with the implementation of international best practices and standards, increase the competitiveness of the sector, and contribute to energy security in Egypt.

Although there are many flare-reduction efforts in Egypt, some argue that these efforts are not enough. Yahia, stating that the current efforts are not enough, noted the obstacles these efforts face in the conflict of interests between IOCs and NOCs and in the applied financial schemes.

“Ongoing efforts are not sufficient at all. We do

not need gas flare reduction, what is needed is a total stoppage of gas flaring,” stated Bassey. In addition, Bassey stressed the importance of issuing strict regulations that simply ban gas flaring and compel oil companies to either re-inject the associated gas into wells or have the gas utilized for electricity generation. He also encouraged governments to impose fines on gas flaring. On the other hand, Yahia thinks that attracting investors to extract products from these gases is a viable way to reduce gas flaring.

Regulations and Policies

Egypt, unlike many other oil-producing countries, does not have specific laws or regulations for gas flaring and venting, except the general safety and health regulations set out under the laws governing individual and commercial activities, according to a Reuter’s article about Egypt’s oil and gas regulations. This lack of regulation suggests that the economic, social, and environmental benefits are not fully recognized, even if they are considerable and easy to identify.

The statutes relevant to gas flaring and venting in Egypt are the Hydrocarbons Law (Model Concession Agreement), the Environmental Law (Law No. 4 of 1994), and regulations for the Environmental Law (Decree No. 338 of 1995). “This [environmental law] should be included in the upcoming agreements to force the IOCs to comply with any environmental regulations issued by the government. In parallel, the petroleum ministry should exert more efforts to execute flared gas recovery projects, if it is economically viable,” stated Yahia.

Bassey, like Yahia, also pointed to the importance of issuing specific laws to deal with flaring and venting issues, highlighting that most African governments see the extractive sector as the major generator of foreign exchange. To earn the maximum income from extractive activities, governments either do not enforce laws and regulations or they put in place very weak laws. This tendency will persist until communities and citizens insist that they cannot maintain the environmental and health costs of environmental pollution while companies reap unjust profits and governments pile up revenue.

In the same context, Abdul Rahman discussed a success story, explaining that Norwegian major oil company, Statoil, is a global leader and pioneer in flare gas recovery, and has also developed proprietary technology for zero gas flaring. He added that one of the main triggers for such great strides for Statoil is the introduction of a carbon tax (polluter pays principle). Therefore, it is imperative to introduce legislation to encourage companies to shy away from gas flaring. “In addition to a carbon tax, specific limits on carbon dioxide emissions could be introduced within the Environment Law executive regulations,” he informed.

Moreover, Abdul Rahman highlighted that introducing a carbon tax could further improve economics of flare gas recovery projects. He further explained that specific clauses in agreements with IOCs to prohibit normal gas flaring at all stages of oil & gas exploration and production, especially for associated gas, could also be a driving force towards reducing gas flaring.

According to the World Bank, “EGPC grants permission to flare gas that cannot be marketed and that exceeds operational requirements. Permission is given in the context of approval of an Environmental Impact Assessment (EIA) at

\$5 B

Needed investments to eliminate gas flaring in Egypt

each operational stage, including well testing. It is understood that as a result of oil sector efforts to minimize both flaring and venting, the EGPC does not perceive them to be a major environmental concern.” Furthermore, the Egyptian Environmental Affairs Authority (EEAA) is responsible for compliance checking, emissions monitoring, and enforcement, although some

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degree of internal control has been introduced by the requirement that the operator keep a register showing the impact of activity on the environment. Noncompliance with any flaring restrictions may constitute grounds for revoking the operator’s rights.

Where gas flaring is hard to eliminate, pollutant emission levels must not exceed the maximum permitted limits that are set in relation to international standards and approved by EGPC. Generally, operators must ensure that the emission of noxious and harmful smoke, gases, and fumes are within the accepted limits. These limits, according to the World Bank, are 2,500 milligrams per cubic meter (mg/m³) for sulfur dioxide, 300 mg/m³ for nitrogen oxide (NO_x), and 200 mg/m³ for particulates.

Flare reduction can make a notable contribution to Egypt’s precarious power supply situation and produce tangible environmental benefits, especially as the government is putting greater emphasis upon climate-change prevention. As such, some experts conclude that Egypt should expand its efforts to curb gas flaring by creating a legal framework, an investment environment, and supervisory conditions that will discourage gas flaring and encourage the capture of currently flared gas.



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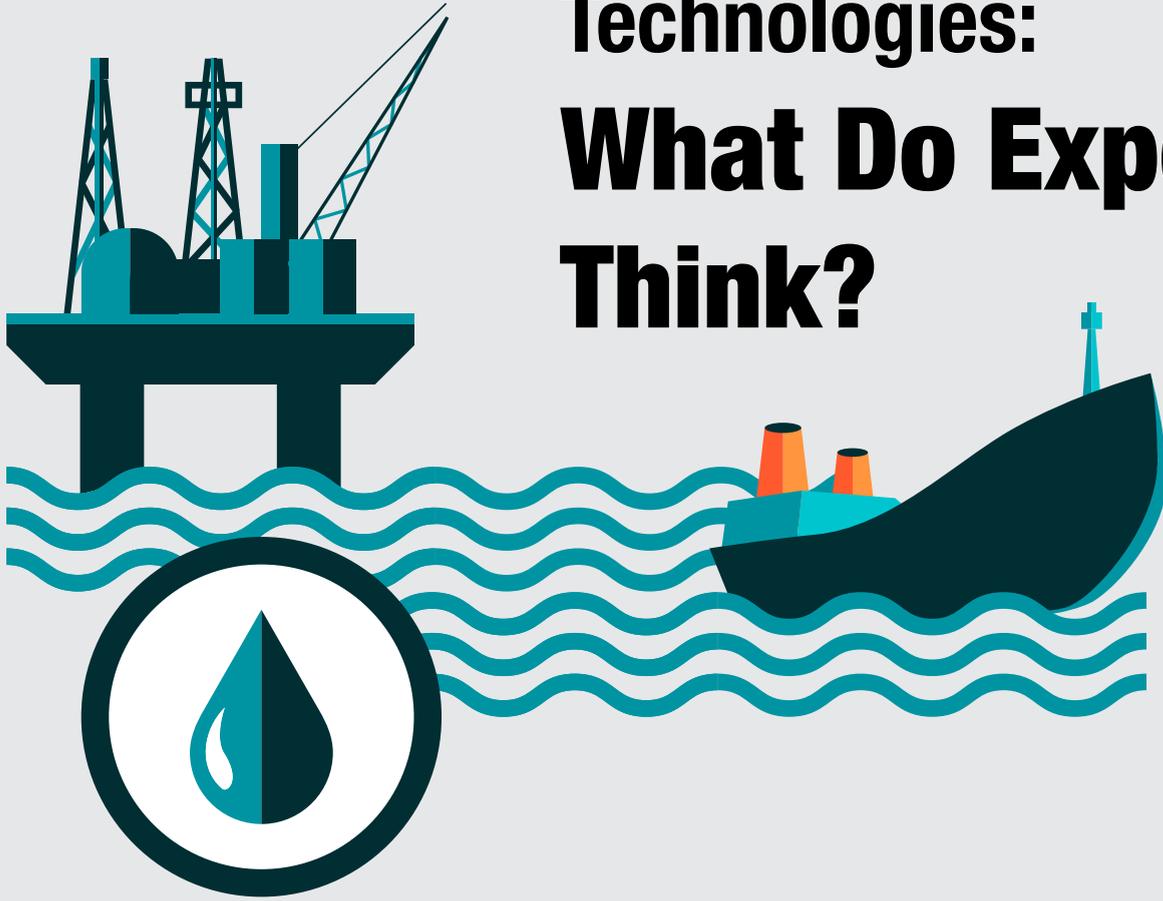


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Deepwater Exploration Technologies: What Do Experts Think?



By Mahinaz El Baz

Due to production increases, Egypt is set to achieve self-sufficiency in natural gas by the end of 2018. This path has not been easy, as the larger share of the country's natural gas has been in deepwater fields. Although there are many challenges facing deep-water gas exploration and drilling, innovative technologies represent an excellent solution to providing a wider, diversified, and sustainable mix of energy resources for Egypt's future. Experts argue that the challenges posed by deepwater drilling have, in a remarkable short period, forced the oil and gas industry to develop significant new technologies and techniques.

The challenges of drilling in deepwater environments have necessitated the development of more advanced design criteria than usually used in onshore and shallow-water wells, according to Offshore Technology Conference's paper titled, 'Overcoming Deep and Ultra Deepwater Drilling Challenges'.

Deepwater Exploration and Drilling Challenges

Deepwater gas exploration presents an array of obstacles, even for the most experienced firms. Although the industry has improved its techniques through trial and error and technology advancements have driven down the costs of deepwater production, firms still face a number of challenges that cause lengthy development times, sometimes up to twelve years for deep-water projects, according to Arthur D. Little's study, "Opportunities and Challenges for Global Deepwater Players."

Many experts agree that there are obstacles facing deepwater exploration and drilling. "The main challenges of deepwater drilling are the massive cost of drilling [and] the absence of sufficient technology in drilling; [furthermore] the high pressure and high temperature wells in such water depth[s] require certain specifications in both drilling tools and wire line and completion tools," said Mohamad Saad, Exploration Geologist at the Egyptian Natural Gas Holding Company (EGAS).

Confirming Saad's opinion, Ahmed Shohdy, Development and Operation Geologist at Saudi Aramco, noted that deepwater exploration is difficult, due to the water depth, and requires long drill pipes to extract gas. Yet, in Shohdy's opinion, the main challenge is the high pressure and high temperature of deepwater wells.

Focusing on pre-exploration processes, Amr Manhaway, General Manager at Seaharvest Oil & Gas Services, explained that there are many factors to be considered prior to exploring a new concession, such as cost, depth, pressure, and concession location. Moreover, Manhaway highlighted that some geological formations encountered at that depth require unconventional tools and casing sizes.

"All the above factors can cause a lot of serious problems while drilling, and the operator must take extreme measures to overcome [them]," Manhaway said, adding that this required a larger budget.

Everything from high exploration costs to short

license periods and the uncertain environmental impact of drilling can make deepwater gas drilling a difficult venture, according to Hany Erfan, Senior Geologist at Dana Gas Egypt. He further noted that the development of the offshore Zohr field has produced a positive trend in the oil and gas industry. Despite the fact that frequent technological advances have made deepwater operations more feasible, the cost effectiveness of such projects remains a tentative obstacle in the fields' development, Erfan added. Yet he pointed out that as global demand for energy increases, deepwater extraction will become more attractive despite these issues.

Viable Solutions

New technological solutions that are currently being developed offer an exciting glimpse into the future of gas exploration in Egypt. Shohdy believes that technology is the best way to

"The main challenges of deepwater drilling are the massive cost of drilling and the absence of sufficient technology in drilling; furthermore, the high pressure and high temperature wells in such water depths require certain specifications in both drilling tools and wire line and completion tools."

overcome the obstacles facing deepwater gas exploration. He further noted that there are many available approaches to overcoming these challenges, such as using suitable mud types or employing drill ships or large semi-submersible rigs. He stressed, however, that many companies struggle with the high cost of such technologies and go bankrupt after encountering dry wells.

"While the technological advances are promising, the costs [of] developing and constructing these systems [reach] well into the tens of billions of dollars. Therefore, firms [hesitate] when it comes

"While the technological advances are promising, the costs of developing and constructing these systems reach well into the tens of billions of dollars. Therefore, firms [hesitate] when it comes to exploring and producing deep-water gas sites."

to exploring and producing deep-water gas sites," stated Rifaat in agreement.

In order to cut costs, many energy firms participate in joint ventures when drilling exploratory wells. Even then, the high operational costs of drilling have caused many potential projects to go south. An example of this risk, Rifaat noted, is Shell Egypt. After investing millions of dollars as an initial investment, the company changed course and chose not to pursue deepwater sites in the Mediterranean.

Manhawy explained that proper cost planning—taking into account offset well data—is essential for overcoming these obstacles and for gaining an accurate estimate of the cost. "Another main pillar of having a successful drilling plan, is the [support of] the EGPC, [such as] the special agreement done between EGPC and BP instead of the old cost recovery scheme," said Manhawy.

"Another main pillar of having a successful drilling plan, is the EGPC, such as the special agreement done between EGPC and BP instead of the old cost recovery scheme."

It is worth noting that in 2012 BP announced it has awarded the first contracts for project 20K™, a multi-year initiative to develop next-generation systems and tools to help unlock the next frontier of deep-water oil and gas resources, according to BP's press release. BP is currently developing the project, which they hope will make it possible to drill up to 20,000 per square inch (psi). One of the core aspects of the project is relying-on sub-sea production facilities, which significantly increases the

amount of hydrocarbons that can be extracted from a field. BP estimates that if Project 20K™ achieves its objectives, as much as 20 billion barrels could be recovered over the next 20 years.

Moreover, BP sees potential applications for the technology in Egypt and other deep-water basins around the world.

Erfan noted that to properly plan the entire process, specialists must gain a solid understanding of the geo-mechanical properties, stream regimes, down-hole pressures, and environmental hazards in deepwater and ultra-deepwater projects. "They must design and construct the platforms and equipment necessary to combat the marine and environmental challenges and extract the gas as safely and as efficiently as possible," he added.

He further highlighted that highly specialized training is essential to ensure that all facilities are operated properly. While the technological

"They must design and construct the platforms and equipment necessary to combat the marine and environmental challenges and extract the gas as safely and as efficiently as possible."

advances are promising, the costs for developing and constructing these systems are very high. In the light of economic, technical, and logistical challenges related to deepwater drilling, the new and developing technologies could prove to be a long-term solution to the feasibility issues associated with the extraction process. Advances are being made to combat environmental and safety hazards and to improve the design of production facilities, Rifaat said, noting that these developments will make operations more cost effective.

Collaboration for a Safe and Sustainable Future

The growing cooperation between Egypt's government and energy firms will create a more attractive environment for investment and development, according to experts. "To grow such cooperation, flexibility is essential. Changing agreement to suit different conditions is an important factor, which has already been done," said Manhawy.

Applying new technologies is also necessary, he added. The government should encourage energy firms to apply new technologies in each and every well in an effort to lower prices. International oil companies (IOCs) must have the opportunity to implement these new techniques in order to eventually reduce the total cost.

Egypt's government is already making efforts to cooperate with energy firms. Firms tend to avoid horizontal wells due to their high costs, but the government should encourage firms to drill them, Shohdy said. It is noteworthy that on average, horizontal wells are more expensive and technically difficult to drill than average vertical wells. Despite their higher cost, an increasing

number of horizontal wells are being drill around the world, according to Roy Nurmi's article at the Middle East Well Evaluation Review.

Affirming the need for extra efforts, Erfan highlighted that the government should work with energy firms to cover most of the empty areas with high resolution processed seismic lines, which could decrease the required time to study offshore concessions, and to increase licensing periods to ensure that the firms have adequate time for deepwater well investigation.

The government should also initiate a huge geological and geophysical project to identify reservoir geometry and fairway maps based on the available seismic and well data, Erfan added. This database would reduce the time companies would need to study possible drill sites. Furthermore, he said that the government faces an important decision on whether to change some concession agreements to encourage large firms to invest in high risk areas.

In addition, experts emphasize the importance of collaboration between exploration firms and service firms. They advise service firms to increase investment in local capacity development; adopt collaborative models between operators, service providers, and equipment manufacturers for the deployment of integrated deepwater technical solutions; and increase modularization through the development of compact plug-and-play production systems that can be configured for maximum efficiency over the life of a deepwater field, according to the Arthur D. Little study.

Service and equipment suppliers must have a disciplined approach to capital contractor management to ensure a high return on their assets. This approach requires aligning capacity with ever-changing demand across geographical locations. It could also require strategic growth through mergers and acquisitions in order to increase scale and market share, according to the cited study.

"To grow such cooperation, flexibility is essential. Changing agreement to suit different conditions is an important factor, which has already been done."

Energy firms drilling for natural gas in deepwater locations face many significant challenges. Technology can alleviate these obstacles, but it comes at a high price. Due to financial, technical, and logistical obstacles, firms are slow to incorporate recently developed technology. To overcome these challenges, experts suggest multiple solutions, such as cost planning, training, and flexible concession agreements. If implemented, they believe, these policies and actions will boost Egypt's production of natural gas, facilitating the government's efforts to diversify the country's energy mix and to achieve self-sufficiency in natural gas.



A Deeper Look into Egypt's Quest to Begin Natural Gas Exports

By Sarah Samir

Not only known for its antiquities and for being an agricultural provider, Egypt was once known for its natural gas exports. The North African Country was exporting around 30% of its natural gas production in 2009 in the form of liquefied natural gas (LNG), according to the Gas Exporting Countries Forum (GECF)'s Egypt country profile. However, growing local demand has turned Egypt into a gas importer after years of natural gas boom.

To bring back the golden era, the Egyptian Ministry of Petroleum and Mineral Resources is working according to plans in order to reach natural gas self-sufficiency and eventually export natural gas once more, despite the ever growing natural gas consumption.

The Exporting Era

In 1997, Egypt made new natural gas discoveries in the Mediterranean deep water, which enabled the North African country to enter the gas game as a supplier, according to the Egyptian Ministry of Petroleum's studies on natural gas exports. Therefore, the Egyptian oil and gas sector had to study the international natural gas market, as well as its production costs. It further had to restructure the oil and gas industry and establish infrastructure to prepare the sector for exporting.

In 2003, Egypt started exporting natural gas to Jordan and Israel. Accordingly, in the year of 2016, the nation established a pipeline passing across the Gulf of Aqaba in order to export its natural gas to the Jordanian kingdom, as Eric Schewe wrote in his article 'How Natural Gas Works in Egypt'.

As an exporter, Egypt supplied natural gas to different markets using LNG facilities, making total of \$3.2 billion earnings from natural gas exports by fiscal year 2007/2008, according to Daily News Egypt. The country counts with two LNG plants

established close to its coasts: the SEGAS LNG plant and the IDKU LNG Plant, which enable the country to export LNG to global market.

Egypt Becomes LNG Importer

With the fast growing gas demand and the natural decline of fields' production, Egypt had to stop supplying for the international market in order cover its local consumption. Since domestic production was not enough to fulfill the country's needs, Egypt turned into a natural gas net importer in December 2012, a drastic change of status considered to be "due to the lack of improvement and development of gas wells in the last years," as Process Engineer at the Egyptian Natural Gas Company (GASCO), Magdy Ahmed, told Egypt Oil & Gas.

"We received the first cargoes of LNG in April 2015, after equipping our ports and other facilities with the right infrastructure to receive them," Minister of Petroleum and Mineral Resources, Tarek El Molla, said in an interview with BP Magazine. Molla further explained that Egypt suffered from a declining natural gas production for three years after the 2011 revolution, which led the country to take immediate temporary steps through natural gas importation.

In 2015 and 2016, the country's production was not enough to meet the country's demand. Egypt's output recorded 2.715 million tons in 2015, while consumption made 3.037 million tons. In 2016, local natural gas supplies slightly increased to 2.85 million tons; yet, consumption also jumped to 3.396 million tons of natural gas, as mentioned at CAPMAS' data.

In 2017, gas demand has continued to increase at rapid pace. Electricity generation from natural gas power plants have consumed alone 4 billion cubic feet per day (bcf/d) of the product during July 2017, which consists of an increase of around 8% from the 3.7 bcf/d of natural gas consumed in May

2017. Furthermore, the hike in demand at power stations reached 300 mcf/d in June and July due to the high temperature, the Ministry of Petroleum and Mineral Resources' First Undersecretary for Gas Affairs, Mohamed Hassanien Radwan, told Amwal Al Ghad in July 2017.

Hikes in electricity production result in a great amount of gas usage, since the sector consumes 63% of Egypt's overall natural gas demand, according to the latest report issued by the Egyptian Natural Gas Holding Company (EGAS).

Rising Production

Egypt succeeded to buy only 76.6% of the planned natural gas imports in fiscal year (FY) 2016/2017 as the country imported just 118 cargoes out of the 154 cargos previously expected, according to a press release by the ministry of petroleum.

This decrease came as the Egyptian natural gas production is increasing due to linking new discoveries to local output. In May 2017, BP announced the start of production from West Nile Delta Development, achieving first gas extraction eight months ahead of schedule. Egypt's natural gas production started to stabilize as the state "signed more than 74 new or amended agreements in the last three years with different partners," El Molla told BP.

During 2017, local output has continuously increased with a percentage that is higher than

"With new discoveries and the new market regulatory law, there is a guarantee that Egypt will export natural gas."

the natural gas consumption increase. In June 2017, Egypt produced 3.19 million tons, a year-on-year (y-o-y) hike of 26.5% from 2016's 2.52 million tons. Meanwhile, Egyptian consumption rose to 3.69 million tons in June 2017 from 3.33 million tons in June 2016, a 10.8% y-o-y increase, according to CAPMAS. Additionally, the country is expected to start production from several new concessions, which will further boost output rates to cover local demand.

"Recently, Egypt has several discourses, such as Zohr Field, with reserves around 30 trillion cubic feet (tcf). It was announced that 81% of the work has been completed in Zohr by end of July, and the early production will start by end of 2017. Moreover, Egypt has the Atoll Field, which is located in East Nile Delta in North Damietta Offshore, with reserves of around 1.5 tcf; in addition to the North Alexandria concession, and the production from Giza and Fayoum field, which will start by the end of 2018," Professor in Petroleum Engineering and Energy Advisor in the Committee of Energy in Egyptian Parliament, Tharwat Hassane, told Egypt Oil & Gas. "All these fields by end of 2018 will add significant value to Egypt's natural gas production, which will enable Egypt to be one of the best of natural gas exporters to the whole world," he added.

he probability of exporting gas by 2019 will depend on the gas production from new discoveries and the capability of working companies to improve production."

Egypt to Export Natural Gas

With bright prospects in natural gas output, the country should regain its position as natural gas exporter, especially because it already has the infrastructure required for exporting the product. Egypt is expected to start exporting natural gas during the second half of 2019, as the country is working to achieve its self-sufficiency target, Former Chairman of EGAS, Mohamed El Masry, disclosed in February 2017.

"With new discoveries and the new market regulatory law, there is a guarantee that Egypt will export natural gas," Hassane pointed out. He further noted that, in order to achieve its export target, the government should "put a quick plan to complete all work for the new facilities for the new fields such as Zohr and North Alexandria, enhance the well productivity by work over operation and put more fields in the production, and start thinking about the unconventional resources." Hassane added that the Egyptian oil and gas authorities should also "invest in more exploration areas, enhance and maintain the gas network facilities

to take more natural gas capacities, and try to use the new gas market regulatory law very soon and start giving the new gas license to the investor."

Yet, the state will still have to deal with some challenges in order to achieve its export plans. While Egyptian natural gas production is increasing, the government is adding new natural gas consumers to the local gas grid by adding households and commercial units to the grid. Furthermore, as the industrial sector is growing, huge factories are expected to be established and increase the local usage of natural gas.

"I expect that the Zohr field and other new discoveries under process will have a role in supplying local market's needs and creating strategic reserves, then the surplus could be exported in order not to face the same problem we faced in 2010, when we opened the way for exports and were not able to commit due to the gap between consumption and production that might have led to the violation of international agreements." Group CEO of Solid Capital, Mohamed Reda, stated to Egypt Oil & Gas. "I think Egypt could export after 2019 upon having more preparations to cover demand and secure reserves, and then it can start exporting the natural gas surplus," he stressed.

Meanwhile, other experts believe that the probability of exporting gas by 2019 "will depend on the gas production from new discoveries and the capability of working companies to improve production," as pointed out by Magdy Ahmed to Egypt Oil & Gas. "It will take some time more to export natural gas without effect the local consumers badly," he added.

With Egypt exporting natural gas, the industry will attract more investments as the "international oil companies (IOCs) will benefit from natural gas surplus and exportation [in light of] the new gas market regulatory law, which allows the investors and the IOCs to sell the produced gas inside and outside of Egypt with good prices," Hassane explained.

74

Agreements signed in the last 3 years.

Eventually, exporting natural gas will boost the Egyptian economy as it will increase foreign currency reserves and raise foreign investments. "Gas market is a promising market to which most countries are heading; therefore, there is a possibility of increasing prices. This will have an effect on Egyptian economy, as the national economy has very few foreign currency sources. Hence, exporting natural gas will have a new source of foreign currency that adds to the foreign currency reserves, which will lead to currency stability," Reda pointed out.

LNG Imports 2016/2017



Egypt towards Regional Energy Hub

In light of the increasing natural gas production and the ministry's aim to reach natural gas self-sufficiency, Egypt has adopted an ambitious vision. The country seeks to become a regional and global hub for energy generation, transmission, and distribution to Europe, especially to Germany, according to Egypt's President, Abdel Fattah El Sisi, who disclosed the government's plan on the occasion of the German-Egyptian Economic Forum in Berlin in June 2017.

Although daring, the Egyptian vision is achievable as the North African country already owns the facilities required for exporting natural gas and for the transportation of LNG. Egypt also shares the Arab Gas Pipeline with Jordan and Syria, which connects Egypt to Arab countries and has the possibility to extend to Turkey, which will help Egypt to export natural gas to different markets.

Moreover, Egypt has the basis for importing natural gas as the country has two floating storage and regasification units (FSRUs) installed on its shores. In addition, the Arab republic issued the new gas regulatory law that allows "IOCS to produce, buy, and sell the natural gas from Egypt and vice versa," Hassane explained. As he further noted, the new law will also "give IOCs the freedom from the obligation to supply natural gas to qualify consumers, and allow [the government] to reduce the burden of support for these quantities."

The new law will also "accelerate the cost recovery cycle for compliance area partners, involve the private sector in natural gas infrastructure expansion projects, allow recovery of return on large investments in gas transmission and distribution networks through tariff, increase the level of service provided to consumers and achieving competitiveness in the gas market, and provide natural gas for existing and planned industries, enabling them to produce and export to increase," Hassane said.

Besides the new discoveries, the government has taken certain steps to prepare Egypt to become a regional hub. The government's efforts include developing existing fields, developing infrastructure, issuing tenders to explore in the Red Sea, issuing the new gas market regulatory laws, and revisiting exploration and production (E&P) contracts in order to incentivize IOCs to operate in Egypt's oil and gas sector.

With natural gas moving to and from Egypt, due to the export and import facilities as well as the new gas legislation, Egypt will be able to achieve its vision to become a regional energy-trading hub soon. Additionally, despite the downfall of natural gas production and natural gas importation, the North African country is surely working to overcome the challenge of the gap between natural gas supply and demand.

4 BCF/D

Electricity demand of natural gas.

Developing Egypt's GAS GRID: Obstacles and Opportunities



By Mahinaz El Baz

The past two decades have witnessed a noteworthy expansion of the Egyptian natural gas market to the point where gas now accounts for more than half of the country's energy needs, according to British Petroleum's statistical review 2016. The local government, thus, needed to continuously extend and develop its natural gas distribution grid to connect more residential, commercial, and industrial units throughout the country. Developing and expanding Egypt's natural-gas distribution grid in terms of conducting maintenance, meeting demand, and attracting foreign direct investment (FDI) will accelerate Egypt's efforts to attain a self-sufficient gas market.

Operation and Maintenance

Egypt has one of the largest gas infrastructures in the region and has developed a national distribution grid to cover the country, according to reports by both the African Development Bank and the African Union. With the aim to increase the number of citizens connected to the grid, it has been extended and upgraded on a regular basis to expand gas utilization in the residential sector. Accomplishment of this goal will not only better utilize and more efficiently allocate Egypt's energy resources, but it will also bring economic prosperity and investment to many neglected areas, such as Upper Egypt, by connecting them to the natural-gas grid and providing for their energy needs.

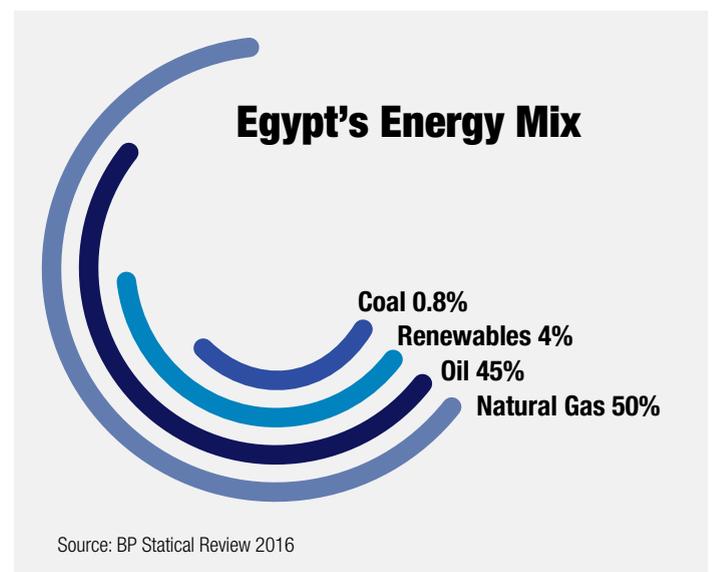
While the gas-distribution grid has been expanded through completion of new gas pipelines, other pipelines are still under construction to achieve Egypt's goal of connecting a maximum number of factories to the national grid. These pipelines will be controlled by a Supervisory Control and Data Acquisition (SCADA) system, utilizing the latest technology to control the grid through the National Network Center, according to EGAS' annual report.

Increased usage of natural gas will contribute to Egypt's strategic goal of preserving its environment by reducing the consumption of higher-pollutant fuels. The new pipelines will also permit the connection of more households to the national grid.

The Egyptian government recently announced that 600,000 households were successfully connected to the national grid during fiscal year (FY) 2016/2017. However, the current rate shows a slowdown in growth when compared to the previous year. In FY 2015/2016, 700,000 households were added to the grid, according to a source at EGAS, as reported by Amwal Al Ghad. It is worth adding that initial plans for 2016/2017 FY were to connect 750,000 households to the national grid.

5

Million fuel smart cards issued for vehicles

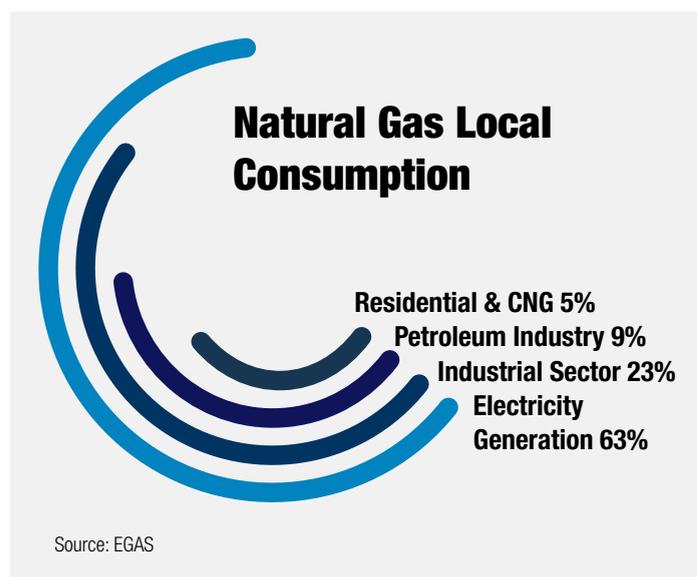


While the government is accelerating the pace of developing the national gas-distribution grid, providing solutions for local energy demand, and taking steps to attract foreign direct investment, it still faces many significant challenges in the development of its national grid, according to Moataz Sonbol, a specialist in natural-gas issues.

“The main challenges facing the development of the natural gas grid are the lack of natural gas supply, aging infrastructure, the delay in extending sewage networks, rapidly spreading slums, the continuous support to the subsidized cooking gas cylinders, and the economic hardships facing distribution companies after floating the exchange rate,” Sonbol said.

Growing Demand and New Discoveries

Driven by rapidly rising domestic energy consumption



“Despite the obstacles facing the government, there is a will to resolve them quickly in order to reach the goal of natural gas self-sufficiency by 2018.”

caused by industrialization, urbanization, and real-estate and tourism investment, Egypt’s energy demand continues to outpace supply. From 2002 to 2012, oil-product and natural-gas consumption increased by 37% and electricity consumption increased by 30%, according to a report by TAQA on the Development of Natural Gas in Egypt.

With rising demand and increasing reliance on natural gas to meet local consumption –especially for power generation and electricity– the national grid reached a length of approximately 7,407 km

8.2

Million households planned to be connected to the grid.

and a capacity of 170 million cubic meters per day in 2016, a source at Egyptian Natural Gas Company (GASCO) told Egypt Oil & Gas.

While other factors play a role, the key driver of consumption in Egypt is population growth. Egypt’s population-growth rate is one of the highest in the MENA region, a trend that is likely to extend beyond the medium term due to Egypt’s youth boom. Gas-intensive industries, such as the steel and fertilizer industries, are expected to return to full utilization as the economy recovers, according to a BNP Paribas report.

In its efforts to meet local energy needs, particularly electricity generation, EGAS has constructed nine high-pressure-pipeline projects, adding a total length 215 km to the national grid, and gas lines to four new power stations.

The electricity sector’s share of gas consumption reached approximately 1,039 billion cubic feet (bcf), representing 63% of consumption. The industrial sector used about 379 bcf or 23% of consumption, according to EGAS’ annual report.

New gas discoveries will help fill the gap between supply and demand. In May 2017, Egypt’s Minister of Petroleum and Mineral Resources, Tarek El-Molla, said that the Zohr gas field will be connected to the national grid before the end of 2017, according to Energy Egypt. During the same month, British Petroleum (BP) announced that it has started gas production from the first two fields, Taurus and Libra, of the West Nile Delta development. Gas from the development reached the national grid in March 2017. The ramp up to stable operations and the

commissioning of all nine wells of the development’s first two fields have also been completed. All the gas produced from this field will be fed into the national grid, World Oil reported.

“Despite the obstacles facing the government, there is a will to resolve them quickly in order to reach the goal of natural gas self-sufficiency by 2018, in addition to achieving a new record in developing gas fields and put them online to be linked to the national grid,” Sonbol stressed.

Financing Gas Networks

Even though, the Ministry of Petroleum and Mineral Resources, via EGAS, is carrying a major part of this heavy burden, the support of private sector and international institutions has contributed to the implementation of the plan for extending and developing the natural-gas distribution grid.

In 2014, Egypt received a \$500 million loan from the World Bank (WB) and a \$83 million loan from the French Development Agency (AFD), according to EGAS. Moreover, EGAS has received a financial grant of \$80 million in 2015 from the European Union (EU) and the AFD for the Households Natural Gas Connection Project for Egypt. The objective of the project is to assist Egypt increase household access to a reliable, lower-cost, grid-connected natural-gas supply. The project has three components. The first component, grid expansion and household connections, will finance the investments necessary to expand gas networks in project areas and connect 1.5 million households to the distribution network. The second component, financial support for household connections in disadvantaged areas, will extend the grid to eleven relatively poor governorates. The third component, institutional strengthening, will aim to improve the governance structure, fiscal transparency, and accountability of EGAS and support the development of regulations

for the gas sector, according to the World Bank.

“The grant received from the EU and the AFD will definitely help in supporting citizens who are unable to pay for the gas connection charges. Each customer receives a grant of EGP 1,500 per unit, which is an important step to overcome the financial obstacles,” Sonbol explained.

“The grant received from the EU and the AFD will definitely help in supporting citizens who are unable to pay for the gas connection charges. Each customer receives a grant of EGP 1,500 per unit.”

Challenges Ahead

The speed with which the ministry aims to develop the natural-gas distribution grid could create challenges that could slow its completion. These barriers will be dealt with once regional development plans have been completed and included in the overall implementation strategy. The new gas law will also support the development and extension of the gas grid.

“The new gas law and regulatory authority will enable plants to export gas and overcome the lack of natural gas supply problem. It will also attract foreign direct investments, especially to energy-intensive industries,” Sonbol stated.

Expanding the natural-gas infrastructure to reach new areas, such as Upper Egypt, could stimulate much-needed economic development in these regions and encourage industrial development and increased investment.

“The new [...] regulatory authority will enable plants to export gas and overcome the lack of natural gas supply problem. It will also attract [FDI], especially to energy-intensive industries.”

Over 75% of Egypt’s households purchase LPG cylinders from a distribution network characterized by persistent shortages, an informal market, and difficult conditions for handling cylinders, according to the World Bank. Such fact urges the need to develop and extend the national gas grid. Moreover, by the end of the natural gas’ development project, the number of households connected to the natural gas grid is expected to increase to 8.2 million households, the World Bank informed.

The Impact of the US Shale Revolution on International Fuel Trade

By Erica Fauser

The United States (US) has long been the world's largest producer and consumer of finished petroleum products; however, it is now experiencing a significant increase in its exports of these products. Technological advancements in the last two decades have made this possible, and the US is currently experiencing a "shale revolution" due to the use of new and cost effective technologies such as hydraulic fracturing (or "fracking").

The technologies developed have allowed the United States to exploit previously untapped shale and rock formations, and have dramatically transformed the US energy potential by allowing increased production of oil and natural gas from formerly inaccessible shale formations. As a result, the United States has surpassed Russia as the world's top natural gas producer, and by 2020, the US is expected to overtake Saudi Arabia as the world's largest oil producer.

However, the country's new geopolitical standing, due to the shale revolution, is unsettling to some. Members of the Organization of the Petroleum Exporting Countries (OPEC) are unable to counteract the shale boom in the US while other countries, like China and Poland, seek to replicate the shale boom.

Increasing Shale Production vs. International Trade

Starting in 2006, independent US oil companies began utilizing a new and cost-effective technology of fracking, and since 2011, the United States has experienced what is being called a "shale boom" or "shale revolution." The process of fracking involves the high pressure pumping of a mixture of water, chemicals, and sand down previously drilled and cased wells. The pressure at which the mixture is pumped into the well, coupled with the mixture's ability to fracture small cracks already existing in the once impervious rock layers, allows previously untapped oil and gas to open and seep up through the drill rig.

The utilization of this process has led the US to evolve into a major exporter after decades of being an importer. These exports are a consequence of increased domestic crude production interacting with a number of other factors. Specifically, exports of finished petroleum products have increased. This is because the export of finished petroleum products is not restricted. Additionally, the large-scale shale production lowers the domestic crude oil price relative to the world price, while maintaining the equality of world prices for finished products. As a result, firms are incentivized to refine the oil domestically within the United States (as opposed to refining it overseas) and then to export the refined products to other countries around the world.

Without doubt, the impact of increased production of US oil, natural gas, and petroleum products as a result of the shale revolution on international trade has been monumental.

World petroleum demand continues to grow, particularly in developing countries, and diesel fuel has experienced particularly strong demand around the world. Therefore, it is not surprising that the US, as the world's largest refiner with one-fifth of the world's refining capacity, having satisfied domestic

markets, has responded to these international market opportunities.

Impact on OPEC and GATT

To some, the shale revolution is threatening the systemic understanding of an industry that was once believed to be operating with a limited amount of resources controlled by the few. Specifically, the once dominant General Agreement on Tariffs and Trade (GATT) and later OPEC are becoming obsolete in controlling the international fuel trade as a result of the current shale boom. However, to understand the collapse of GATT and OPEC it is important to understand the beginning of each organization.

Oil, perhaps the most important resource after World War II (WWII), was deliberately omitted from early trade negotiations for GATT, and that choice to exclude it by the world superpowers (US, UK, France, Belgium, USSR), which at that time controlled Middle Eastern reserves, has had profound effects throughout the commodity's history.

Global economics were changed in 1948 with GATT, and the new world superpowers after WWII recognized the strategic importance and proceeded to establish control over the proven reserves of oil. However, despite their recognition, oil was strategically excluded throughout this long history of negotiations – the most strategic international commodity. The strategic exclusion of crude oil from the consideration of GATT is further evidenced by the fact that none of the prominent oil exporting countries of the era were contracting parties to GATT. The lack of regulation of crude oil enabled the United States, for example, to more effectively control its own crude by prohibiting the export of crude oil under all but a small number of circumstances.

However, in an unanticipated move to the signatories of GATT, the OPEC "cartel" was formed on September 14, 1960. Following decades of colonial control and control via multinational corporations, OPEC members found themselves, for the first time ever, in control of the future of their countries. Member countries wanted control of their nations' resources and the market, and, although foreign oil companies initially fought this push, they ultimately lost the battle due to the exclusion of crude oil from GATT's regulation and were granted control over major oil company operations.

Since oil-exporting countries banded together to form the most powerful cartel on the planet, there was not an incentive for these formerly dominated colonies to consider the fairness of the policies governing their monopoly. However, experts believe the OPEC monopoly is deteriorating as a result of the US shale revolution. This is due to the US control over its crude, coupled with the use of new fracking technology to tap into previously untapped shale formations to retrieve oil and gas, has given the US a competitive advantage in controlling the market and the trade of finished petroleum products.

Obstacles to Replicating the "Shale Boom" Elsewhere

Many other countries have shale gas potential: notably China and Poland, which have significant

shale reserves, much more than the US. However, both China and Poland face unique obstacles unlike the North American country.

The Chinese government has realized that reliance on imports diminishes the country's independence, especially when so many of its costly energy ventures are tied up in the Middle East and Africa, where political turmoil threatens regional stability. Thus, it is a high priority for China to develop more domestic energy resources in order to meet its increasing energy demand. The solution is potentially in Chinese oil shale resources, which amount to 48 billion tons of shale oil, with proven oil shale reserves of about 36 billion tons.

China has recently commenced exploration and production of shale domestically, but faces the obstacle of water scarcity in East Asia and China to implement the hydraulic fracturing technology. In addition, China lacks the environmental regulatory policy to tackle the issue. The Asian country will thus find itself increasingly dependent on Middle Eastern oil until it can overcome this obstacle.

Meanwhile, the shale gas discovery in Poland sparked the beginning of efforts by multinational corporations to exploit perhaps one of the largest organically shale-rich areas in Europe. Natural gas quantities discovered in Poland are potentially capable of allowing the whole region of Eastern Europe energy independence, which would decrease Europe's reliance on Russian and Algerian imports of oil, natural gas, and petroleum products. Companies that have already invested in this potential energy have included Chevron and Exxon Mobil.

The basins discovered in Poland display favorable characteristics for profitable natural gas extraction, reporting estimates that these reserves contain 710 trillion cubic feet (tcf) of unrisks shale gas, with a risks recoverable source of only 100 tcf of that total amount. Considering the fact that Poland could change its importer status to that of an exporter for the region, like the US has done as a result of the shale boom, both the government and industry are anxious to take hold of this great opportunity for the energy sector. Developing Poland's shale reserves through fracking could also change its geopolitical standing within the European Union (EU), and decrease the EU's reliance on Russian imports.

Standing between investors and exploration are gas permits and a growing European public opinion about the environmental threats hydraulic fracturing potentially creates, such as water contamination from fracking process. In addition to environmental restrictions in several European countries and unlike the United States and China, another obstacle is the fact that Poland's land is more densely populated.

Fracking friendly laws balanced environmental and regulatory mechanisms with a "free market" type system opens up investment opportunities. Therefore, in order to replicate the shale boom elsewhere and compete with the United States, not only must there be shale reserves and the use of fracking (or similar) technology, but the laws of the country seeking to replicate the boom must also be "fracking friendly" to encourage investment and successfully compete in the fracking game.



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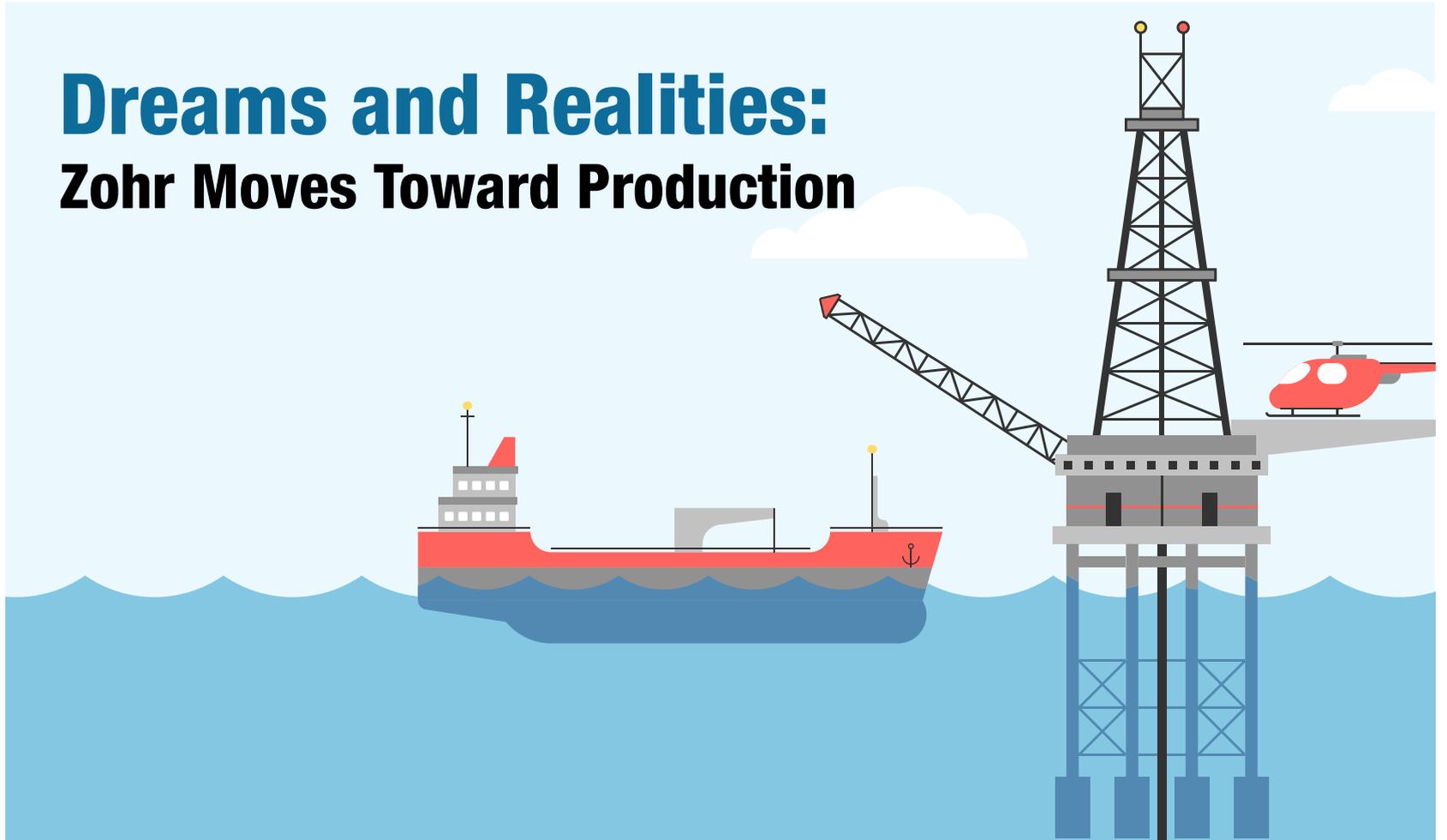
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Dreams and Realities: Zohr Moves Toward Production



By Noah Finley

Two years after its discovery, Egypt's mammoth natural gas field is set to begin production this fall, providing welcome relief to a country currently heavily dependent on gas imports. The exploitation of Zohr—and its neighboring fields of Aphrodite, Tamar, and Leviathan in Cyprus and Israel—opens new opportunities for Egypt. With its network of pipelines and natural gas liquefaction plants, some already dream of making Egypt into a hub for regional and domestic exports of liquefied natural gas (LNG). Such aspirations, however, remain for the future. At present, these ambitions remain mere dreams as Egypt struggles to meet its domestic demand for natural gas—a demand that government officials hope production from Zohr will satiate.

Egypt's Natural Gas Sector

Egypt, a former natural gas exporter, has, over the years, seen its production decline and its consumption increase, leaving it dependent upon imports of natural gas to meet its energy needs. From exporting 15 billion cubic meters (bcm) in 2005, exports declined to almost nothing by 2014, according to Simone Tagliapietra and Georg Zachmann, fellows at Bruegal, an economic-focused think tank, in a piece published by Forbes.

Between 2009 and 2015, Egypt's production of natural gas fell by 22.3%, according to Jean-Francoise Seznec and Samer Mosis in an article published by the Middle East Institute. In 2016, domestic production stood at 4.4 billion cubic feet per day (bcf/d), Reuters noted in July 2017. Demand, however, had increased. Between 2000 and 2012, demand rose 8.4% a year due to increasing household and industrial consumption, Anders Norlen and Kerri Maddock

noted, writing in September 2015 for Energy Insights by McKinsey. Between 2006 and 2016, demand increased by 14 bcm or nearly 36%, according to Enerdata. In 2016, Egypt used 53 bcm of natural gas, a staggering 38% of natural gas usage on the African continent, the consulting company notes.

As the country struggled to meet domestic demand, it suffered from occasional brownouts. To ensure a steady flow of electricity, the government chose to prioritize electricity generation and cut natural gas supplies to the industrial sector, Reuters reported in June 2016. To meet domestic demand, Egypt became an importer of liquefied natural gas (LNG). Instead of exporting LNG, Egypt was now importing it. Its liquefaction plants became strangely silent. In fiscal year 2016/2017, Egypt imported 118 cargoes of LNG, Reuters reported in August. These imports have proven a drain on its economy and foreign exchange reserves, forcing the government to spend its scarce supply of dollars on LNG imports.

The Zohr Natural Gas Field

In 2012, the Italian energy company, Eni, encouraged by recent natural gas finds in Israeli and Cypriot waters, submitted a bid for the Shorouk Concession. Royal Dutch Shell had previously explored the area and drilled multiple exploratory wells—but had found nothing. Nevertheless, Eni went forward with the project based upon its analysis of the local geological formations on the seabed. In 2015, the company reached out to other oil and gas firms, looking for a partner in its exploration and development of the Shorouk Concession. By the end of July, it had not received any bids and closed the tender, according to a Reuters

article from September 2015. The next month, in August 2015, it became apparent that Eni had discovered a massive natural gas field, one that would dwarf the neighboring Aphrodite (Cyprus), Tamar (Israel), and Leviathan (Israel) fields. It was named Zohr.

Located approximately 190 kilometers off the Port Said coast, the deepwater Zohr field is submerged under approximately 1,500 meters of water and extends over 100 square kilometers, making it the largest known natural gas field in the Mediterranean. To put that number into context, it is helpful to note that Egypt's current natural gas reserves stand at 53.75 trillion cubic feet (tcf), according to a senior source at EGPC. This massive gas field is now set to come online with a few weeks.

Impact of Production from Zohr

As the Zohr field begins production, its natural gas will begin alleviating Egypt's current shortage. The CEO of ENI, Claudio Descalzi, estimated in August that Zohr will produce approximately 1.642 bcf/d by the end of 2017, according to Al Ahram Online. This production is slated to rise to 2.7bcf/d by 2019, according to AmCham Egypt's November 2016 Industry Insights. With an annual output of 20-30 billion cubic meters (bcm), as projected by Tagliapietra and Zachmann, Zohr has the potential to drastically increase Egypt's production of natural gas.

This rising production will allow Egypt to cut back on natural gas imports. In fact, due to rising production from a number of sites, Egypt is already looking to cut back on its imports. Earlier this month, the Minister of Petroleum and Natural Resources, Tarek El Molla, stated that Egypt was "planning to import 154 cargoes of LNG in fiscal year 2016/2017 but we only

imported 118 cargoes because of the increase in local gas production,” according to Al Ahram Online. Egypt’s production of natural gas has risen to 5.3 bcf/d, the First Undersecretary of the Ministry of Petroleum and Mineral Resources, Mohamed Taher told Amwal Al Ghad in August, but it still falls well short of the 6 bcf/d of domestic demand. With the addition of production from Zohr, this gap should continue to shrink and eventually disappear—if consumption levels remain relatively stable. Over the past few years, demand has been growing at a significant rate. Rising demand, if it paces increases in production, will prevent Egypt from resuming its previous status as a significant natural gas exporter.

On a more short-term basis, it is not clear exactly how much money natural gas production from the Zohr field will save the Egyptian government. In May, President Abdel Fattah El Sisi estimated that increased production from all of Egypt’s new fields could save the government \$3.6 billion per year, according to Al Ahram Online. While natural gas from the field will allow Egypt to reduce its imports of natural gas, maybe even eliminate them as the government projects that Egypt will achieve self-sufficiency in natural gas by 2019. Eliminating imports will not fully remove the government’s outlays on natural gas. Even though the terms of the agreement between Eni and the Egyptian government are unknown, it is safe to assume that a significant portion of the output from Zohr will belong to Eni and its partners as reimbursement for their investment and operation costs. Based upon other production sharing agreements (PSAs) between the Egyptian government and international oil companies (IOCs), Eni and its partners could be entitled to up to 40% of the field’s output to recover their investment costs and an additional 31-40% of the remainder to cover operational costs, according to Seznec and Mosis. While this gas will likely flow into Egypt’s gas-deprived domestic market, it will come at a price. While undoubtedly cheaper than importing LNG, purchasing this natural gas from Eni and its partners will continue to prove a financial drain, albeit a smaller one, on Egypt’s exchequer.

On the positive side, not all these funds will be lost to the Egyptian economy. Eni and other IOCs have often subcontracted Egyptian firms. Egyptian businesses have produced many of the components necessary for the drilling and development of Egypt’s natural gas fields. This money, while not flowing directly into the Egyptian treasury, produces jobs and pumps foreign exchange into the Egyptian economy. In August of 2017, Descalzi pledged that half of Eni’s 2018 Zohr investments would be channeled into the Egyptian economy, Al Ahram Online reported.

An Opportunity for Egypt

The discovery of the Zohr field galvanized the government to take action to revitalize its natural gas sector. In an effort to regain the confidence of the major IOCs, the government has developed a plan to clear its back payments and raised the rates it pays for domestically produced natural gas. It has also embarked on ambitious market reforms, slashing energy subsidies and approving a massive overhaul of the gas market. These policies, by introducing some market mechanisms, will make it easier for international

oil and gas companies to operate in Egypt’s domestic market. Under the new gas regulation law, private companies will be able to import and sell natural gas on the domestic market, intentionally weakening the government’s monopolistic hold on gas prices and distribution.

Sensing favorable governmental policies, IOCs have begun to invest in Egypt again. Leading energy companies, such as BP, Royal Dutch Shell, Eni, and Rosneft have invested in exploration and development of Egypt’s oil and gas fields—the most notably example being Zohr.

A Reuters article from 2015 had referenced the company’s inability to find a partners for its exploration work in 2015, Eni has since recruited BP and Rosneft to assist it in developing the Zohr field, selling a 10% stake to BP for \$375 million and a 30% stake to Rosneft for \$1.125 billion and pro-quota reimbursement of previous expenses, according to the company’s press releases. Investments have also begun to flow into other fields, notably the Atoll, Libra, and Noorus fields, and into exploration and development concessions in Egypt’s western desert.

These investments have already reversed Egypt’s trend of declining production. Production from the Libra and Noroos fields has recently increased Egypt’s production capacity by 700 million cubic feet per day (mcf/d), Taher told Amwal Al Ghad in August. Production increases are also expected at other sites by the end of the year, most notably from Zohr.

“The fields of Zohr, North Alexandria and Noorus are among the most important projects that will increase natural gas production [...] and will contribute to [Egypt’s] natural gas self-sufficiency by the end of 2018,” El Molla said in a statement released to the press and reported by Reuters.

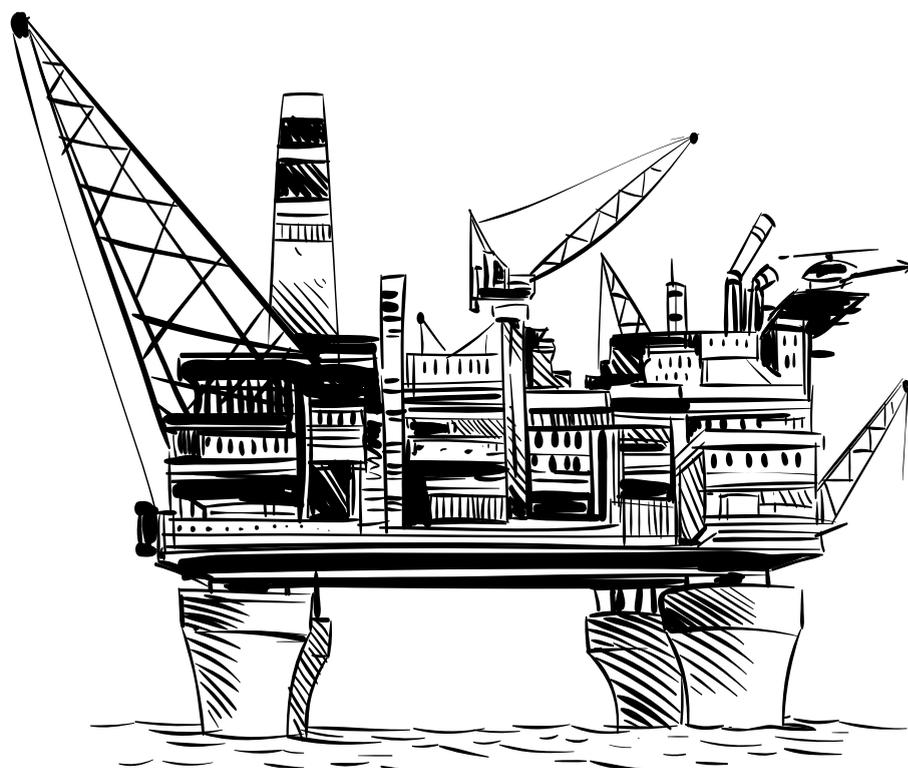
These three fields, alone, are expected to produce 4.6 bcf/d by 2019, according to the Reuters’ news article.

The market reforms undertaken by the government should also facilitate the shifting of the burden of natural gas imports toward the private

sector, permitting industries to purchase the natural gas they need directly from international providers and decreasing the strain on Egypt’s state-run companies to secure sufficient natural gas supplies. These importing companies will also utilize Egypt’s existing natural gas network, resulting in transit earnings for the state and greater reliability for the consumers. It will also open the door, some hope, for the re-export of regional gas. Both Israel and Cyprus have a surplus of natural gas, but no obvious export routes. Shipping it to Egypt for liquefaction at Egypt’s LNG facilities could provide a relatively easy solution for both nations and also garner Egypt re-export earnings. While still a distant scenario, Egypt’s rising production, which should meet, even overshoot domestic demand, makes the scenario distinctly possible. Eni’s development of the Zohr field could serve as barometer for IOCs considering investments in Egypt. If it proves successful, it will demonstrate that the Egyptian government is a viable partner for gas exploration, development, and marketing and could lead to further investments in Egypt’s natural gas sector. If not, other IOCs might hesitate to follow Eni’s example to invest heavily in Egypt.

Moving Forward

For Egypt, the fate of its natural gas sector could hinge on Zohr. Natural gas extraction from the site should staunch Egypt’s natural gas demands, allowing Egypt to reduce and, eventually, eliminate its LNG imports—at least if it can stabilize demand. More importantly, however, the successful development of the Zohr field will send a clear signal, reinforced by the country’s market reforms, that Egypt is once again ready to do business. Instead of playing its hand cautiously by maintaining its previous gas policies, Egypt is making a bold move to capitalize on local discoveries. It is too soon to say whether these changes will ultimately make Egypt a regional gas hub, as some hope; yet the discovery and development of Zohr and Egypt’s reform agenda have put the country—no longer just a passive observer of changing market conditions—back in the driver’s seat.





Understanding the Prospects of Natural Gas Vehicles in Egypt

By Mariana Somensi

The Egyptian cabinet announced in June the cut of fuel subsidies as a move to reduce the country's budget deficit. The increase in benzene and diesel prices following the cabinet's decision led many citizens to look for natural gas as a cheaper alternative of fuel.

An estimative released by the Egyptian International Gas Technology Company (Gastec) indicated a 250% increase in the number of car conversions to natural gas after subsidies were lifted, an average of 35 cars per day, according to Gastec's Chairman, Hesham Redwan.

Although shifting cars to run on gas has a considerable high price, which ranges between EGP 5,000 and EGP 11,000 depending on the gas cylinder, according to *Ahram Weekly*; in addition to long-term benefits to the environment, citizens' pockets, and the overall economy turn natural gas into an interesting source of power for cars.

Financial Benefits

When a driver arrives at a filling station, the difference between natural gas and petrol prices is clear: while conventional fuel prices remain at as much as EGP 5, natural gas costs around EGP 2. The significant difference is highly attractive for those who have been affected by the price increase in the energy sector. However, a larger quantity of gas is required to produce the same amount of energy of a fuel tank, which leaves some customers wondering if the cheapest price is still worth it when compared to natural gas vehicles' (NGV) driving range.

Although the shortest range poses some disadvantages, such as the need of refueling more often and less room in the car in case of larger gas cylinders to cover a biggest mileage, the overall price of natural gas remains cheaper than conventional fuel. "Converting my car to run on natural gas will save me more than EGP 1,000 a month," Ahmed Salem, a 40-year-old employee, told *Al-Ahram Weekly*.

Free from Oil Price Oscillations

Since 2014, the price of oil barrels has been suffering from a severe downturn as supply has overcome oil demand. To put prices back on track, the

Organization of the Petroleum Exporting Countries (OPEC), in a partnership with non-OPEC members, established an outstanding agreement to cut oil production in 2017. Although oil prices increased during the year, the efforts of the OPEC-led deal were constantly beaten by the large shale production in the United States, which brought many ups and downs to oil barrel prices and, subsequently, oil derivatives.

The price of natural gas, on the other hand, has remained constant amid the oil price oscillations, which is a very convenient advantage for NGV. "Historically, natural gas prices have exhibited significant price stability compared to the prices of petroleum-based fuels. This stability makes it easier to plan accurately for long-term costs", William Harris wrote to *How Stuff Works* website.

The Dilemma of Importation

Although Egypt was a great exporter of natural gas, the country became a net importer after the demographic expansion led to an increase of local gas demand. The need of reducing the federal government's costs, which became evident when the cut of subsidies were announced, rises a concern on whether natural gas cars would actually increase the consumption of a product that is already highly imported, which would bring a subsequent hike in Egypt's expenses and a reduction in the foreign currency available in the country.

However, the percentage of natural gas usage for transportation is not significant compared to other sectors. In 2012/2013, gas utilization as fuel for vehicles reached 0.4 million tons, "representing only 1% of total natural gas consumption by all sectors during the same year," Hamed Konkor pointed out on his case study "Egypt: Policy Reforms to Promote Energy Efficiency in the Transportation Sector" written to the United Nations.

Additionally, the great increase of NGVs shows that Egyptians have started to be more conscious about fuel usage, which indicates a higher concern regarding the levels of consumption compared to the price.

"Because of fuel subsidies and the subsequent low price of fuel, Egyptians were not aware of fuel

35

Cars on average converted per day to natural gas

consumption in the past, so [they] used to buy cars without taking the vehicle's consumption as a strong factor to be considered. Now that the government has cut subsidies, the general tendency is that the population becomes more aware of fuel consumption," the economic expert Omar El-Shenety, Managing Director of Multiples Investments Group, disclosed to *Egypt Oil & Gas*. This awareness can lead Egyptians to reduce the amount of fuel consumed in an attempt to reduce fuel costs.

Furthermore, Egypt would have to bare only one year before regaining its prominent position at the natural gas market. As major gas fields become operational, including Eni's Zohr—the biggest gas field ever discovered in the Mediterranean—the Ministry of Petroleum and Mineral Resources set the ambitious goal of achieving self-sufficiency in gas production by 2018. The Ministry's goal, which enables Egypt to cover gas demands with local output, prevents the Federal Government from allocating a considerable amount of its budget to oil and gas imports, which enables gas prices to remain low in the country.

Furthermore, not depending on foreign products also secures the local market against any economic or political instability in partner nations that might affect gas supplies. As such, shifting from conventional fuel to natural gas is a very efficient way to avoid fuel shortages caused by diplomatic conflicts and international affairs.

Environment Friendly

Even though natural gas is a fossil fuel, its impacts on the environment are less aggressive than the impacts of oil fuels. A study carried by the American Gas Association (AGA) pointed out that natural gas produces 117,000 pounds of air emissions per billion

British thermal unit (Btu), while oil products produce as much as 164,000 pounds per billion Btu.

“Greenhouse gas emissions [of NGV] are reduced on a total lifecycle or well-to-wheels basis by 15% to 25% below diesel vehicles,” according to Go With Natural Gas, a Canadian collaborative industry-government initiative to encourage greater use of natural gas in Canada’s transportation sector. The organization further noted that “during vehicle refueling, there are no evaporative emissions as the connection between the fuel dispenser and the vehicle creates a sealed system.”

The emissions reduction promoted by NGV can lead to the improvement of key environmental concerns, such as human health, acid rain, increase of greenhouse effect, and other aspects related to poor air quality. “For this reason, the State of California [United States] encouraged greater use of natural gas in transit buses and in public fleets. Similarly, Canada developed the world’s first natural gas transit bus in Hamilton, Ontario, in response to poor air quality due to local industrial activity,” the Canadian organization Go With Natural Gas disclosed.

Besides its benefits against air pollution, NGV can also promote improvements in the quality of the soil and groundwater as natural gas is less dense than the air and rises to the atmosphere when released. “Sophisticated monitoring systems are used on a 24/7 basis to monitor station conditions. If a fuel storage tank were to leak, the fuel would vent to atmosphere,” Go With Natural Gas added.

Additionally, using natural gas as fuel is a helpful feature against noise pollution, as NGVs are quieter than vehicles running on diesel. As the Canadian organization informed, natural gas transit buses, for instance, “are up to 10 decibels quieter at idle compared to diesel transit buses.”

Inflammable Gas

A warning flag raised against NGV is the higher inflammability of natural gas compared to oil fuels, which could cause more severe damages in case of car accidents. Furthermore, as it does not have color, taste, or smell, a natural gas leakage is harder to be detected and poses great danger of explosions and fire if careless handled.

However, Go With Natural Gas assured that, in case of car accidents, the risks are not higher than in accidents involving conventional fuel cars. In fact, “in the event of a motor vehicle accident involving a fire, natural gas fuel storage systems on vehicles are designed to release fuel from the storage tanks, so as to minimize risk to vehicle occupants and the public,” it noted.

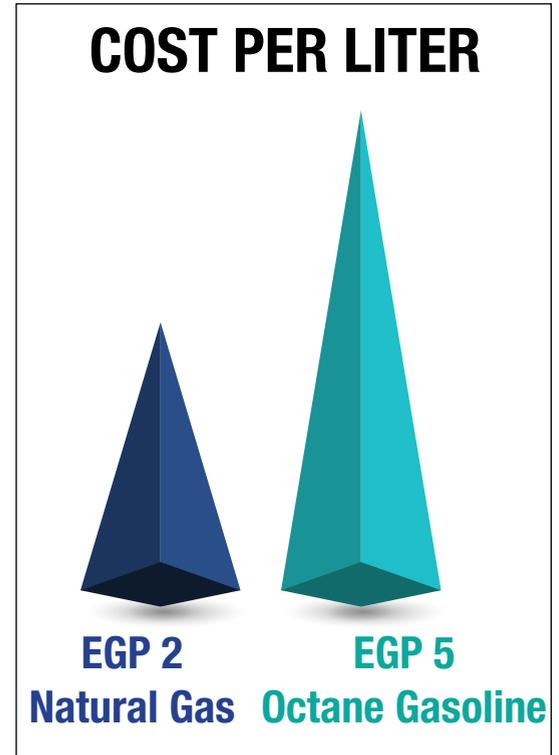
Converting Your Car to Natural Gas

The conversion is available to everyone; however, the economic specialist Omar El-Shenety noted that the process is more appealing to a specific public: the public transportation sector and private drives.

“The price increase tends to lead people to look for cheaper alternatives of fuel. However, shifting for cheaper kinds of fuel, such as natural gas, is not likely to happen in a great number among people who normally use their cars just as transportation for personal use. On the other hand, if you look at the public transportation or taxi and private drivers, they are more dependent on fuel, so they would be the ones greatly investing in cheaper alternatives of refueling their vehicles,” El-Shenety added.

It takes customers around 4 hours to make the fuel conversion to natural gas. The process includes adding up parts to the motor and inserting a gas tube to the car, which is responsible for rationalizing the car’s running cost, according to Gastec’s Chairman, Hesham Redwan.

Customers who want to convert their cars to natural gas and profit from the benefits of NGVs should have their IDs, driver’s licenses, and a recent electricity bill in hand, according to a gas station employee who spoke to Al-Ahram Weekly. Due to the relatively high price of the conversion, payment can be effectuated by instalments. In this case, customers are required to have a guarantor, who will also have to present his ID.



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The Fueling Effect of Natural Gas in Egypt's Electricity Sector



By Tamer Mahfouz

Natural gas was the most recently discovered source of fossil fuel in Egypt, and it was left up to the discretion of the government to direct it towards the channels that would best serve the country. Due to the almost non-existent conversion costs, the government chose to use natural gas in power stations. A major reason behind the reliance on the product is that it is the cleanest fossil fuel and, therefore, the most efficient as more of it burns in the combustion chamber, generating more energy than oil. Additionally, recent discoveries of natural gas fields, like Zohr, the largest gas field in the Mediterranean, and a new law allowing the private sector to trade the product are enhancing the status of natural gas as the fuel of choice for power generation in Egypt.

Generating Electricity

Natural gas can be up to 40% more efficient than oil, according to Power Scorecard, an online tool that ranks the types of fuels used to generate electricity. This efficiency means that power stations do not need much investment in filters and catalytic converters to purify the exhaust from burning it. As an added benefit, switching from using steam or oil to natural gas does not require significant changes to the power plant. Accordingly, at the turn of the century, the main allure of using natural gas to generate electricity was that it would relieve pressure on oil derivatives, such as mazut and diesel, whose reserves and investments were decreasing, hurting public transport, land, and sea freight.

By June 2017, approximately 75% of Egypt's electricity was generated by natural gas, according

to OME. The remaining 25% was powered by mazut, which amounted to approximately 27,000 tons of the product, according to an anonymous source talking to Al Masry Al Youm. Between 2006 and 2016, around 52% of Egypt's natural gas was used to generate electricity, while the rest went to households and factories, according to a CI Capital report published in 2017. This went up to 71% on average in 2017, an anonymous source working in the Ministry of Electricity told Youm7. During the height of the summer season in August, power stations were consuming between 3.9 and 4 bcf/d of natural gas. This is compared to an almost stable 3.5 bcf/d during the same period since 2014. Furthermore, it is around 80% of Egypt's local production at the time (5.1 bcf/d), according to the anonymous source.

Gas Imports

This reliance on natural gas amid Egypt's declining foreign currency reserves between 2012 and 2014 resulted in frequent power cuts for both households and factories during peak demand periods in the summer to keep the power stations for households running as long as possible. With Ramadan in August and July, demand rose further, creating constant rolling blackouts.

In 2014, imported natural gas solved the problem of powering households during the summer. Factories, however, continued to suffer from more frequent blackouts than ever before. Cement and fertilizer factories, for instance, saw their natural gas quota drop from 940 million cubic feet per day (mcf/d) day to 350 mcf/d during summer 2014. At the time,

overall fuel shortages ranged from 20% to 50%, as reported by Mada Masr in April 2017, and natural gas was powering around 80% of Egypt's power stations. Nowadays, imports continue to increase to meet local demand. By August 2017, the sector consumed as much as 6 bcf/d, of which around one bcf/d was imported.

High Consumption

Rising consumption of natural gas and the devalued pound resulted in higher natural gas bills during the first six months of the year, which increased by EGP 1.5 billion to reach EGP 7 billion, according to the Minister of Petroleum and Mineral Resources, Tarek el Molla, who talked to the press in September. Experts and the government hope to see natural gas consumption decline during the next six months by around 5% as winter approaches, and people stop using air conditioners at home, according to Molla.

Due to the high consumption, two alternative measures can be taken to alter long term demand patterns of natural gas: the use of coal, and allowing the private sector to supply the national grid. The coal legislation was introduced in 2013, allowing the importation of coal for industrial purposes for the first time. The move aimed at supplementing natural gas supply to factories where the saved natural gas would be diverted to fuel power stations. The first shipment was imported in 2014, and by 2015, all cement factories had made the conversion from natural gas to coal. Additionally, an amendment in 2015 allowed the construction of coal-powered power stations. However, after the float and subsequent

devaluation of the pound, coal became too expensive, and news reports were saying that factories are reverting back to natural gas, which would effectively cost them nothing since the infrastructure is already there.

Two years after the introduction of coal, the feed-in tariff was introduced to allow private energy investors to supply the national grid with electricity from renewable sources, aiming at ultimately reducing Egypt's reliance on fossil fuel to generate electricity. The first benchmark is for renewable energy to account for 20% of electricity generation by 2022, a percentage significantly larger than the current 5%.

New Investments

For the time being, to meet increasing electricity demands, new natural gas powered station investments by government and private sector are being fast-tracked to meet the forecasted increase in demand. The West Assuit power station, for instance, will be getting an upgrade in its natural gas pipeline to deliver more gas to the station, an expansion that was approved in August and should take under a year to be completed. It will require 1,400 km of pipe work, and a circumference of around 20 meters, dug 20 meters under the ground.

A month earlier, in July, General Electric (GE) completed its upgrade of the Nubaria power plant, which will increase its production by 6.7%, up from 750 MW while reducing natural gas consumption by 3%. The upgrade turned Nubaria power station into one of the few units in the world and the first in the Middle East and North Africa to use GE's latest natural gas turbine, the 9FA GE.

Al Korymat power station, in Upper Egypt, has also been getting a GE-upgrade since last March, and is set to use the same generator. The station's output will increase to 270 MW from 250 MW per turbine, with a natural gas consumption improvement of 2.8%. The overall up-rated output will reach 750 MW, and its clients will mainly be cities in Upper Egypt. Revenue is expected to increase by \$5.3 million, according to a news report in Al Dostor. Siemens is also currently in the middle of its upgrade of other parts of the Korymat complex, which will increase its production by 50 MW.

Damietta natural gas firing power station is also set to get an upgrade by the end of the year, according to the Ministry of Electricity's spokesman, Ayman Hamza, who talked to Youm7 in January. The station's output will increase by 250 MW as a result of a partial replacement of the generators in the complex. It will also be connected to the national grid for the first time. This upgrade is estimated to cost EGP 3 billion financed by EBRD, a Saudi development fund, and the station's owners, state-owned East Delta Electricity Production Company.

Meanwhile, the Hurghada and Sharm el Sheikh natural gas powered stations are expected to be linked to the national grid, as announced by Gaber el Desouky, the head of the Egyptian Electricity Holding Company, early August. The cost of this connection will be EGP 57 million for Hurghada plant and EGP 53.897 million for the one in Sharm el Sheikh. Each station generates 288 MW from natural gas. The connection should be completed before the 2018 summer season.

General Electric is also going to invest \$250 million in Egypt to build four natural-gas power stations, as reported by several media outlets in September. The financiers are German bank AG and British HSBC. The agreement was first signed in mid-2016, but GE has only submitted its financial closure for all four projects in September 2017. The power plants will be located in the investment zone in New Cairo, Beni Suef, Dakahlia, and East Port Said. The first station to be completed will be the New Cairo one. All four are expected to be up and running in 2018 and will ultimately produce a total of 7 GW.

Moreover, Siemens has already finished the first phase of its mega power plant, which will ultimately produce 14,400 MW, with investment totaling EUR 6 billion. The completed phase was up and running in March, producing 4800 MW connected to the national grid. Its main aim is to power the New Administrative Capital. The remaining phases should be completed by the first quarter of 2018, according to local Siemens officials, who talked to media during the announcement of phase one. The other power plants will be located in Beni Suef and Borolos districts.

Driving Force

A main driver for this massive growth in natural gas investments has been an unprecedented wave of new, large-scale natural gas discoveries that, after the devaluation, are now cheaper in dollar terms. There is also a slight wave of relief among international gas firms after the government affirmed its commitment to repaying its debt, dropping them by \$2.2 billion from \$4.5 billion in 2017. This compares to an all-time high of \$6.5 billion in 2015.

The biggest gas discovery in Egypt is the Zohr natural gas field. Italy's Eni discovered the supergiant Zohr field in late 2015, which is the biggest natural gas reservoir in the Mediterranean and one of the biggest in the world. Its reserves are estimated at 30 trillion cubic feet, over 47% of current Egyptian reserves. Projected investments will top \$15.6 billion by the time the project is completed, according to the Minister of Petroleum, Tarek El Molla. Baker Hughes is one of the high-profile companies contracted to perform services at the site by Petrobel, the joint venture between Eni and the Egyptian General Petroleum Corporation (EGPC), tasked with attracting investments to the field. "This project has the potential to meet Egypt's growing gas demand and save the country billions of dollars that would otherwise be spent on importing gas," Lorenzo Simonelli, the President and CEO of Baker Hughes, disclosed in a statement in September. There are currently seven confirmed wells at the site, and, by the end of 2017, Zohr's production should top 900 million cubic feet of natural gas, according to the Egyptian Natural Gas Holding Company (EGAS). By 2020, it will add 2.7 bcf/d to Egypt's domestic production. This will be equal to 34.5% of Egypt's 2020 forecasted production capacity, according to CI Capital's report.

The government is pinning its hopes on Zohr, expecting it to help the country reach self-sufficiency in natural gas between the end of 2018 and the beginning of 2019, and allow it to start exporting natural gas once again by 2020, El Molla noted in May at a press event. Furthermore,

natural gas production is expected to increase to over 5.1 billion cubic feet by the end of 2017, El Molla told the media in September.

Besides Zohr, there were other main gas discoveries in Egypt in 2016. BP, for instance, found gas reserves in its offshore concession in north Damietta and in its Baltim South Development Lease in the Nile Delta. Royal Dutch Shell also discovered 500 billion cubic feet of natural gas in the Western Desert. In the last three years, there were around 21 natural gas excavations, El Molla also highlighted in May, as reported by Egyptian Streets. The three discoveries previously mentioned should increase Egypt's current natural gas production by 50% in 2018 and 100% by 2020, according to El Molla.

Meanwhile, nine more projects are expected to come online by 2019. These discoveries have already prompted the Egyptian government to start cancelling orders for natural gas deliveries, according to a Reuters article published last May.

With this rise in supply, the Ministry of Electricity announced that the Ministry of Petroleum has openly agreed to power all fossil fuel power stations that were using mazut, since natural gas will be able to cover the demand, a news report by Al Masry Al Youm published in June suggested.

Involving the Private Sector

Another huge push for electricity-generation investors to build natural gas powered stations was recent legislative reforms that were approved by the parliament and later ratified by the president. The Natural Gas Act became an implemented law in August, and its main point is to allow the private sector to trade natural gas for itself.

The government has, traditionally, been the main buyer and seller of natural gas in Egypt. However, with the forecasted increase in supply, it is not a surprise that the government has opened the doors to the private sector. Under the Act, a new regulatory authority will be created to oversee transactions, license private firms, and set plans to develop the sector. It will also exercise some control over pricing to prevent monopolies, other forms of unfair competition, or market manipulation.

With many companies able to trade natural gas across the borders, the reforms are meant to prevent natural gas shortages and long power outages during peak times. "This law effectively relieves the government from the burden of providing for the rapidly growing natural-gas consumption and turns it into a regulator," Radwa El-Swaify, head of research at Cairo-based Pharos Holding, told Bloomberg last August. "It's all part of the same direction of having freer markets in Egypt," she added.

As Egypt's economy continues to expand—as the World Bank estimated a growth of 3.9% in the GDP by the end of fiscal year 2016/2017—and Egypt builds its new administrative capital, the country will face increasing electricity demands. Driven by the recent natural gas discoveries and investor-friendly reforms, natural gas is likely to continue to maintain its prominent position in Egypt's electricity generation if increasing production can keep pace with rising domestic demand.

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The Influential Role of Iran on OPEC's Welfare

Fluctuating global oil prices for the past three years have continually hurt both government and private sector oil investors. The near halving of oil prices overnight since mid-2014 came six months after the US lifted economic sanctions placed on Iran since 2011. The decision allowed Iran to ramp up oil production to ultimately increase its exports by over 150% in 2016 compared to 2013. It did not help that international demand has dropped significantly after China's GDP growth rate stabilized near 7% compared to a 10% GDP growth rate floor prior to 2011.

A landmark deal was signed in November 2016 between the Organization of the Petroleum Exporting Countries (OPEC) and non-OPEC members to reduce global crude oil production output, effective 2017, in an attempt to reduce supply and increase global oil prices. However,

Iran received an exemption from the deal, and has been allowed to increase its crude oil production to 4 million barrels per day (b/d), according to an EU Central Bank document reporting on the November meeting.

"Iran's influence in OPEC, and indeed in the region, has been growing since the lifting of nuclear-related international sanctions," said Bhushan Bahree, an OPEC analyst at IHS Market, to The New York Times in November 2016. To date, global oil prices have yet to cross the \$55 a barrel, some way off their over \$100 highs.

Making it difficult for Iran to reach this cap limit by the end of the year is the United States reinstating some sanctions on the country last July. The move, which will likely cut some of Iran's export capabilities, should ultimately raise global oil prices once again. Meanwhile, Iran is taking advantage of the November 2016 agreement stretching to March

2018 and seeking new oil investments between \$50 and \$60 billion, according to Iran's oil minister Bijan Zanganesh, as reported by Iranian Tasnim news agency, to raise production and ultimately exports beyond the current cap.

Iran's Status in OPEC

Prior to the 2011 economic sanctions on Iran, its production capacity was 4 million b/d, of which 2.3 to 3 million b/d were exported. It was the second biggest oil producer in OPEC after Saudi Arabia and ahead of Iraq. However, the economic sanctions that were imposed on the country in reaction to its pursuing nuclear plans meant that exports dropped to around 1 million b/d. This dropped Iran's global oil export market share from 9% to 6%. As a result, other OPEC countries increased production to try to compensate for the lack of supply. This allowed oil prices to stabilize above \$100 a barrel.



Oil Prices

Iran's high production levels and the fact that its production quota increased while its major competitors had to decrease their crude oil production, coupled with lower global demand, resulted in oil prices not being able to cross the \$55 a barrel mark – despite an overall drop in oil production from OPEC to 32.5 million b/d from 33.7 million b/d before the November 2016 agreement. Iran needs oil prices to be closer to \$135 a barrel for the country to break even for domestic operations, according to data compiled by Deutsche Bank reported by Thomson Reuters in 2014.

However, the low price and production figures are proving to be a best-case-scenario for Iran, for the time being. “Iranians will try to win back markets by price. They will go back to their traditional customers in Asia who simply had reduced their share of Iranian oil. It is not like Iran has been out of the market. Iran has only been half out of the market,” said Daniel Yergin, Vice Chairman of IHS to CNBC in January 2016.

Meanwhile, Iran is able to quickly meet the demands for these markets because they have an estimated 40 to 50 million barrels of crude and petroleum products in floating storage, ready for quick delivery.

Throughout 2016, the instant increase in oil export volume allowed Iran to convert economic contraction during 2015, by up to 5.4% during the last quarter of the year, to a growth rate of 15.7% during the last quarter of 2016, according to Trading Economics.

Much More Oil

The negative impact Iran has on global oil prices will likely increase in the near future. This is because Iran is looking to increase its production by attracting new oil investment to ultimately increase crude oil production to between 4.28 and 4.8 million b/d by 2021, as reported by Bloomberg in October 2016 and The New York Times in November 2016, respectively.

The investment potential is definitely there. Iran is the third biggest crude oil certified reserves among OPEC countries and has the second biggest natural gas reservoirs compared to other cartel members as of 2016, according to OPEC data reported in 2017.

However, expanding beyond the 4 million b/d mark needs a lot of investments by foreign private sector firms. These firms will also have to plug the technology gap in Iran's infrastructure to increase the efficiency of excavating crude oil for local use and refinement or for direct exporting.

“Ramping up production beyond this level would require massive new investment, which can in any case only materialize in the long run,” wrote David Ramin Jalilvand, who works in the Middle East and North Africa department of the Friedrich Ebert Foundation in Berlin, in *Al Monitor* in December 2016. Total expected investments in crude oil extraction, natural gas and petrochemicals is expected to top \$200 million to reach and take maximum advantage of the 4.28 million b/d forecasted production increase, according to Zanganeh, as reported by Bloomberg in October.

There are currently some signed investment

agreements with international oil firms including France's Total SA, who are developing the South Azadegan oil deposit. The company is also in the running to develop a portion of the country's South Pars 11 gas field, the biggest natural gas field in the world. Meanwhile, the National Iranian Oil Company (NIOC) has signed 10 agreements with international oil excavation companies to get government data regarding the country's fields with the ultimate aim of attracting excavation firms to invest in the country, according to NIOC Managing Director Kardor, as reported by Bloomberg in October 2016. They are also in negotiation with Royal Dutch Shell to secure an undisclosed energy project. There are a total of 50 oil and gas project opportunities in Iran right now, according to Kardor, as reported by Bloomberg.

Still a High Risk Environment

Despite the lifting of the sanctions and apparently positive attitude from the Iranian government towards oil Foreign Direct Investment (FDI), there are still inherent risks in doing business in Iran. It is currently ranked 120th on the 2017 Doing Business Report out of 190 countries. Its lowest ranking factors are protecting minority investors (ranked 165th), trading across borders (ranked 170th), and resolving insolvency (156th).

Iran is also facing massive political risk after the US introduced fresh sanctions mid-July 2017. So far they have been minor, singling out 18 Iranian individuals and entities that are accused of missile development, weapons procurement, and software theft, according to a joint announcement by the Department of State, Treasury and Justice. These individuals and entities would be unable to do business in the US or with American companies outside the North American country.

“The United States remains deeply concerned about Iran's malign activities, which undermine regional stability, security and prosperity,” said the official statement. On the other hand, other sanctions have been relaxed since the current US President Donald J. Trump came to office. “There is a lot of uncertainty,” said Homayoun Falakshahi, an Iran analyst at Wood Mackenzie talking to The New York Times in November 2016. This, for many, makes giving solid forecasts regarding future oil price movements a difficult task, to say the least.

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After sanctions were lifted in 2014, Iran quickly increased crude oil production by one-third to 3.7 million b/d, partially leading to the sudden drop in global oil prices by mid-2014, according to a Bloomberg article in 2016. As of 2016, Iran's crude oil production was 3.651 million b/d (10.32% of OPEC's production), of which 1.92 million b/d was exported (8.3% of OPEC total crude oil exports). Iran's exports of petroleum products were 0.899 million b/d (18% of OPEC's total exports). This is according to OPEC's 2017 annual report. Meanwhile, the country's natural gas production topped 257.63 billion cubic meter in 2016 (22.4% of OPEC's total production). Of that, 226.67 million cubic meters was exported (27.34% of OPEC's natural gas exports).

This makes Iran the third biggest crude oil producer in OPEC after Iraq (4.647 million b/d) and Saudi Arabia (10.46 million b/d) as of 2016. Furthermore, Iran is the biggest natural gas producer in OPEC, according to the cartel's 2017 report. It is followed by Qatar and Saudi Arabia in second and third place, respectively.



Phase III: Khalda Increases Gas Production at Hydra Field

By Mariana Somensi

Khalda Petroleum Company (KPC), an Egyptian joint venture (JV) between the Egyptian General Petroleum Corporation (EGPC) and the US firm Apache, launched the Hydra Gas Development project at its Hydra pressured gas condensate field in the country's Western Desert.

The field is located south of the company's Obayied gas plant and to the north of Qasr field, approximately 8km to the southwest of the pipeline that runs from the Shams manifold to Obayied gas plant.

Due to a decline in Qasr deliveries to Obayied, the Hydra Gas Development project was established to enable Khalda to sustain the current gas deliverables prior to Qasr compression project by producing gases up to 160 million standard cubic feet per day (mscf). The scheme's cost was approved in as much as \$50 million.

Genesis Oil & Gas Company (GOGC) was contracted by KPC's shareholder Apache to perform Engineering & Procurement support. Genesis' Conceptual Study for the project's development was completed in March 2013 and approved in April of the same year by EGPC, which resulted in the implementation of a phased procurement strategy. Petrojet was awarded a Construction & Installation contract.

The project was divided in three stages. The first two phases involved installing Hydra facilities, which accommodate the fluids only in early field life, where the pressures are sufficiently high to free flow to the host facilities.

The scheme's Phase I consisted of a temporary mode of production prior to the installation of Phase II to remove free water. This step of the project

promoted a tie-in to the existing Hydra trunk line and the installation of the duplex four air coolers, chemical injection, associated tie-in for future phases, and associated utilities.

The associated tie-ins and off-takes were expected to enable new expansions to be carried out without shutdowns. The phase was completed successfully in March 2017 and increased Khalda's production by 6,000 barrels of condensate and 160 million standard cubic feet (mscf) of gas.

Phase II operations were not designed to increase gas output. Instead, it would maintain the integrity of the pipeline connecting the Shams manifold and Obayied gas plant by decreasing the corrosion inhibitor dose. Accordingly, a new three-phased separator was set to separate Hydra fluids.

As a result, the separated water was sent for further treatment and the gas and condensate was comingled and transported to the host facilities. The separator was entirely duplex and designed utilizing the same design philosophy as Qasr start of line (SOL).

Forecasted completion date for the second phase was set by September 30, 2016 due to few challenges faced during operations. Firstly, the fabrication of the production separator's vessel was completed by December 2015 while the transportation plan was still not established.

Furthermore, the produced water treatment package (PWTP) had a delivery delay of 52 weeks due to complications in initial engineering design, which also resulted in a high cost of \$1.7 million.

The complications required a redesign of the system according to the standards established

by the Electronic Industries Alliance (EIA) and the specifications of the Egyptian Environment Affairs Agency (EEAA). The redesign ended up by enhancing and improving the water treatment package and decreased the number of utilities, which brought further cost savings by \$1.2 million.

The installment of air coolers were forecasted by January 22, 2017. During operations, it was noted that Hydra fuel gas discharge pressure was 72.5 PSI while the temporary generator required inlet pressure of 150 PSI. The incompatibility led Khalda to equip the generator with an electrical starter motor. After amending the obstacles, the second stage of the project reached successful completion.

Phase III, which was out of the scheme's scope with regard to the design, targeted compression and required the installation of a compressor and its associated equipment, such as KO drum, cooler, auxiliaries, and instrument air and nitrogen packages.

Khalda's final report on the project was issued early 2017 and indicated an actual cost of \$47,125,000 from the previous \$50 million available for the first two phases of the activities. With the project's development, KPC backfilled the decline in Qasr deliveries to Obayied by initially producing gas from Syrah field and then substituting with Hydra gas.

As stated by the company, accelerating the development of Hydra was considered a major priority for Khalda to achieve the target production goals and support the need for additional domestic gas supplies within Egypt. The project meets the country's expectations of gas production increase to reach self-sufficiency by 2018 – a vision established by the Ministry of Petroleum and Mineral Resources after the discovery of new gas fields.



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The Practicality of Egypt's Energy Hub Dreams

Egypt is being heralded as a new "regional" energy hub with the discovery of its Zohr gas fields and its plans for energy generation, transmission and distribution, especially to Europe. As of 2016, Egypt has sufficient natural gas reserves rank it 16th globally. This is certainly good news for the country whose economy needs energy to kick start and power its economy and provide jobs for its ever growing population, which has increased by 20 million in just ten years to over 93 million. But the concept of being a regional energy hub clearly encompasses more than Egypt itself.

So the question that comes to mind is what is the region? Presumably it is the greater Middle East. But that area is a hub of countries rich in energy resources that are market globally. As Egypt gears up to export its gas, it will enter into a very competitive market. It will be competing with its "neighbors", including Iran, Qatar, Saudi Arabia, UAE, Iraq and Azerbaijan, not to mention Libya and Algeria, which is expanding its significant gas exports to the EU. In addition, Turkey sees itself, with its extensive gas pipeline system, as the gas bridge from the Caucasus, and potentially Iran and even Turkmenistan, to the EU. The EU has seen the construction of LNG facilities which has made gas imports from the US and other nations possible and made gas more of a commodity. The increased competition for the EU market has benefited EU significantly as it has witnessed a dramatic 50% + drop in natural gas prices since 2013.

The EU is admittedly geographically close, just across the Mediterranean Sea from Egypt and therefore a natural lure. But Egypt will have to contend itself with ever lower gas prices. Moreover, in order to reach Europe, under-the-sea pipelines will have to be built, which are costly, prospectively in the billions of dollars, and take years to construct. And construction cannot start until the complex intergovernmental and host government agreements with transit and off-take states and gas buyers have been negotiated. Concluding these hundred plus page agreements, and a host of other contracts, will constitute a lawyers full employment act and literally take years. Of course as lawyer, I would be more than pleased to draft such agreements, but Egypt would lose valuable time in building an economically more prosperous Egypt.

Further if Egypt wishes to refurbish and expand its LNG facilities for gas export, that will present its own challenges. Egypt will have to contend with competitive low cost LNG producers such as Qatar.

Of course, there is an old saying, where there is a will, there is way, so if there is a will to be a regional hub, there must be a way. But it there is a counter saying, timing is everything. And now is the right time, especially with such low gas prices and prospectively high pipeline and other construction costs, for Egypt seize the moment, and use the Zohr gas fields, as well as its other resources, such as solar power, to spark Egyptian national development, so that a bright future for Egypt's youth population is secured. Of course, even here there are challenges, but readily surmountable ones. A solid legal investment and regulatory framework must be drafted and enacted so that investors commit funds in the development of the potential of the Zohr gas fields. And responsible investors can also help Egypt achieve its SDG goals, which is the foundation for assuring a prosperous future for the Egyptian people.

In short, with almost 100 million people, in economic terms, potential consumers and producers, and a rich history, Egypt can capture the moment and use its natural gas now to propel it to be "the" economic hub of the eastern Mediterranean.

By Jenik Radon

Adjunct Professor, School of International and Public Affairs, Columbia University.

OPINION COLUMNS

National Oil Companies & International Oil Companies Relation

Nine out of the ten top reserve holders worldwide are National Oil Companies (NOCs). The national firms are considered to require a significantly larger quantity of capital to obtain the same profit as international oil companies (IOCs), and have more difficulty replacing reserves and expanding oil production than the IOCs. A new strategy that may become more common in NOCs is the successful global deals-making due to their desire to invest in downstream as a tradeoff. Additionally, in recent years, sustained oil prices have enabled the ability of NOCs to finance their own deals.

Many NOCs are semi-privatized, listed on key stock exchanges, and adhere to many of the same financial controls as IOCs. Some are now able to self-fund their own operations, and many have strengthened their own governance and independent decision making. However, NOCs national priorities sometimes interfere with the firms' ability to maximize the value of oil resources, replace reserves, expand production, and perform in a technically efficient manner.

NOCs that are fully government owned and sell petroleum products (at home) are only about 35% as technically efficient as a comparable firm that is privately held. If a larger share of global oil investment in production capability is impeded by NOCs non-commercial socio-economic priorities, then importing nations need to adjust their national energy strategies to reduce vulnerability to changes or instability in NOCs' reinvestment.

National firms are spending more on R&D. However, this has not yet had much of an impact. With the oil price currently well below the break-even point of their nations' budgets, they are still behind IOCs in terms of R&D effectiveness. Some NOCs have now caught up to IOCs in R&D spending, and in some cases overtaken them. Still, while some IOCs and some leading NOCs have started to adjust to the new baseline for oil price, others have been slower in learning how to manage it.

By Wael Essam El Rayes

General Manager for Data & Information Analysis, Project and Planning Department, EGPC

OPINION COLUMNS

Exploration what is Possible

The selection of an optimum well location in promising structure based exploration projects, is an integrated process including all petroleum system elements, in most cases the well is selected in the up dip direction, but in appraisal wells, the location could be selected in down dip direction, because the expected oil migration is the up dip direction toward the shallow depth where the small pressure and the high seal efficiency.

However, in some cases we can put the well location in the down thrown side of the fault; for example, if the down thrown is rollover anticline in an extensional clastic system or if the expected reservoir is carbonates because the carbonate fractures in the down thrown is expected to be higher than up thrown side.

These basic rules are reversed with the present case 'It looks like a mirror image from the corrected location', the team selected the down dip of the faulted three way dip closure, and fortunately the well is intersected by fault and the drilling cuts analysis showing a clear hydrocarbon shows in shallow formation, quickly they start to correct their error and decided to move the new well location to the up dip location, the lateral displacement between the two wells was 50 meter or what is equal to two seismic traces with oil discovery.

By Dr. Ahmed Abd El-Gawad Sultan

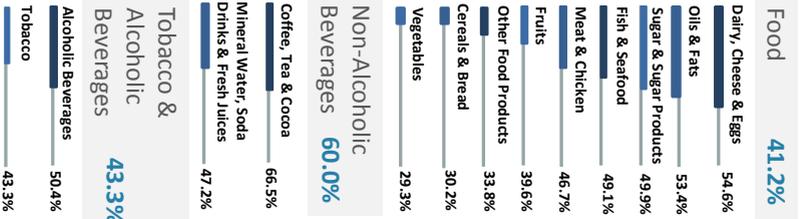
Petrophysics Department Manager, Exploration Department, Tharwa Petroleum Company.



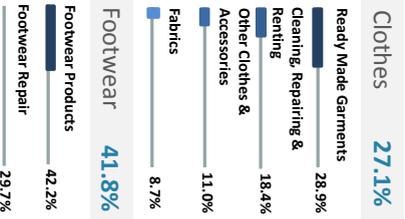
DISSECTING THE ANNUAL HEADLINE INFLATION IN AUGUST 2017 (31.9%)



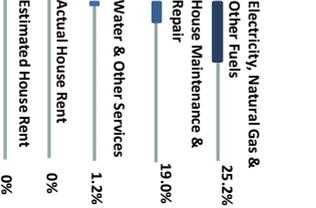
Food & Beverages
41.6%



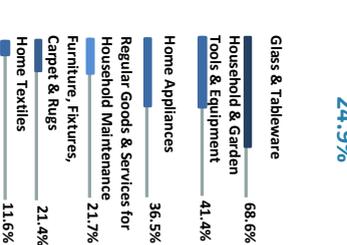
Clothes & Footwear
30.2%



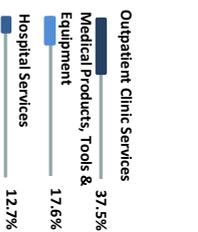
Housing & Utilities
8.1%



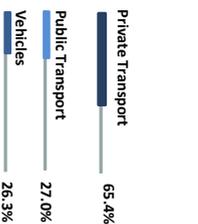
Furniture, Fixtures, & Household Equipment
24.9%



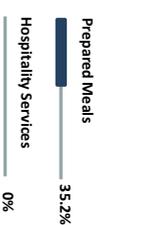
Healthcare
21.2%



Transportation
38.4%



Hotels & Restaurants
35.0%



Recreation & Culture
41.1%



Education
12.3%



Communications
4.9%

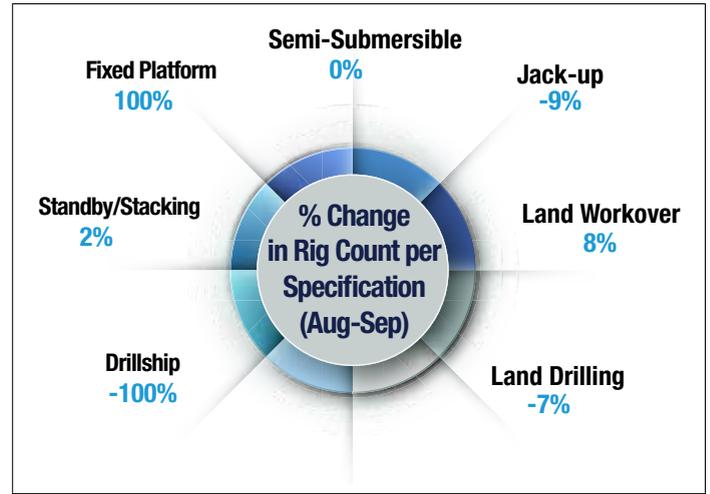


Miscellaneous Goods & Services
22.9%

Source: The Central Bank of Egypt & CAPMAS

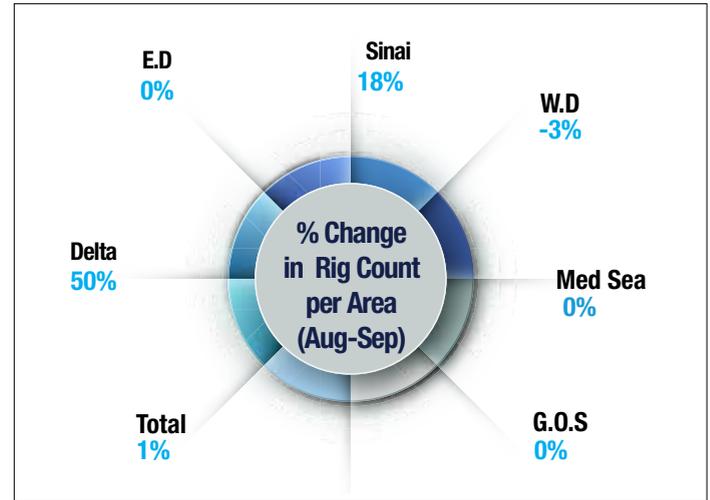
Rigs per Specification

Date	Land-Drilling	Land Workover	Jack-Up	Semi Submersible	Fixed Platform	Standby/Stacking	Drillship	Total
Sep-17	39	40	10	1	2	56	0	149
Aug-17	42	37	11	1	1	55	2	149
Jul-17	45	37	11	1	1	52	2	149
Jun-17	45	40	11	1	1	49	2	149
May-17	44	37	11	1	1	53	2	149
Apr-17	41	36	11	1	0	58	2	149
Mar-17	39	35	10	1	0	62	2	149
Feb-17	35	30	10	1	0	70	2	148
Jan-17	34	30	10	1	0	71	2	148

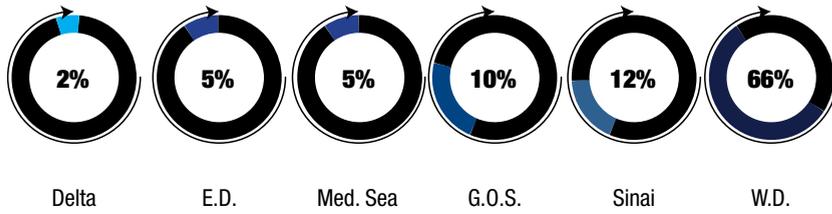


Rigs per Area

Month	G.O.S.	Med. Sea	W.D.	Sinai	E.D.	Delta	Total
Sep-17	9	5	61	11	5	2	93
Aug-17	9	5	59	13	5	3	94
Jul-17	9	6	59	14	6	3	97
Jun-17	9	6	61	13	6	5	100
May-17	9	6	58	12	6	5	96
Apr-17	8	6	55	11	6	5	91
Mar-17	8	5	53	11	6	4	87
Feb-17	8	5	47	11	5	2	78
Jan-17	8	5	45	12	5	2	77



Distribution of Rigs (Sep-17)



PRODUCTION AUGUST 2017

	Crude Oil	Equivalent Gas	Liquefied Gas	Condensate
Med. Sea		13,451,436	186,215	583,814
E.D.	1,986,523	15,192	3,526	2,001
W.D.	9,385,426	7,748,503	701,523	1,520,214
GOS	4,135,487	715,564	302,216	73,569
Delta	44,321	7,629,951	139,356	449,568
Sinai	1,738,859	10,001	41,201	19,542
Total	17,290,616	29,570,647	1,374,037	2,648,708

Unit: Barrel

DRILLING UPDATES



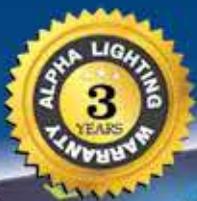
Region	Company	Well	Well Type	Rig	Depth	Well Investments
Eastern Desert	Eshpetco	RABEH-E-43	Development	ECDC-6	5,800	\$1 M
Delta	El Mansoura	TAMAD-4 ST	Development	EDC-9	6,438	\$2.5 M
Western Desert	Petrosilah	NSILAH-3	Development	ECDC-1	8,000	\$1.5 M
	Norpetco	ABRAR-32	Development	ECDC-2	6,911	\$1.055 M
	Petrodara	BORAQ-5 ST-2	Exploratory	EDC-62	8,965	\$3.532 M
	Petrosannan	AES-E3(1/13)	Development	SHAMS-2	10,827	\$1.840 M
	Qarun	WONC-212	Development	EDC-63	5,220	\$2 M
	Qarun	E.BAH LN-2	Development	EDC-65	9,050	\$1.9 M
	Khalda	HERUNEFR-w 4x	Exploratory	EDC-57	15,010	\$2.29 M
	Khalda	MARASI-1x	Exploratory	ST-4	14,400	\$2 M
	Khalda	HYDRA E-1X	Exploratory	EDC-17	9,139	\$1.1 M
Khalda	ABAR-1X	Exploratory	EDC-11	15,556	\$3 M	

*Production figures are for August 2017.

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810 lm.



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E27 White / Warm
600 lm.



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60/120 cm. White
800/1600 lm.



5W Small Bulb
E27 Warm
400 lm.



5W Candle
E14 Warm
400 lm.



7W Spot-12V
Gu5.3 Warm
450 lm.



7W Spot-240V
Gu5.3 Warm
450 lm.

ALPHA LIGHTING

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