Egypt's Leading Oil And Gas Monthly Publication
June 2018 - 44 Pages - Issue 138
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EGYPT OIL&GAS NEWSPAPER

THE DABAA PROJECT IN NUMBERS:

Is Nuclear Energy the Right Option for Egypt?

EXCLUSIVE INTERVIEW

Fullstream Capabilities and Solutions; an Interview with Mirna Arif, BHGE Regional Sales Director

RESEARCH & ANALYSIS

INTEGRATING ENERGY MIX INTO Egypt's Energy Sector

WASTE-TO-ENERGY for a Sustainable Future in Egypt

BARRIERS TO INVESTMENT: Attracting Finance for the Renewable Energy Sector

ENERGY SUBSIDY CUTS: The Hardest Part of Egypt's Economic Reform

FIELD BEST PRACTICES

22nd, September 2018 **WORKSHOP**

Qaroun Field

CALL FOR ABSTRACTS

If you have an interesting case study, applied technology, or opinion related to any of the workshop's topics, we kindly invite your field staff to present us with abstracts that would add value to the event. The Field Workshop agenda will feature:

WORKSHOP THEME IS "FIELD BEST PRACTICES / LESSONS LEARNED"

Field Best Practices, a critical piece of Operational Excellence, consist of HS&E best practices and workplace culture, production and water injection efficiencies, facilities and optimum water handling processes, and lessons learned from operational challenges.

Abstract should discuss one of the below topics:

- Artificial Lift Utilization, Efficiency, Uptime
- Production Facilties Integrity and Corrosion Management
- Production Chemicals Utilization
- HSE, Work Place Culture

ABSTRACT CONTENT

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

ABSTRACT CONDITIONS:

- Must be prepared and presented by a field staff
- Must be technically factual and includes lessons learned
- Should avoid commercialisation
- Must be written in English
- Should be submitted in electronic format and be a maximum of 500 words

ABSTRACTS DEADLINES:

- **June 30, 2018** – Abstract submission
- **July 15, 2018** – Notification of acceptance
- **September 1, 2018** – Presentation submission

WHY YOU SHOULD PARTICIPATE

- You will have the chance to present and discuss your case study with different field staff from different fields
- You will receive a recognition for your presentation during the workshop
- Best presenter will be awarded during the workshop and praised during our Upstream Operational Excellence Convention - November 2018 that will be attended by H.E. Eng. Tarek El Molla

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

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EDITOR'S NOTE

Egypt has embarked on an ambitious journey towards the diversification of its energy sector. The country expects to generate as much as 20% of its electricity through renewables by 2022, and a great amount of new agreements have been signed to help the country achieve this goal. In this line, this issue discusses Egypt's most recent projects in the energy sector and highlights the country's alternatives to improve its energy mix.

In our exclusive interview, Mirna Arif, BHGE Regional Sales Director, explains the outstanding role of BHGE's technology in the development of the oil and gas sector, as well as the company's position as the world's first and only fullstream company operating in the petroleum industry. Our monthly report brings an in-depth look into Egypt's strategy to diversify the energy sector, in addition to the country's electricity production, consumption, and peak load.

You can also find in this issue an extensive analysis on the governmental subsidies reform, as well as on the current barriers and latest measures to attract finance for the renewable energy sector. You can further learn about waste-to-energy as an alternative energy source in Egypt, in addition to the introduction of electric cars into the Egyptian market. On nuclear energy, we bring you the latest updates on Egypt's Dabaa nuclear power plant and other nuclear projects in the MENA region.

We would like to stress that one of the features in our May issue was published without the author's credit. Accordingly, please note that the feature entitled "Working on the Rigs through the Eyes of Junior Field Engineers" was written by our team member Omnia Farrag.

As always, thank you for your readership and support. We wish you enjoy reading this issue.

EDITOR IN CHIEF

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EGYPT OIL&GAS NEWSPAPER

EGYPT'S LEADING OIL AND GAS MONTHLY PUBLICATION

EGYPS EGYPT PETROLEUM SHOW

Proudly the Official Publication

Publisher **MOHAMED FOUAD**

This publication was founded by **Mohamed Fouad** and **Omar Donia**.

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Egypt to Attract $10B Foreign Investments in Oil, Gas

Egypt will attract around $10 billion in foreign investments in the oil and gas sector during fiscal year (FY) 2018/19, Minister of Petroleum Tarek El Molla has said. The minister also said that foreign investments in the sector will reach $10 billion in FY 2017/18, a 25% increase from levels seen in FY 2016/17, CNBC Arabia reported. The 25% rise was driven by international oil companies increasing their investments in Mediterranean natural gas projects. Egypt plans to boost its natural gas output from its newly discovered fields such as the Zohr field.

Egypt Connects 8.6M Households to National Gas Grid

The number of households connected to the national gas grid reached around 8.6 million in April 2018, Minister of Petroleum Tarek El Molla stated. El Molla said that around 2.7 million households have been connected over the past four years, around 30% of the total number. The minister made his remarks at the Households Gas Connection Project Conference, held with the theme of 'Towards Clean Energy Access for All Egyptians'. The conference was held to announce details of the joint project funded by the European Union (EU), the Agence Francaise De Developpement (AFD) and the World Bank (WB).

EU to Fund Household Gas Connection with $83M

The EU will provide a $83.2 million fund to the Egyptian government to be used for connecting households to the national gas grid. The fund will be primarily used to fund the costs of delivering gas for high priority, low-income families, of which around 500,000 will benefit. The news was revealed by Egyptian Minister of Petroleum and Mineral Resources Tarek El Molla during a press conference held to announce details of a joint project funded by the EU, the Agence Francaise De Developpement (AFD) and the World Bank, which will help to deliver natural gas to households in high priority areas.

Egypt, EU Sign Energy Partnership MoU

Egyptian Prime Minister Sherif Ismail attended the signing of a strategic energy partnership memorandum of understanding (MoU) between Egypt and the EU on April 23. The Egyptian cabinet announced that the MoU was signed after ministerial-level discussions, a number of high-level visits and a series of coordination meetings. "The signing of the MoU represents a major milestone and a step change in the fruitful relationship between Egypt and the EU," the EU stated. The MoU signing took place during the three-day visit to Egypt by EU Commissioner for Climate Action and Energy Miguel Arias Cañete between April 22 and April 24, 2018.

Egypt to Complete Gahdam Fuel Warehouse in 7 Months

Egypt will complete the construction of the Gahdam fuel warehouse in Assiut within seven months, an official at the Egyptian General Petroleum Corporation said. The project, which belongs to El-Neel Oil Marketing Company, is estimated to cost around EGP 35 million and is part of the plan to bridge the gap between production and domestic consumption of petroleum products and to ensure Upper Egypt governorates have adequate access to diesel, benzene and mazut. The Petroleum Projects & Technical Consultations Company (Petrojet) is handing the fuel warehouses implementations for El-Neel Oil Marketing Company.

Egypt to Receive Third Iraqi Crude Oil Cargo in June

Egyptian ports will receive the third cargo of 2 million barrels Iraqi crude oil at the end of June 2018, head of the Egyptian General Petroleum Corporation Abed Ezz El Regal said. Ezz El Regal added that the country had already received the second cargo at the beginning of April and will be receiving one of the remaining shipments every two months. The remaining Iraqi oil shipments contain around 6 million barrels of Iraqi crude oil, according to Ezz El Regal. Egypt and Iraq had activated a contract earlier in 2018 that will see Iraq ship 2 million barrels of crude oil from Basra every two months of the year with soft payment terms and a 90-day grace period.

Petrosilah to Invest $55M in 2018/19

Petrosilah Petroleum Company plans to invest $55 million into Egyptian oil exploration during fiscal year 2018/19, Managing Director and Chairman Taher Abdel Rehim has said. Abdel Rehim said that production from the Abboud well had allowed the company to increase its overall output to 7000 barrels a day (b/d) of crude in April 2018. The company plans to boost its output further to 7500 b/d over the upcoming two months. Petrosilah plans to drill six development wells and two exploratory wells in several areas in Fayoum during 2018/19, with investments worth $20 million, Abdel Rehim highlighted.

Planning Ministry Investing $8.3B in Petroleum Sector

The Ministry of Planning, Monitoring and Administrative Reform is investing $8.3 billion in the petroleum sector in order to boost the capacity of refineries by 10%. The increased capacity will allow refineries to boost their annual production to 41 million tons. The ministry also said that Egypt aims to further diversify its energy sources. By fiscal year (FY) 2020/21, 44% of the country's power usage will come from natural gas, 39% from petroleum products 9% from coal and 8% from renewable sources. The ministry also aims to connect another 3 million homes to the natural gas grid by FY 2020/21.

Egypt to Launch E&P Outbidding

Egypt's Ministry of Petroleum is in the process of launching new international bids for the exploration and production (E&P) of natural gas in the Mediterranean Sea, petroleum minister Tarek El Molla announced. The ministry will also open bids for oil and gas E&P in the Red Sea region before the end of 2018 after seismic surveys have been completed. El Molla said that the offshore E&P bids are part of the ministry's strategy to expand activities in unexplored areas which have promising oil and gas potential.

Egypt to Pay $200M in Arrears to IOCs

The Ministry of Petroleum and Mineral Resources will repay debts of $200 million to several international oil companies (IOCs) in June 2018, sources at the ministry said. The government is attempting to repay the entirety of the country's debt to IOCs in order to attract further foreign investment, and to increase oil and natural gas production rates. The upcoming repayments will go to several IOCs including Royal Dutch Shell, Apache, BP, Eni and Dana Gas. Egypt paid $200 million in arrears owed to foreign oil companies in January 2018, according to Egypt's Minister of Finance, Amr El Garhy.

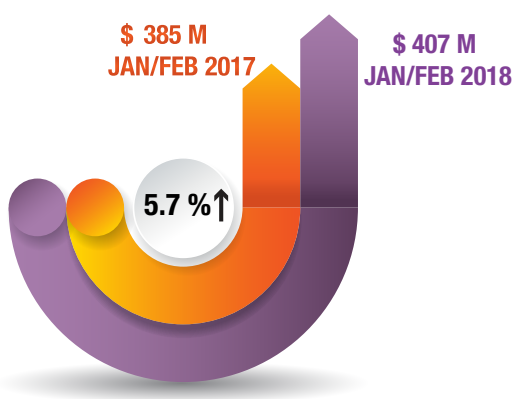
Egyptian Natural Gas Output Increases 24.8% YOY

Egyptian natural gas output increased 24.8% year-on-year (YOY), reaching 3.191 million tons in February 2018 compared to 2.556 million tons in February 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that consumption of natural gas in Egypt rose by 6.5% YOY to 3.249 million tons in February 2018, up from the 3.051 million tons consumed during the same month in 2017. Natural gas production declined by 11.24% in February 2018, down from the 3.595 million tons produced in January 2018. Natural gas consumption decreased by 11.08% in February 2018, compared to the 3.654 million tons consumed in January 2018.

Egyptian Consumption of Petroleum Products Drops 14.45% YOY

Egypt's consumption of petroleum products fell by around 14.45% year-on-year (YOY) to reach 2.682 million tons in February 2018, compared to 3.135 million tons in February 2017. The country's output of crude oil, condensates and butane slightly increased by around 2.78% YOY to be 2.554 million tons during February 2018, from the 2.485 million tons produced in February 2017, according to a report by the Central Agency for Public Mobilization and Statistics (CAPMAS). Egypt's daily crude oil production has increased by 4.3% so far in 2018, compared to 2017, said head of the Egyptian General Petroleum Corporation Abed Ezz El Regal.

EGYPTIAN PETROLEUM EXPORTS



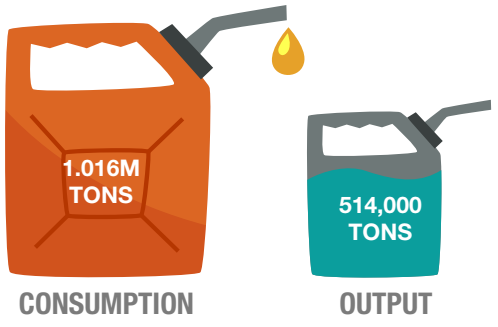
Butane Imports Decrease by 18.3% YOY

Egypt's butane imports decreased by around 18.3% year-on-year (YOY) between February 2017 and February 2018. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that the country imported 197,000 tons of butane in February 2018, down from 241,100 in the same month in 2017. The report also shows that Egypt's annual butane consumption dropped by around 2.5% YOY, from 364,900 tons in February 2017 to 355,800 tons in February 2018. Meanwhile, the north African country's output of butane rose by around 4.8% YOY reaching 144,600 tons in February 2018, compared to the 138,400 tons produced in the same month of 2017.

Egypt's Diesel Consumption Falls 9.12% YOY

Egypt's consumption of diesel reached 1.016 million tons in February 2018, a 9.12% year-on-year (YOY) decrease. Figures published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that Egypt consumed 1.118 million tons of diesel in February 2017 by comparison. Egypt's diesel output fell by 11.22% YOY reaching 514,000 tons in February 2018, compared to 579,000 tons of diesel produced in the same month of 2017. Diesel production decreased by around 7.22% from the 554,000 tons recorded in January 2018, while consumption fell by 12.86% from the 1.16 tons consumed in the preceding month.

OUTPUT & CONSUMPTION OF DIESEL - FEB 2018



Egypt's Daily Consumption of 92-Octane Falls to 12.6M Liters

Egypt's daily consumption of 92-octane benzene has fallen to around 12.6 million liters, an official source at the Egyptian General Petroleum Corporation said. Overall benzene consumption dropped by 4% in the time the government is trying to boost its petroleum product's output through developing refineries, the official source pointed out. The source stated that benzene consumption has decreased since June 2017 when the price of 92-octane price increased from EGP 3.5 per liter to EGP 5 per liter.

IMF: 5.2% Egypt GDP in 2018

Egypt's gross domestic product (GDP) will reach 5.2% during 2018, up from 4.2% in 2017, according to new IMF projections. The IMF's May 2018 Regional Economic Outlook report also forecasts the Egyptian economy to grow by 5.5% during 2019. The report said the optimistic outlook for the Egyptian economy was partly due to an increase in natural gas production. "One of the reasons for the growth is the expansion of long-term national projects due to sustainability, not only due to the anticipated hike of gas production," emerging market specialist Abdel-Rahman Taha said.

Egypt's Daily 95-Octane Consumption More Than Doubles

Egypt's daily national consumption of 95-octane benzene has increased by over 480% to average 530,000 liters in April 2018, compared to 110,000 liters before June 2017, Minister of Petroleum Tarek El Molla has said. The consumption increase was led by the new 95-octane benzene product released in February 2018, which is available at ExxonMobil and Total gas stations, the minister explained. El Molla said that the new benzene will eventually be available at every gas station in the country. The remaining outlets are currently in the phase of processing additions to pave the way to launching every company's new benzene brand.

El Molla: Egypt Aims For 5% Petroleum Products Import Rate

Egypt plans to develop refineries during the upcoming four years to decrease the import rate of petroleum products to 5%, compared to the current rate of 35%, Egyptian Minister of Petroleum Tarek El Molla has said. El Molla stated that the rationalization of petroleum products' consumption will reduce imports and help to provide a surplus in the future. This will mean that petroleum products such as benzene and jet fuel may be exported. The minister's speech came during a parliamentary meeting on May 5, held to discuss the Ministry of Petroleum's 2018/19 financial budget.

Egypt-Cyprus Gas Pipeline to Cost up to $1B

Minister of Petroleum Tarek El Molla has said that the proposed pipeline between Cyprus's Aphrodite gas field and Egypt's liquefied natural gas facilities will cost between $800 million and $1 billion. El Molla revealed the information during a joint press conference with Cypriot Energy Minister Yiorgos Lakkotrypis. The Egyptian minister said Cypriot gas sent to Egypt would be used both for export and domestic consumption. Lakkotrypis emphasized that the two parties would try to come to an agreement as soon as possible but declined to give a timespan. The two countries have been in talks over the pipeline since December 2017.

Egypt Energy Debts Reach EGP 800B

Debts owed by the Egyptian energy sector have reached around EGP 800 billion, Minister of Finance Amr El Garhy said. El Garhy pointed out that new hydrocarbon discoveries and increased natural gas production will contribute to promoting the energy sector. The government is currently paying 50% of the cost of petroleum provided to citizens, El Garhy stated, adding that within the upcoming two years subsidies on benzene, diesel and petroleum products will be lifted completely. The Egyptian government plans to reduce subsidies of petroleum products by 26% and electricity subsidies by 47% in the annual budget for the 2018/19 fiscal year.

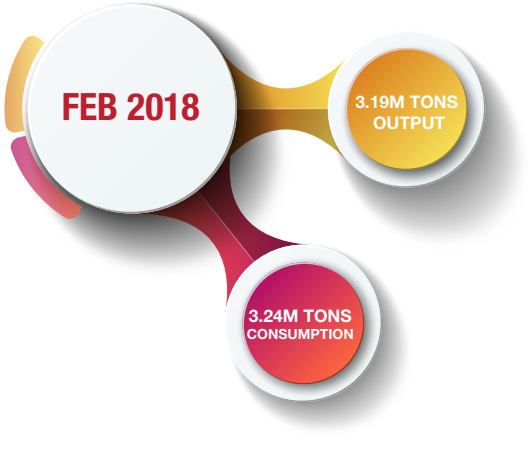
Egypt Cabinet Approves Nour Concession E&P

Egyptian Minister of Petroleum Tarek El Molla has been given the green light to contract several Egyptian companies to participate in exploration and production (E&P) activities. The Egyptian cabinet approved the license, which will allow the ministry to work with the Egyptian Natural Gas Holding Company, the Italian Egyptian Oil Company (IEOC B.V), Tharwa Petroleum Company on E&P. Participating companies will search for natural gas and crude oil in the Mediterranean Nour Concession, off the northern coast of the Sinai Peninsula. The cabinet's decision was issued in meeting number 119, chaired by Prime Minister Sherif Ismail.

Mexico Finances 90% of Zohr Pipeline Costs

Mexican investment has financed 90% of the costs of the pipelines installed in the Zohr natural gas field, the Mexican ambassador to Cairo, Jose Octavio Tripp, said. The ambassador said that financial interest from the north American country has continued to increase in several fields, such as cement production, and the design and construction of recreational facilities for children. Mexico will make further investments in the Egyptian market, Tripp confirmed. The ambassador's statements came during a meeting with the Egyptian Businessmen Association. The meeting was attended by a delegation of Mexican companies interested in making investments in Egypt.

OUTPUT & CONSUMPTION OF NATURAL GAS



Egyptian Petroleum Exports Value Rises by 5.7%

The value of Egyptian petroleum exports increased by 5.7% to reach $407 million during January and February 2018, up from $385 million in the first two months of 2017. Figures released by the Central Agency for Public Mobilization and Statistics (CAPMAS) also show that Egypt exported $343 million of crude oil in January and February 2018. The value of Egyptian fuel exports fell 0.2% year-on-year in January 2018. Previous statistics published by CAPMAS revealed that Egypt exported $330.554 million of oil in the month of January 2018, compared to $331.227 in January 2017.

Egypt Consumes 3.3M Tons of Natural Gas in April

Egypt consumed 3.3 million tons of natural gas in April 2018, compared to 3.2 million tons in winter, an official source at the Egyptian Natural Gas Holding Company said. Of all the country's sectors, electricity-generating power plants, residential and industrial units consume the most natural gas, the source pointed out. Egypt's natural gas output recently increased to reach 5.7 billion cubic feet per day (bcf/d), compared to 5.5 bcf/d at the beginning of 2018, due to the production of new natural gas fields, including Zohr, North Alexandria and Atoll.

Zohr Output Increases to 1.1 bcf/d

The output of Egypt's Zohr natural gas field has reached 1.1 billion cubic feet per day (bcf/d), Eni has announced. The field's capacity is set to reach 1.2 bcf/d, after the company started-up the third production unit (T-2) only one week after the second one began operations. Production is scheduled to reach 2 bcf/d by the end of 2018 and 2.7 bcf/d in 2019. Minister of Petroleum Tarek El Molla previously said that current efforts to expand production capacity will enable output to reach around 1.2 bcf/d by the beginning of Ramadan.

Egypt to Pay $850M to IOCs

Egypt will repay $850 million in arrears to international oil companies (IOCs) operating in Egypt, said Tarek Amer, governor of the Central Bank of Egypt. Amer did not mention the total debts to IOCs, nor the timeline for repaying them. The Ministry of Petroleum will repay debts of $200 million to several IOCs in June 2018, sources at the ministry previously said. The government is attempting to repay the entirety of the country's debt to IOCs in order to attract further foreign investment, and to increase oil and natural gas production rates.

Agiba Produces 20 mscf/d Natural Gas

Agiba Petroleum Company is producing between 48,000 and 50,000 barrels of crude oil per day (b/d), around 20 million standard cubic feet per day (mscf/d) of natural gas, and around 50 tons of butane per day, said Essam El Kafas, head of Agiba Petroleum. El Kafas expects the company's production to exceed 50,000 b/d during the coming period as it starts to operate nine wells that are currently under maintenance. These wells are expected to produce around 2500 b/d of crude oil. The total production of the company will exceed at least 55,000 b/d after the wells recently-discovered by Eni in the West Meleiha concession are linked to production, El Kafas pointed out.

Egyptian Parliament Approves E&P in North Sinai

The Egyptian Parliament has approved legislation to allow Minister of Petroleum Tarek El Molla to contract with the Egyptian General Petroleum Corporation (EGPC) and Perenco North Sinai Petroleum to amend the exploration and production (E&P) agreement for the North Sinai offshore concession. The parliament also approved legislation allowing El Molla to contract with EGPC, Kuwait Energy, Dover Investment Limited, and Rockhopper Egypt to amend the E&P agreement of the Abu Senan region, in the Western Desert. Earlier in May, El Molla was given the green light to contract several Egyptian companies to participate in exploration and production activities.

LPG Investors Association: 140M Subsidized LPG Cylinders Go To Non-Eligible Citizens

The Egyptian government subsidizes non-eligible citizens with over 140 million liquefied petroleum gas (LPG) cylinders each year, said the head of the LPG Investors Association, Mohamed Saad El Din. The government subsidizes a total of 360 million LPG cylinders per year. Each cylinder costs EGP 90 and the government subsidizes just over a third (EGP 32.5) of the cost. Saad El Din argued that the government should adopt a more scientific approach to subsidy distribution. He suggested that every citizen should pay the full cost for a cylinder and the government would then provide the subsidy in the form of cash through ration cards.

Egypt Gas Announces Q1 Losses

Egypt Gas Company has announced pre-tax losses of EGP 12 million in Q1 2018. In comparison, the company made pre-tax profits of EGP 14.5 million in Q1 2017. Egypt Gas's revenue recorded EGP 397.3 million in Q1 2018, compared to EGP 318.6 million in the preceding year. At the beginning of April, Egypt Gas's general assembly authorized the company to pay out dividends of EGP 1 per share. The company said in a statement to the Egyptian Exchange (EGX) that it may pay the dividends in several installments, depending on the company's liquidity status at the time of payment.

Egypt to Start Gulf of Suez Seismic Survey in 2018

Egypt will start the seismic survey for the Gulf of Suez region before the end of 2018, in order to provide new opportunities for exploration and production (E&P), an official source at the Egyptian Ministry of Petroleum and Mineral Resources said. Most of the E&P activities in the Gulf of Suez are based on seismic surveys that were conducted years ago. Updating the Gulf of Suez surveys, as well as those of the Red Sea, may enable the sector to discover new hydrocarbon deposits, the source pointed out. The oil and gas sector is keen to use the new discoveries to increase the capacity of Egyptian refineries from the current 38 million tons.

Egypt Opens Two E&P Bid Rounds for 27 Concessions

The Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, has announced the opening of two international bid rounds for exploration and production (E&P) during 2018. Egyptian General Petroleum Corporation (EGPC) and the Egyptian Natural Gas Holding Company (EGAS) will launch tenders for oil and natural gas E&P activities in 27 concessions. The concessions cover most of the sedimentary basins across Egypt, El Molla pointed out. EGPC's tender will be for E&P in 11 concessions, including five in the Western Desert, two in Nile Delta, three in the Gulf of Suez, and one in the Eastern Desert. Meanwhile, EGAS's tender spans 13 concessions in the Mediterranean Sea and three concessions in the onshore Nile Delta region.

Egypt Announces Deadlines for E&P Bid Rounds

The Egyptian Ministry of Petroleum has announced that the dates for submitting bids for two exploration and production (E&P) bid rounds will be in October 2018. The ministry stated in an advert published in Al Ahram newspaper that companies must submit their bids for the Egyptian Natural Gas Holding Company's (EGAS) tender by October 8, 2018. Meanwhile, the deadline for receiving bids for the Egyptian General Petroleum Corporation's (EGPC) tender will be on October 1, 2018. Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, announced the launch of the two E&P tenders for exploration and production (E&P) on May 21.

Egypt Signs $200M Funding Agreement with EBRD

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

Egypt to Reach Petroleum Products Self-Sufficiency in 3 Years

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

SDX Announces Oil Discovery in Egypt's Rabul 4 Well

SDX Energy has announced making an oil discovery at the Rabul 4 well, located in Egypt's West Gharib Concession. The Rabul 4 well was drilled at a 5,250-feet depth and it "encountered approximately 43 feet of net heavy oil pay across the Yusr and Bakr formations, with an average porosity of 16%," the company said in a statement. The company, which owns a 50% stake in the concession, expects the Rabul 4 well to be producing and connected to the processing facilities at Meseda following an evaluation of the discovery, which is currently ongoing. Upon completing the well, SDX Energy will start drilling two development wells at the Meseda field.

Snam, EGAS Sign Natural Gas Infrastructure MoU

Osama El Bakly, head of the Egyptian Natural Gas Holding Company (EGAS), and Marco Alvera, CEO of Snam, have signed a memorandum of understanding (MoU) that will see the Italian consortium participate in Egypt's natural gas and manufacturing sectors. The MoU signing took place on the sidelines of the EU-Egypt Sustainable Energy Business Forum, in attendance of Egypt's petroleum minister, Tarek El Molla. Egypt also signed a strategic energy partnership MoU with the EU on April 23. The MoU with the EU will provide new opportunities for cooperation between the two sides and strengthen the long-term strategic partnership, El Molla said during his speech at the forum.

Mubdala to Sign Zohr Contracts in May

Mubadala Petroleum is expected to sign the final contracts to acquire a 10% stake in Egypt's Zohr natural gas field in May 2018. The contracts were discussed during a meeting between Egyptian Minister of Petroleum Tarek El Molla, Mubadala CEO Bakhit Al Katheri, and Mubadala Executive Manager of the Refining and Petrochemicals Department Khalifa Abdallah Al Romeithi. The officials also discussed several areas of future cooperation in the light of Mubadala's interest to invest in the Egyptian oil and gas activities. Mubadala previously bought a 10% in the Shorouk Concession from Italian oil company Eni in March 2018.

Apex Signs $15M Western Desert Agreements

Apex International Energy has signed $15 million worth of agreements for 3D seismic acquisition services and long-lead well equipment to develop its concessions in Egypt's Western Desert. The deals include a contract to acquire 1,000 square kilometers of 3D seismic data in the Southeast Meleiha Concession to BGP International Egypt. Both exploration drilling and seismic acquisition operations are expected to start in Q4 2018, company CEO Roger Plank said.

EmaratMisr to Open New Gas Stations

EmaratMisr will open two new gas stations in 2018, company head Mohamed Othman Eigeza announced. The stations will be located at Damanhur on the Cairo-Alexandria road and on the Cairo-Suez road near Rehab City. He added that the company worked with the Ministry of Petroleum to install Automatic Tank Gauge systems in its 14 gas stations. The newly-used system analyzes fuel levels and detects leakage. The company has started to use more trucks since signing more distribution contracts and expanding its industrial activities, EmaratMisr's general manager, Mohamed Gomaa bin Sharaf, stated.

TransGlobe Completes Drilling K-45 Development Well in Egypt

TransGlobe Energy Corporation has announced the completion of a drilling operation at Egypt's K-45 development well. The well, located in the South K-field, was drilled at a depth of 5,831 feet and targeted the Asl A sand. The well "encountered main Asl A sand approximately 66 feet structurally higher than the K-46 well and is structurally the highest well in South K-field Asl A & B pools", the company stated in an official press release. The Canadian firm also said that K-45 had encountered "an internally estimated 195 feet of net oil pay comprised of 120 feet of net oil pay in the Asl A pool (A1, A2 and A3), and 75 feet of net oil pay in the Asl B pool."

Eni Discovers Oil in Egypt's Faghur Basin

Eni made a new oil discovery in the Faghur basin, located in the Western Desert. The well is delivering an initial 2,300 barrels per day (b/d) of crude oil and 400,000 cubic feet per day (cf/d) of associated petroleum gas. The SWM A-2X was drilled at a total depth of 5,090 meters and found 18 meters of light oil in the Dessouky formation, the company announced. The Faghur basin is located 103 km north of the Siwa Oasis in Egypt's Western Desert.The new discovery in Faghur will be linked to nearby infrastructure and crude will be shipped to El Hamra Terminal via existing pipelines.

SDX Starts Drilling Kelvin-1X Well

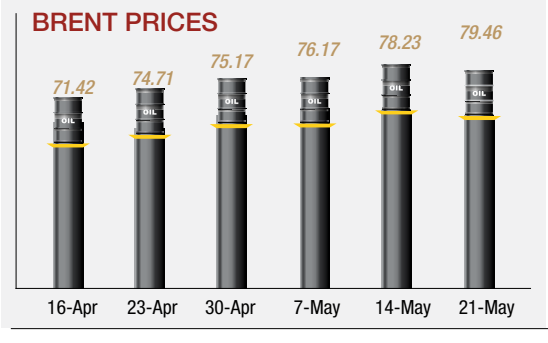
SDX Energy has announced the spudding of its Kelvin-1X exploratory well located in Egypt. The well was drilled in the South Disouq concession, in which the company owns a 55% stake."The well is anticipated to take up to 30 days to drill and if successful, will be completed, flow tested and connected to the infrastructure being developed at the SD-1X discovery location," the company said. The company plans to drill four wells in South Disouq during 2018, of which the Kelvin-1X is the second. It is hoped that South Disouq drilling campaign will confirm SDX's optimism over the potential of the concession.

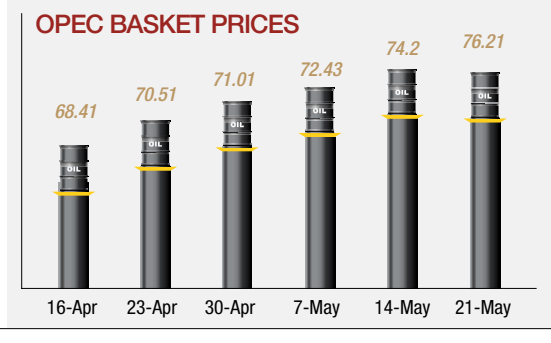
Eni, Lukoil to Build Natural Gas Processing Plant in Egypt

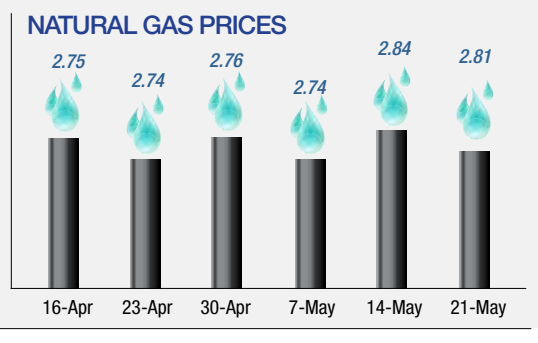
Italy's Eni and Russian Lukoil will work with the Egyptian General Petroleum Corporation (EGPC) to build a natural gas processing facility in Egypt's Western Desert. The plant will cost $700 million to build and will process 100 million standard cubic feet (mscf) of natural gas per day. The final go-ahead for the construction of the facility is pending governmental approval. However, it is expected to start before the end of 2018 and to take three years to be completed, said Mohamed al-Kaffas, head of AGIBA Petroleum Company. The new plant will process natural gas from the Western Desert, before transporting it to a gas complex in Alexandria via a 200 km pipeline, al Kaffas pointed out.

Qalaa Holding to Increase Stakes in ERC

Qalaa Holding Company has announced plans to boost its indirect ownership of the Egyptian Refining Company (ERC). A regulatory filing revealed that the company is in talks with financial consultants to study loan alternatives for extending its role in the ERC. One option being explored is to purchase more shares in Orient Investment Properties, a Qalaa subsidiary that holds shares in the ERC.In February 2018 ERC announced that its new $3.6 billion processing plant would start operation in six months.The value of total loans financing the plant's project has reached $2.6 billion, Chairman Ahmed Heikal, pointed out during the third "Egypt Investment Forum."







SAUDI ARABIA

Saudi crude exports fell to 7.122 million barrels per day (mb/d) in March 2018 from 7.251 mb/d in February. February's export numbers marked a 13-month high for OPEC's largest oil producer, lower only than the 7.713 mb/d recorded in January 2017. **The country's total oil products exports in March also fell month-on-month to 1.75 mb/d from an all-time high of 2 mb/d in February.**

Saudi Aramco and Malaysian National Oil Company (NOC) Petronas have launched their joint ventures in refining and petrochemicals located in Malaysia under the name "PRefChem" as a part of the two companies' collaboration on the Pengerang Integrated Complex (PIC) located in Pengerang, Johor.

The first external audit of Saudi Aramco revealed that the company has 270 billion barrels in oil reserves; slightly higher than the 261.8 billion barrels Aramco reported in its 2016 annual statement. The audit was conducted by companies including DeGolyer and MacNaughton, and Baker Hughes' Gaffney, Cline, and Associates. **Aramco's reserve base will have a direct effect on the company's valuation for its upcoming initial public offering (IPO).**

Saudi Basic Industries Corp (SABIC) is looking to purchase around 50% of the $4.6 billion Indian petchem project backed by Oil and Natural Gas Corporation (ONGC).

UAE

Abu Dhabi National Oil Company (ADNOC) announced on May 13 plans to invest almost $50 billion over five years to develop its downstream business. The NOC plans to double its refining capacity and triple its annual petrochemicals output potential to 14.4 million tonnes by 2025.

Dubai expanded its solar power generations capacity by 200MW after the completion of the first stage of the third phase of Mohammed bin Rashid Al Maktoum Solar Park. The second and third stages of the current phase will be completed in 2019 and 2020, and will expand the site's capacity by another 600 MW. **The installation will be world's biggest single-site solar park when finished, and is projected to provide 75% of Dubai's total power output by the year 2050.**

ADNOC and the Belgium-based Ravago Group have signed a Memorandum of Understanding (MoU) to explore opportunities for cooperation at the Ruwais Industrial Complex in the United Arab Emirates. The two companies will explore ways to "upgrade and commercialize" the non-prime product generated at Borouge, the polyolefins joint venture between ADNOC and Austrian Borealis.

ADNOC and Spain's Cepsa have signed a project development agreement for a new linear alkylbenzene (LAB) facility in Abu Dhabi's Ruwais refining and petrochemicals complex. The LAB facility will use products from petrochemical refining processes to create detergents, paints, and cosmetics.

ADNOC agreed the sale of two stakes in offshore blocks worth $1.5 billion to Austrian OMV. The Austrian firm acquired 20% interest in the offshore fields and associated infrastructure of Satah Al Razboot, along with satellite fields Bin Nasher and Al Bateel as well as Umm Lulu.

QATAR

Qatar Petroleum (QP) has invited companies to bid for development and operation contracts for a new petrochemicals complex at Ras Laffan Industrial City. The new petrochemicals complex is scheduled to be operational by 2025. It will house an ethane cracker to convert the chemical to ethylene, with a capacity of more than 1.6 million tons per year, making it the largest in the Middle East.

IRAN

The EU is updating legislation to allow European companies to avoid US sanctions when doing business with Iran. The measure will exempt European companies from having to comply with US penalties and will provide compensation to affected firms. It is scheduled to be in place by August 6, when the first round of sanctions take effect.

Total announced that it would abandon its multibillion dollar agreement if it did not receive a waiver from the US exempting it from sanctions.

National Iranian South Oil Company (NISOC) signed a non-binding Memorandum of Understanding with London-based Pergas for the development of the Keranj field in Khuzestan province.

Oil prices reached $80 a barrel on May 17, driven by concerns over falling supplies due to the American sanctions. It reached an intraday peak of $80.18 a barrel before falling back to $79.67 at 13:26 GMT. **Crude prices had not breached the $80 mark since November 2014.**

Iran will award Farzad B gas field to domestic Iranian contractors if India withdraws from negotiations over the field's development due to the US sanctions on Iran. The two countries are negotiating a $3-4 billion deal for Indian state refiners to obtain development rights in the Persian Gulf natural gas field.

Iran is looking to form a joint oil company with Azerbaijan. The company would be formed within the framework of the memorandum of understanding (MoU) on Joint Development of Relevant Blocks in the Caspian Sea, signed between the two countries in April 2018.

OMAN

Independent oil producer Occidental Oman (Oxy Oman) has signed two oil field service contracts with local Omani companies for engineering support services, the renting of centrifuges, and solid control engineering services. The contracts were signed with Value Engineering Center (VEC) - to provide engineering support services for capital projects in Mukhaizna, Oxy Oman's primary oil field - and with Hormuz Energy Services (HES) - to supply Oxy Oman with equipment expertise important to controlling the quality and efficiency of drilling fluids systems, including centrifuges and solid control engineering services.

Shell and Total signed separate memoranda of understanding (MoUs) with Oman to develop several onshore gas deposits in Block 6, located in the Greater Barik area. Shell and Total own respective 75% and 25% stakes in the block.

IRAQ

Iraqi failed to obtain investment from top international oil companies during an exploration and development auction held for blocks near the borders of Iran, Kuwait and in offshore Gulf waters. Italy's Eni, the only oil major to submit an offer for any of the blocks, made two unsuccessful bids. **Of the 11 blocks on offer, three went to UAE-based Crescent Petroleum, two to Chinese company Geo-Jade, and one to United Energy Group, based in China. Five of the blocks failed to attract any bids.**

Norwegian oil and gas operator DNO announced on April 26 that it intends to expand and accelerate operations in Kurdistan. The company added a third licence in Kurdistan, assuming operatorship of the Bashiqa licence with 40% interest partnering with ExxonMobil, Turkish Energy Company, and the Kurdistan Regional Government. **DNO stated that its gross production in Q1 2018 averaged 113,997 b/d, 109,427 b/d of which came from its Tawke licence in Kurdistan.**

Russia's Lukoil, in conjunction with local state-run Basra Oil Company, aims to double production from Iraq's West Qurna-2 oil field to 800,000 barrels per day (b/d) by 2025. The production increase will be implemented in stages: oil production at the field is planned to reach 480,000 b/d by 2020, while a further 320,000 b/d increase is projected by 2025.

Iraq has increased the daily production of its Zubair field by 50,000 barrels to reach 475,000 barrels per day (b/d) following the completion of a new oil processing facility. Three more processing plants will be constructed in the future as part of a long-term plan to increase the capacity of the Eni-operated field to 625,000 b/d.

KUWAIT

Independent oil and gas company Kuwait Oil is considering selling all or part of its Block 9 asset in southern Iraq. The sale is being considered to create extra liquidity for debt repayments and dividend payouts to company shareholders.

The Kuwaiti parliament has renewed confidence in Minister of Oil and Minister of Electricity and Water Bakheet Al-Rashidi in a vote at the National Assembly.

Kuwaiti Al Zour refinery project is expected to be completed by December 2019. The project is a part of Kuwait's plans to increase the country's daily downstream production capacity from 3.2 million barrels to 4 million barrels by the end of 2020. The plan also includes a more than **double increase of the refinery capacity of he state-owned Kuwait National Petroleum Co (KNPC) from 936,000 b/d to 2 mb/d by 2035 as part of a $25 billion spending plan.**

Kuwait Oil Tanker Company (KOTC) agreed a $167.6 million deal with South Korean shipbuilding firm Hyundai Mipo Dockyard for the construction of four petroleum tankers, each tanker will weigh 48,000 tonnes and construction of the first ship will be completed by February 2020, with the remaining three to be finished in May 2020.

Kuwait Petroleum Corporation CEO Nizar Al Adsani announced that **the NOC is looking to more than double its tanker fleet from 28 to 60 ships by 2040.**

LIBYA

Libya's offshore Bahr al-Salam gas field has resumed production at 380 million cubic feet per day after completing upgrades and maintenance. The maintenance linked new wells in the field to the coastal station of Sabratha, which sends untreated hydrocarbons to the Mellitah Complex.

FULLSTREAM

Capabilities and Solutions; an Interview with

MIRNA ARIF, BHGE Regional Sales Director

By Mariana Somensi

Baker Hughes, a General Electric company (BHGE), is the world's first and only fullstream provider of integrated products, services, and digital solutions for the oil and gas sector. The company is based in over 120 countries and has over 100 years of successful operations in Egypt.

Besides being part of the country's most prominent petroleum projects, BHGE recently signed a memorandum of understanding (MoU) with the ministry of Petroleum to launch the "Upstream Gateway Project" within the Ministry's Modernization Program. Mirna Arif, Regional Sales Director at BGHE, spoke to Egypt Oil & Gas and commented on the company's innovative role in the industry, as well as on BHGE's latest activities in Egypt.

As the first fullstream digital industrial oil and gas company, how does BHGE Digitalization assist in the sector's transformation?

BHGE has always been a key partner to Egypt's oil and gas sector. Our presence dates back to the early 1900s, when we were part of the country's first oil discovery. Egypt holds some of the world's largest oil discoveries and, as the world's only fullstream company, we have a major role to play with digitization as a key enabler.

BHGE is leading the digital transformation of the oil and gas industry, bringing the latest in technological innovation and providing our customers with more ways to maximize their efficiency, increase uptime, and optimize their production across the entire value chain. We are bringing together the full power of digital solutions and technology from across BHGE's fullstream industrial businesses to transform the petroleum sector, making it more agile, more adaptive, and highly collaborative – all of which are key elements to maintaining the sector's competitiveness and attractiveness.

The recent downturn and the disruptive approaches brought along are redefining the shape of our industry. Companies today are striving for ways to get connected in order to optimize their operations. By digitizing operations, our customers in the oil and gas sector can benefit with significant cost savings, increased maintenance efficiency and effectiveness, avoiding unplanned downtime, and maximizing equipment availability and production throughput, all while reducing operational risks and improving safety.

> BHGE is working very closely with the various modernization teams, supporting the sector's digital transformation strategy not only in upstream, but also in midstream, downstream, and petrochemicals.

> The digital transformation of the ministry's National Data Center will further support the energy sector's growth and attractiveness to international investors.

How do these technologies optimize operations and reduce costs?

BHGE has always been a big believer in the power of data and analytics and their capability to transform our industry. As a digital industrial company, we have many solutions that help drive efficiencies, productivity and better customer outcomes.

Predix, GE's platform for the Industrial Internet, is the foundation on which we build all our technology, leveraging the scale, security, predictive analytics engines, and digital twins that make an agile, adaptive and connected digital oil and gas industry possible. Optimizing increasingly complex oil and gas operations is more crucial than ever. Every asset, person, process, and system in business generates significant amounts of data. The key to converting this information into actionable insights lies in digitalization and making data work for our customers.

With enterprise oil and gas software from BHGE, purpose built on GE's Predix and Asset Performance Management (APM), our customers achieve a step change in fullstream productivity across assets, people, processes, and systems. By removing silos and connecting data, insights, and self-learning models across operations, they eventually increase capital efficiency and profitability, decrease marginal costs, and better manage their resources.

Only BHGE has a fullstream capability: the portfolio, the technology, and the people to radically transform the oil and gas industry and deliver unparalleled improvement in industrial yield for our customers from reservoir to refinery.

> The project [Upstream Gateway Project] has scalability to support the modernization and digitization of Egypt's midstream and downstream oil and gas sector, leveraging BHGE's fullstream capabilities and solutions to drive further productivity and cost-efficiency across the value chain.

BHGE recently signed a MoU with Egypt's Ministry of Petroleum. Could you comment on the company's role under the agreement?

We are very proud of our partnership with the Ministry of Petroleum in Egypt for the "Upstream Gateway Project." The MoU focuses on driving efficiency across Egypt's oil and gas sector through the management of bid rounds using BHGE's advanced digital solutions for data consolidation and aggregation in a secure central data lake. The digital transformation of the ministry's National Data Center will further support the energy sector's growth and attractiveness to international investors. This MoU marks our continued support of the ministry's Modernization Program. On the longer term, the project has scalability to support the modernization and digitization of Egypt's midstream and downstream oil and gas sector, leveraging BHGE's fullstream capabilities and solutions to drive further productivity and cost-efficiency across the value chain.

How do BHGE advanced digital technologies help the Ministry achieve the goals of its Modernization Program?

Egypt's oil and gas sector is going through a transformational era enabled by the Modernization Program, which is setting a clear path for our country to confidently compete in the global oil and gas market. This ambitious program, under the auspices, direction, and guidance of the Minister of Petroleum and Mineral Resources, H.E Eng. Tarek El Molla, is looking at various innovative solutions to address the challenges that the sector has witnessed over the past few years. The program is a key enabler to drive better outcomes for the industry as it looks at processes across the entire value chain, with a dedicated focus to Egypt's prime resource: its human capital.

BHGE is working very closely with the various modernization teams, supporting the sector's digital transformation strategy not only in upstream, but also in midstream, downstream, and petrochemicals, leveraging BHGE's fullstream capabilities, advanced artificial intelligence, fit for purpose predictive analytics to drive further productivity and cost efficiency across the entire value chain.

Through a single pane of glass, our fullstream digital technology is connecting all elements of the various organizations, providing one platform, one system, one user interface across the entire value chain: from upstream, to midstream, to downstream onto the consumer. We are providing a true convergence of operations, process ecosystems, people, and systems from field development planning through to optimizing production, reducing risk and driving downstream throughput and efficiency.

With BHGE being Egypt's partner since the beginning of the 20th century, what are the company's main projects in the country?

BHGE is a long-standing partner to Egypt for 100+ years of successful operations. We have more than 600 employees in the country and continue to increase our local capabilities through our engagement in large-scale projects that are driving further local impact. BHGE has proudly drilled the seven wells of Shorouk Field, of the giant gas discovery Zohr, with the latest Logging While Drilling technologies. BHGE technology will also be used to drill another major gas project in Egypt, NIDOCO Wells, located in Delta, which will help enhancing the overall gas production in Egypt.

Most recently, BHGE was awarded a major contract for subsea oilfield equipment for the development of phase 2 of the giant Zohr gas field offshore Egypt. BHGE will provide project management, engineering procurement, fabrication, construction, testing, and transportation of a subsea production system.

BHGE is helping drive localization in the country in partnership with key local players in the market. For instance, we are partnering with Petroleum Projects & Technical Consultations Company (Petrojet) to locally manufacture its API certified sucker rod pumping units. The units have been fabricated and assembled in Petrojet's workshop in Idku, Alexandria. In 2018, BHGE has extended its partnership with Petrojet by signing a close to EGP 1 billion contract with Petrojet to provide manufacturing and fabrication services for BHGE's upstream oil and gas operations in Egypt, including the fabrication, construction, and testing of heavy-duty structures and components for BHGE's subsea production.

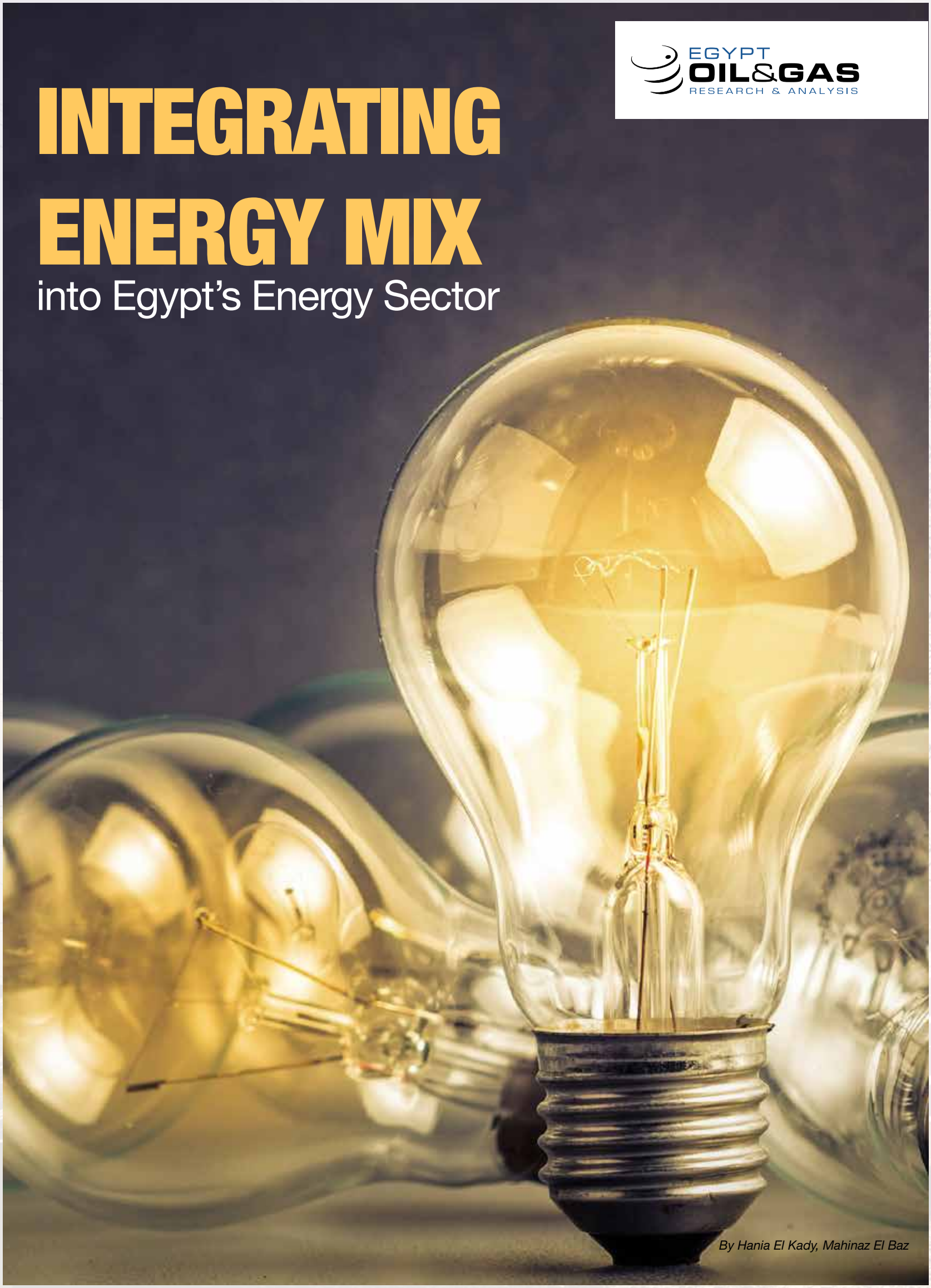
We have an extended relationship with Egypt. We are committed to continue working with the ministry, our customers, and partners to help them achieve their vision and goals for the region.

In your opinion, what aspects of the Egyptian petroleum sector still need to be improved and how?

One of the key improvements of how the industry can operate better is the integration of the overall operational processes across the entire value chain. This is exactly what the Modernization Program is aiming to achieve, driving and optimizing the overall efficiency of Egypt's oil and gas sector. The various pillars of the program address various areas of the sector, such as upstream and downstream optimization, digital transformation, investment attraction, but, above all, human capital development, hence driving the sustainability and continuity of the sector. Collaboration is also a key enabler of productivity. With data at the heart of decision-making and interdependencies connected and shared across the entire value chain, productivity improvement across the sector's companies is guaranteed. Finally, ensuring a predictable and attractive investment climate would help attract significant foreign direct investment and better utilize Egypt's oil and gas resources.

INTEGRATING ENERGY MIX

into Egypt's Energy Sector



By Hania El Kady, Mahinaz El Baz

In 2015, the United Nations Sustainable Development Summit declared the 2030 Agenda for Sustainable Development, widely known as, the Sustainable Development Goals (SDGs). One of these goals is primarily concerned with "affordable and clean energy", that would be attainable through diversifying energy mixes all over the world.

In the same line, Egypt formulated its 2030 vision on a set of pillars in order to diversify its economy and shape a new Egypt. Energy is one of the vision's main pillars that aim to contribute to economic growth and preserve the environment as well as meeting the local demand for energy. It envisions the sector to be a leading renewable energy hub that is capable of adapting to local, regional, and international developments in a sustainable manner.

Egypt has been suffering from an energy shortage that exacerbated in recent years. Hence, the need to diversify the country's energy resources and shift the reliance from fossil fuels into renewable energies is most needed. In order to meet the 2030 vision expectations, the government embarked on an European Union (EU) initiative to reform the energy sector in Egypt, in addition to an energy strategy modelling to shape a national energy strategy.

PEAK LOAD PROJECTION (GW)

SCENARIOS	AVERAGE GROWTH	2013	2018	2020	2030	2035
LOW	5.2%	27	35	42	59	71
MEDIUM	6.2%	27	35	43	62	76
HIGH	7.1%	27	36	46	68	86

Source: TARES

ELECTRICITY PRODUCTION

Since 1997, Egypt's electricity generation has tripled to over 180 terawatt hours (TW/h) in 2015, according to the BP Statistical Review of World Energy. Even though the electricity production has increased, the Egyptian population grew at a much higher rate widening the gap between electricity production and consumption.

In fiscal year (FY) 2016/2017, Egypt's production of electricity amounted to 188.619 billion kilowatts per hour (kW/h), where the production stood at 185.645 in FY 2015/2016, constituting an increase by 1.6%.

Solar energy was the fastest growing energy source in FY2016/2017, an increase by 357.5%. On the other hand, hydropower shrank by 5.1% in FY 2016/2017 compared to FY 2015/2016.

ELECTRICITY CONSUMPTION

The consumption of electricity amounted to 152.99 billion kilowatt hours (BKW/h) in FY 2016/2017 and 155.476 BKW/h in FY 2015/2016, constituting a decrease of 1.6%.

Households consumed 44.04% of total electricity consumption in FY 2016/2017, while exports made up 0.11% of total consumption during the same period.

EXPECTED EVOLUTION OF PEAK LOAD

An EU funded project, Technical Assistance to Support the Reform of the Energy Sector (TIMES), is an energy strategy modeling that adopts medium/long term energy scenarios to create national energy strategies. TIMES introduced peak load projections based on three different scenarios; low, medium, and high. These scenarios are related to various economic growth estimations. To cite an instance, TIMES expects a low peak load to reach 71 gigawatt (GW) in the low scenario by 2035, 76 in the medium scenario, and 86 in the high scenario.

ELECTRICITY PRODUCTION FY2015/2016 VS FY2016/2017 (BKW/H)

ENERGY SOURCE	2015/2016	2016/2017	ROC(%)
THERMAL ENERGY	169.967	172.989	1.8
HYDROPOWER	13.545	12.849	-5.1
WIND POWER	2.006	2.2	9.7
SOLAR ENERGY	0.127	0.581	357.5
TOTAL	185.645	188.619	1.6

Source: Ministry of and Planning, Monitoring, and Administrative Reform, Annual Report, FY2016/2017.

ELECTRICITY CONSUMPTION FY 2015/2016 VS FY2016/2017 (BW/H)

CONSUMPTION	2015/2016	2016/2017	ROC(%)
HOUSEHOLDS	72.572	67.371	-7.2
INDUSTRY	38.482	41.525	7.9
COMMERCIALS	19.153	18.695	-2.4
PUBLIC UTILITIES	11.922	11.727	-1.6
PUBLIC ENTITIES	6.501	7.001	7.7
AGRICULTURE	6.39	6.497	1.7
EXPORTS	0.456	0.174	-61.8
TOTAL	155.476	152.99	-1.6

Source: Ministry of Planning, and Monitoring and Administrative Reform, Annual Report, FY2016/2017.

SUPPORTING THE REFORM OF EGYPT' ENERGY SECTOR

In 2016, the EU funded the Technical Assistance to Support the Reform of the Energy Sector (TARES) initiative in Egypt, with the cooperation of the Ministry of Energy and Ministry of Petroleum and Mineral Resources.

TARES was established through the development of the Energy Strategy Working Group, applied the TIMES-Egypt modelling and elaborated through scenario analysis, several potentials, and likelihood options looking ahead to 2035. "TARES identifies between the baseline year, 2010, and a target date, 2035, an overall EE (energy efficiency) policy target might achieve feasibly energy savings up to 20 million tons of oil equivalent (mtoe) on a scenario of energy consumption of 112 mtoe in 2035 corresponding to 18% of the total consumption in 2035. The potential savings affect all sectors including the construction, industry, and transport sectors with 8.6mtoe, 6.76mtoe, and 4.5mtoe, respectively," according to a press release published on the EU External Action website.

TARES "aims to improve energy policy and regulatory framework and promote energy efficiency and mitigation of greenhouse gas (GHG) emissions. With an overall budget of EGP 590.3m, the Energy Sector Policy Support Program aims to assist Egypt in implementing its far-reaching energy reforms and to foster implementation of its strategic energy partnership with the EU to improve energy security and sustainable development," the press release explained.

PROPOSED SCENARIOS

There are four scenarios in TIMES energy model that are shortlisted for approval as well as a base-line scenario. This scenario includes a set of factors: oil and gas production, fuel subsidies, availability of coal for power production, nuclear power, renewable energy sources (RES), and energy efficiency.

The fuel subsidies is further categorized into two cases:

- Subsidies kept for the whole time horizon
- 50% phase out in five years, 100% in 10 years (sensitivity on the subsidies)

The scenarios are not primarily focused on costs, but take into consideration other factors, such as diversification of energy supply, energy efficiency, energy cost for the consumer, reduction of GHG emissions, as well as introduction of renewable energy sources.

The first scenario incudes three alternatives for renewable energy sources, employing the same rates for energy efficiency. The second one delays nuclear power by five years and employs high-energy efficiency. The third scenario postpones the use of nuclear power to 2035, refrain from coal in power plants and the whole industry, in addition to high-energy efficiency.

The fourth scenario will phase out subsidies in five years, nuclear power will be on a cost optimization basis, and coal will be available starting from 2021/2022.

An approach of a Multiple Criteria Decision Making (MCDA) was applied in ranking the scenarios by a panel of experts. The MCDA approach incorporated factors other than costs in the set of criteria.

EGYPT'S ENERGY MIX STRATEGY

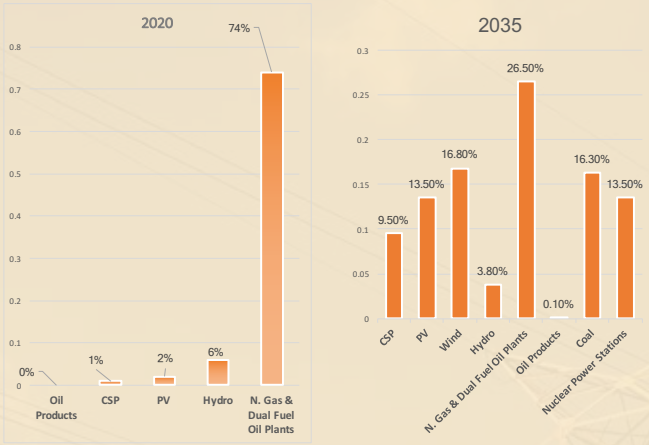
The energy sector in Egypt, namely, electricity, renewable energy, and oil, prepared a study in collaboration with the TARES initiative. The study takes into consideration the technical and economic aspects of producing energy till 2035, as stated on the New & Renewable Energy Authority website.

The Renewable Energy Strategy was amended post the latest events and political developments that took place in Egypt in recent years impacting renewable energy projects. The modification aims to reach 20% out of total produced energy in 2022.

The study includes a set of scenarios for energy mix with different assumptions. It attempts to evaluate the impact of incorporating renewable energies by different percentages in electricity generation mix from a technical and economic aspect in order to choose the optimal scenario.

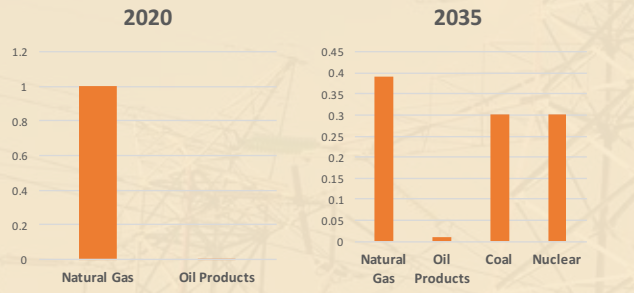
The Energy Higher Commission ratified the Egyptian Energy Strategy until 2035 in November 2016. Scenario 4B is set to be the guideline in energy planning in Egypt in the coming period. The renewable energy contribution rate is projected to reach 37.2% of total electricity produced in 2035.

SHARE OF ELECTRICITY PRODUCTION BY PLANT TYPE



Source: TARES

FUEL INPUT FOR ELECTRICITY PRODUCTION



Source: TARES

PROJECTED PRODUCED ENERGY IN 2022

SOURCE	CAPACITY (MW)	CONTRIBUTION RATE (%)
WIND	6850	12
SOLAR	2880	2
HYDROPOWER	2800	6

Source: New & Renewable Energy Authority

CONTRIBUTION OF RENEWABLES IN TOTAL ELECTRICAL ENERGY

ENERGY SOURCE	EXPECTED ENERGY CONTRIBUTION (%)
COAL	34
OIL	0,5
NATURAL GAS & DUEL FUEL	19.4
HYDROPOWER	3.2
WIND POWER	14.6
PHOTOVOLTAICS	11.8
CONCENTRATED SOLAR POWER	7.6
NUCLEAR	8.8

Source: New & Renewable Energy Authority

ENERGY SUBSIDY CUTS:
THE HARDEST PART OF EGYPT'S ECONOMIC REFORM

By Mahinaz El Baz

Egypt's government has committed to periodically increasing the pre-tax cost-recovery ratio on most fuel products in order to achieve 100% in fiscal year (FY) 2018/2019 and to eliminate electricity subsidies by FY 2020/2021, according to the International Monetary Fund (IMF). In FY 2014/2015, the government launched an energy subsidies reform program by reducing subsidies and increasing fuel prices in the budget—although they still remained well below international prices. In order to continue with the budget deficit reduction plan, the government announced a reduction in energy subsidies one day after floating the Egyptian Pound (EGP) in November 2016. A second reduction occurred in July 2017. The reduction in energy subsidies was a major factor of consumer inflation. Fuel prices rose to more than 100% higher than they were in 2014, while increases in electricity prices ranged from 29-124% higher, depending on the consumption tier, according to BNP Paribas's report.

Prior to the budget approval for the FY 2017/2018, the Egyptian state had earlier cut fuel subsidies in a move that will save around EGP 35 billion compared to FY 2016/2017, according to the State Information Service. The government has followed through on its plan for a fourth round of electricity subsidy reform, lowering its expenditures on electricity subsidies to EGP 30 billion.

It worth noting that energy subsidy cuts are part of plans made when the government acquired a $12 billion extended fund facility (EFF) loan from the IMF in November 2016. Egypt's fuel-subsidies bill has decreased from a peak of 5.9% of growth domestic product (GDP) in FY 2013/2014 to 3.3 % in FY 2016-2017, the IMF declared. It is expected to decline further to 2.4 % of GDP by the end of the current FY 2017/2018.

NARROWING THE BUDGET DEFICIT

With spending estimated at EGP 1.4 trillion and revenue targets of around EGP 989 billion, Egypt's government submitted the new state budget for FY 2018/2019 to the House of Representatives in April, according to the pre-budget report issued by the Ministry of Finance. The new budget is targeting a growth rate of 5.8% of GDP. It further aims to reduce the budget deficit to 8.4% of GDP in FY 2018/2019, achieve a primary surplus of 2% of GDP, and reduce public debt to 91-92 % of GDP. Additionally, it seeks to achieve a 10% inflation rate. In order to achieve these goals, the government will be working on increasing revenues while restructuring public spending to create the fiscal space for spending on social services, the pre-budget report stated.

On the spending side, the government is moving on with its plan to reduce energy subsidies. Subsidies on fuel will be cut by around 21%, leaving total spending at around EGP 89 billion in the new budget. Electricity subsidies will witness a tougher cut of around 45%. "The main impacts of the subsidy cuts are an improvement in the government budgetary results, and hence a better control over domestic public debt towards fiscal sustainability, as well as a short-term increase in the rate of inflation because of upward price adjustments in energy-dependent goods and services," Dr. Alaa El-Shazly, professor of economics at the Faculty of Economics and Political Science (FEPS) at Cairo University, told Egypt Oil & Gas.

Highlighting both economic and social impacts of subsidies cuts, Mahmoud M. Barbary, Assistant lecturer in Economics Department at Helwan University, explained to Egypt Oil & Gas that from an economic perspective, the energy subsidies program in Egypt has failed to achieve its goals, which included fostering the industrial development, avoiding the inflation problems, and protecting the national advantage.

From a social perspective, the main goal of energy subsidies is to help lower classes to get energy products in low prices. However, official data indicates that higher classes benefit from subsidies the most. Statistics show that the poorest 20% of the population, who consume the least, receive around 10% of the subsidies value. Meanwhile, the middle 60% of the population consume 45% of the subsidies. The richest 20%, who consume the most, receive 45% of the subsidies, according to a 2014 report by Sherif Zoheir, a senior tariff specialist at the Ministry of Finance.

As of 2017, Egypt was the sixth cheapest country all over the world to fuel a car, according to Global Petrol Prices website. Petroleum and natural gas represent approximately 96% of Egypt's energy consumption.

"I think that gradually phasing out the energy subsidies will not affect the industrial development plan, because the government can find other investment or industrial motives, such as taxes or duties motives; also the government had a mitigation plan to compensate the poor, such as cash subsidies or necessary goods subsidies," Barbary added.

INTERNATIONAL OIL PRICES: INCREASING CHALLENGES

International oil price fluctuations are among the top challenges that might stop the Egyptian government from achieving its macroeconomic goals for FY 2018/2019. This comes along with other international challenges, such as interest rates and international trade growth.

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

"The assumed international price of oil in preparing the government budget is typically an average price around which prices may fluctuate under changing market conditions. So, on average, there need not be a significant deterioration in fiscal deficit calling for further cuts in energy subsidy under normal fluctuations in international oil prices during the fiscal year," Dr. El Shazly said.

From his side, Barbary explained that the oil prices now are unexpected due to the Iranian-American conflict. "We cannot fix the oil price at this rate right now, any increase in oil prices will lead to a higher energy subsidies, while the decrease in oil price will not lead to a decrease in energy subsides, because we import the energy products in its final shape as a final product and the refining process costs a major proportion in energy subsidies bill. The government must be ready for oil price fluctuation and should be flexible in dealing with any price increase putting plan B and plan C with flexible timeframe to fulfill its energy subsidies reform program," he added.

Interest rates are another challenge facing the government. There is a direct relation between international oil prices, interest rates and energy subsidies. For instance, on a local scale, the Central Bank of Egypt (CBE) kept its benchmark interest rate unchanged in May, as the government prepares for a new round of fuel subsidy cuts against a backdrop of rising global oil prices, according to Bloomberg. In May, the bank's Monetary Policy Committee (MPC) held the overnight deposit rate at 16.75% and the overnight lending rate was kept at 17.75%.

The increase in international oil prices "gained momentum in April and May 2018, leading to the materialization of an upside risk to the domestic inflation outlook," the MPC said in a statement. Even so, it said that the outlook "remains consistent" with achieving the inflation target of 13% (+/-3 percentage points) in the fourth quarter of 2018. Brent crude has risen 19.3% since the beginning of 2018, to almost $80 per barrel, according to Bloomberg.

The rise in oil prices means that the CBE will proceed with caution as it unwinds high borrowing costs, said Bilal Khan, a senior economist at Standard Chartered Bank, according to Bloomberg. Additionally, "the recent rise in US yields could complicate the timing of cuts further."

CONTROLLING THE INFLATION RATE

Reducing fuel subsidies usually leads to an increase in the inflation rate. "The expected subsidy cuts, based on our estimates, should have a 4% incremental impact on headline Consumer Price Index," Allen Sandeep, director of research at Naeem Holding, told Ahram Online.

The government estimates inflation to reach 10% at the end of the FY 2018/2019, while the average inflation rate for the year is set at 13.2% in the budget statement. "We expect one or two hikes in energy prices through the coming fiscal year. There is no way the government can rein in the resulting inflationary pressures to the neighborhood of 10%," Omar El-Shenety, managing director of Multiples Group said, according to Ahram Online. In the same context, estimates made by local investment bank Pharos put inflation at 13.8% by the end of FY2018/2019, while the IMF expects 15.2%.

Egypt's annual urban consumer price inflation -headline inflation- slowed to 13.1% in April from 13.3% in March, according to the CBE. Annual core inflation recorded 11.6% in April, compared to 11.59% in March, the CBE said. Economic experts believe that the inflation rate will increase, due to the changes in consumer behavior in Ramadan, in addition to the upcoming fuel subsidies cut. Thus, they argue that the expected spike in inflation could push the CBE to increase interest rates again.

El-Shenety points out that the highest inflationary wave is behind the country, and it is time to encourage investment by lowering interest rates again. He points to another factor that makes lowering rates inevitable, namely the cost of local debt. Each one per cent increase in interest rates costs the government millions of dollars in debt payments, he added.

The government has put the rate on treasury bills at 14% in the new budget, compared to 16 -18% in the current fiscal year. Foreign investments in Egyptian treasury since the devaluation in November 2016 until March 2018 have come in at $23 billion.

When asked about the best solutions to control the expected increase in inflation rate after reducing energy subsidies in general and fuel subsidies in specific, Barbary highlighted that the government must find a strong and secure plan to control the markets as the fuel prices affect almost everything citizens use on daily basis. "It is only few hours after fuel price increase and we will face a price increase in all necessary goods and services like foods, vegetables, dairy products, and transportation. The only way to control the inflation rate is controlling the markets and declaring the prices of the necessary goods and services through TV and newspapers," he added.

Having a different point of view, Dr. El Shazly, believes that rationalizing energy consumption and market surveillance can help in controlling the expected increase in the rate of inflation.

THE SUBSIDIES REFORM PROGRAM: STEPS FORWARD

Egypt is planning to fully liberalize the energy market – fuel and electricity - by removing subsidies in the mid-term. Economic experts stress on the importance of raising the public awareness and explaining the implications of the subsidies reform program, in addition to the transparency in declaring the upcoming steps.

"Our major problem in Egypt is that we deal with the reform concept as a price increase process, while the reform must include a plan to provide the citizens with energy subsidies, market control regime, a flexible time frame to fulfill the reform program and mitigation procedures. Thus, we cannot limit the reform program in the price increase

> "The main impacts of the subsidy cuts are an improvement in the government budgetary results, and hence a better control over domestic public debt towards fiscal sustainability, as well as a short-term increase in the rate of inflation because of upward price adjustments in energy-dependent goods and services."
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> **DR. ALAA EL-SHAZLY, PROFESSOR OF ECONOMICS AT CAIRO UNIVERSITY**

process, because we can continue to increase the energy products prices and the oil prices continue to increase as well, which makes us rotates in a vicious circle. The appropriate way to phase out the energy subsidies is to make a five-year timeframe including the mentioned above factors, not only the energy products price increase, although it is unlikely that the energy subsidies will be zero within the next 5fiveyears," Barbary said.

Meanwhile, Dr. El Shazly believes that the removal of fuel subsidies is expected to take place during the current presidency term. "The average fiscal deficit as percent of GDP after liberalizing the fuel market is expected to be around 6%," he added.

Experts believe that local and international challenges may harden the subsidies reform program and increase its negative effects on both short and mid-terms. Yet, the previous subsidies system failed to meet its goals. As a result, liberalizing the market became an inevitable matter.

BARRIERS TO INVESTMENT: ATTRACTING FINANCE FOR THE RENEWABLE ENERGY SECTOR

By Matthew Hoare

A report published in 2018 by the International Renewable Energy Agency (IRENA) revealed that capital inflows into the Middle East and North Africa (MENA) renewables sector during 2015 and 2016 were the lowest of any region in the world. The analysis, which includes both public and private sources of finance, gave the MENA region an index of 4. This compares to East Asia, Western Europe, and Sub-Saharan Africa, which had indices of 106.9, 60.6, and 4.6 respectively.

Although this data reflects negatively on renewable energy investment across the MENA region as a whole, the Egyptian sector has witnessed progress over the past years. Since 2014, the Egyptian government has passed several pieces of legislation aimed at removing barriers to foreign investment in the Egyptian economy – including the renewable energy sector. The question now is whether these legislative changes are succeeding in attracting increased amounts of foreign investment into the sector.

REMOVING LEGISLATIVE BARRIERS

During an interview with Bloomberg in December 2017, Minister of Electricity Mohamed Shaker said that the government is planning to produce 42% of the country's electricity from renewable sources by 2025. This figure is significantly more ambitious than the government's previous target of using renewable energy to generate 20% of its electricity by 2022.

Achieving either of these targets requires increased private sector involvement in the production of electricity. This is why in 2014 the government passed the Renewable Energy Law (No. 203/2014), a piece of legislation that for the first time articulated a number of different mechanisms by which private investors can become involved in the production of renewable energy: competitive bidding and auctions, feed-in tariffs, and independent power production. The legislation differentiates between two types of competitive bidding: bidding for 'Build Own Operate' (BOO) projects – a scheme by which investors can establish, own and operate an energy project – and conventional competitive bids. Tenders for BOO projects are managed by the Egyptian Electricity Transmission Company (EETC) and electricity is sold to the EETC at a price agreed upon by the investor and the EETC. Non-BOO tenders offered through competitive bidding are meanwhile administered by the New and Renewable Energy Authority (NREA).

Unlike with BOO projects, the NREA operates the facilities and sells the electricity to the EETC at a price agreed by the Egyptian Electric Utility and Consumer Protection Regulatory Agency. Under the Feed-in Tariff (FIT) system, investors build, own and operate renewable energy facilities, and sell the electricity to the EETC or distribution companies via a power purchase agreement (PPA). The tariffs vary depending on the amount of electricity produced by the facility, and whether produces electricity via solar or wind. FITs are attractive to investors because they operate through long-term contracts spanning up to 25 years, and they guarantee access to the energy grid.

More recently, the government passed the 2017 investment law, a piece of legislation designed to incentivize foreign companies and individuals to invest capital into the Egyptian economy. The law makes it more difficult for authorities to prematurely cancel an agreement, grants foreign investors residence rights for the term of their investment, and treats Egyptian and foreign investors equally under the law. While the legislation addresses investment across the broader economy – and not specifically the renewable energy sector, investors are able to offset 30% of their capital costs against their taxable profits if the project involves electricity production or if it depends on the production of renewable energy.

THE FEED-IN TARIFF PROGRAM

The FIT scheme aimed to establish solar and wind projects capable of generating between 4 and 4.3 GW of electricity each year. The scheme, however, experienced teething problems during the first round of procurement. "There was a conflict in relation to the arbitration clause," Reham Eissa, senior associate at the Sharkawy & Sarhan law firm, told Egypt Oil & Gas. "The international financial institutions

wanted the arbitration to be international, while the Egyptian government was reluctant to accepting something like that."Contributing to the nervousness of investors during phase one was the government's decision to liberalize exchange rates, which promptly resulted in the Egyptian Pound taking a nosedive.

It was only in the program's second phase that the FIT model began to deliver. Despite the government substantially lowering the tariffs on schemes producing more than 500KW of power, international financial institutions began to show more confidence in Egyptian renewables. Firstly, the government gave up its insistence of domestic arbitration and accepted the international arbitration clause. Secondly, it assured investors worried about the stability of the local currency that 30% of the tariff would carry a fixed rate of EGP 8.88 to the dollar.

Later in 2017, the International Finance Corporation (IFC) put more than $650 million into 13 solar projects at the Benban solar facility in Aswan governorate under the Nubian Suns FIT program. Furthermore,the European Bank of Reconstruction and Development (EBRD) invested $500 million under the FIT scheme into further 16 solar projects at Benban. In addition, the Multilateral Investment Guarantee Agency (MIGA) provided $210 million of risk insurance, helping to further assuage the fears of prospective investors. The funding from the EBRD and the IFC covers 29 of the 32 solar photovoltaic (PV) facilities at the Benban installation. These facilities alone will produce around 1.5 GW of electricity upon completion, but the total output of the Benban project is estimated to be anywhere between 1.6 and 2 GW, making it the largest facility of its kind in the world. As of February, there were 25 developers and sponsors making agreements under the FIT scheme to begin development at Benban. In April, the chairman of Triple M Contracting Company announced plans to construct 10 solar facilities in Benban. The success of Benban's FIT scheme was such that the project received Thomson Reuters' Project Finance International Award earlier in 2018.

COMPETITIVE BIDDING

Although the FIT model produced undeniable successes in 2017, the depreciation of the Egyptian pound in 2016 combined with the government's decision to lower tariffs has raised questions about the viability of investing under the FIT program. Leaders of several major solar companies told the American Chamber of Commerce in Egypt that such conditions made it harder for investors to generate worthwhile profits.The devaluation of the currency has also made it extremely difficult for many local companies to take on the dollar-denominated debt necessary to finance projects. For these reasons, Minister of Electricity Shaker announced in July 2017 that FIT would not be renewed for a third program,despite its evident successes. Instead, from now on renewable energy tenders will be issued by the EETC via conventional auctions. Under the new system, investors will be invited to submit technical and financial project proposals, and bid competitively for the project.

There are currently several BOO tenders that are at varying stages of procurement. The first tender put up for auction was for a 600 MW PV project on the western bank of the Nile. According to the terms of the agreement, the successful company will construct either one 600 MW facility, two 300 MW facilities or three 200 MW facilities, and sell electricity to the EETC for a 20-year period. An official from the EETC revealed to Al Mal at the end of April that 15 local and international renewable energy companies were preparing to bid for the tender. The source also said that the government will receive bids for a 250 MW BOO West Nile wind facility by the end of May. According to the source, 15 companies have shown interest in the project and the tender will be awarded by the third quarter of 2018. Details of a third 200 MW solar project in Kom Ombo were revealed to Al Borsain February. Sources told the newspaper that the EETC would open the bidding process in March, yet no further information has been issued about the tender's current status. The commission originally invited bids for the Kom Ombo project back in 2013 but has repeatedly delayed and revised the tender, despite announcing a shortlist of bidders in 2014.

> "We expected [the IDA] would be applicable in the FIT program and we expected that it would be responsible for issuing all the licenses for the project."
>
> REHAM EISSA, SENIOR ASSOCIATE AT THE SHARKAWY&SARHAN LAW FIRM

In March 2018, the EBRD issued a consultancy tender to provide technical and financial support to the EETC for current tenders, and to assist with the development of the wider procurement system. The chosen consultant will provide support to the EETC in the implementation of the three solar and wind tenders mentioned above, as well as a 100 MW concentrated solar plant to be constructed in the Western Nile region. In addition to help with individual tenders, the consultant will also work review the current legislation and work with the EETC to further develop its competitive procurement system. Consultancy firms were told to submit their proposals by April 16, and as yet no further information has been made publicly available. Egypt Oil & Gas contacted the EBRD for further information on the tender's status but the bank declined to comment.

LICENSING

Since none of the tenders are yet at an advanced stage, and because the EBRD's consultancy initiative is yet to produce conclusions about the auction scheme, the jury is still out as to how effective the new bidding mechanism will be. Nevertheless, it is evident that there remain barriers to investment despite the moves by the government to liberalize the electricity sector. Eissa highlights the licensing system as being a continued problem for investors – despite moves by the government to improve the existing system. In 2013, the Industrial Development Authority (IDA) announced plans to create an online one-stop-shop that would make industrial licensing procedures more efficient. This system would allow investors to apply for and receive all the necessary licenses – whether related to construction, operations, electricity generation etc. – from a single online access point.In addition to this, the Ministry of Trade last year backed a new set of regulations designed to make it quicker for private sector companies to obtain the licenses necessary to initiate industrial projects. Instead of 11 separate organizations granting industrial licenses, the IDA now has exclusive licensing powers. Following the passage of the law, Minister of Trade Tarek Kabil said that prior licenses would take only 30 days to process, while a license by notification would take just seven.

Eissa says, however, that the IDA did not exercise its new licensing powers during the FIT program. "We expected [the IDA] would be applicable in the FIT program and we expected that it would be responsible for issuing all the licenses for the project," she noted. "At the moment, it is still very hard to just knock on the door of the relevant authorities to obtain the required license."

AN OPTIMISTIC ENVIRONMENT

Despite the delays and the continued existence of certain barriers to investment, such as the cumbersome licensing system, Eissa is optimistic about the long-term benefits the reforms will have on foreign investment. "Overall we are optimistic," she says. "We receive daily calls from investors and international clients who want to understand more about the development of the market, express their willingness to enter the market and participate in different types of projects."

It is evident that the Egyptian government still has some way to go if it wants to fully open its doors to foreign investment. However, although the past year has witnessed the undeniable success of the FIT scheme at the Benban solar complex, it remains unclear how efficient procurement will be under the government's new auction mechanism. Over the coming months, the statuses of current BOO tenders are expected to be clarified. Details about how the EBRD's consultancy initiative plans to help the EETC to streamline the bidding process are also expected to be uncovered.

WASTE-TO-ENERGY

FOR A SUSTAINABLE FUTURE IN EGYPT

By Sarah Samir

Faced with a growing population, securing energy supplies has become one of Egypt's biggest priorities. Because of this, the past few years has seen the country importing large amounts of energy from different sources. Egypt has also been experiencing difficulties dealing with the growing amounts of waste produced by the increasing population. With the government's plan to become a regional energy trading hub, acknowledging waste as an accessible source of energy is becoming necessary. Hence, Egypt has been reviewing tariffs for energy produced from waste in order to encourage waste-to-energy projects for generating sustainable energy.

Waste-to-Energy

Egypt produces huge amounts of solid waste that can be reused or recycled. Waste that cannot be recycled is processed to decrease its volume and toxicity, and for energy generation. "Egypt has a golden opportunity to capitalize on creating energy from waste, which would be aligned with the new energy strategy of the Egyptian government in which it targets to diversify its energy mix portfolio by adding energy recovery channels to the existing renewable energy projects," expert in waste management and alternative fuels, Omar M. El Hassanein, told Egypt Oil & Gas.

Energy produced from waste comes from two sources: refuse-derived fuel (RDF) and solid recovered fuel (SRF). "While an RDF might have a good calorific value and low chlorine content, clients can never be sure of its composition, because it is not tested and evaluated in an appropriate and standardized way," wrote Geert Cuperus in an article entitled 'The Difference between RDF and SRF'. The RDF "poses a risk for producers and users of these fuels as human health and equipment may suffer from certain, sometime hazardous, components in the fuel," Cuperus explained.

Meanwhile, SRF is acknowledged to be safer as it is produced from non-toxic waste in compliance with European standards, according to Cuperus. Hence, it is important to ensure that safer SRF quality waste is used to produce energy.

There are two available methods used to treat waste: the thermal method - which uses heat to reduce its mass – and biological treatment. "Thermal treatment processes can reduce the solid waste going into a landfill by as much as 80–90% in volume and 65–75% in mass," Mohamed Ibrahim Mohamed Ibrahim and Nanis Abd El Monem Mohamed stated in their article, entitled 'Towards Sustainable Management of Solid Waste in Egypt'. Thermal treatment is accomplished either by incinerating the waste or through "pyrolysis and gasification" in which organic waste is decomposed in a high temperature, low oxygen environment. The biological treatment involves decomposing organic waste, either by composting or by anaerobic digestion. Anaerobic digestion involves decomposing waste using only bacteria, and is a method used in the production of biogas.

"The best technology for Egypt would be anaerobic digestion, given the lack of a sufficient gate-fee, the significance of the waste problem on the national level, and the capital expenditure per unit of energy produced," El Hassanein told Egypt Oil & Gas.

Egypt has great quantities of agricultural wastes, including rice straw, cotton stalks, and maize cobs, which are being shredded. According to bioenergy expert Salman Zafar, this waste could be used to secure bioenergy. "In the agricultural sector, one possible solution to processing crop biomass is co-digested together with animal manures, the largest agricultural waste stream," he wrote to another publication .

Using crop wastes with manure prevents imbalances. "In co-digestion of plant material and manures, manures provide buffering capacity and a wide range of nutrients, while the addition of plant material with high carbon content balances the carbon to nitrogen (C/N) ratio of the feedstock, thereby decreasing the risk of ammonia inhibition," Zafar explained.

However, biogas remains a fringe means of electricity generation in Egypt, El Hassanian tells us. "The only biogas project in Egypt so far is in Beheira and it produces electricity from one determined waste source, which is water treatment plants. It produces methane through anaerobic digestion of the waste source and converts it into biogas," he said.

> "The best technology for Egypt would be anaerobic digestion, given the lack of a sufficient gate-fee, the significance of the waste problem on the national level, and the capital expenditure per unit of energy produced."
>
> **OMAR M. EL HASSANEIN, EXPERT IN WASTE MANAGEMENT AND ALTERNATIVE FUELS**

Waste-to-Energy Tariff

The Egyptian Ministry of Electricity and Renewable Energy aims to produce around 55% of the country's energy from renewable resources by 2050. Egypt has many sources of solid waste, which makes it a potentially attractive market for investors who can generate and sell energy from waste. To ensure that profit margins are sufficient to attract investors, the Ministry of Electricity and Ministry of Finance have been negotiating waste-to-energy feed-in tariffs (FiT) with investors.

In April 2018, media quoted Minister of Environment Khaled Fahmy stating in a parliament meeting that the waste-to-energy FiT had been agreed. The Ministry of Electricity will pay EGP 1.03 per kWh and there will be a price variance that will be paid through a fund established for that purpose. Earlier in February, media published that the Egyptian cabinet approved some tariffs that were pending parliament approval. According to the cabinet's draft, energy generated from household waste would be purchased for EGP 1.6 per kWh, while energy produced from burnable agricultural wastes would be sold for EGP 1.3 per kWh, and energy produced from animal wastes and biogas would be purchased for EGP 1.45 per kWh.

"The new waste-to-energy (FiT) is a good start for the government to attract the private sector in solving the waste problem on the national level; however, the FIT is not sufficient to cover the capital expenditure requirements of such projects without a gate-fee system," El Hassanein explained.

EGYPT HAS MANY SOURCES OF SOLID WASTE, WHICH MAKES IT A POTENTIALLY ATTRACTIVE MARKET FOR INVESTORS WHO CAN GENERATE AND SELL ENERGY FROM WASTE.

Nuclear Waste

Egypt plans to establish its first nuclear power plant in El Dabaa city by the year 2028. The country will be producing nuclear waste that require very specific methods of handling. The country can use this waste in order to generate more power. Uranium isotopes continue to be present within used nuclear fuel. These, as well as plutonium isotopes found inside the reactor, can be processed and used to generate additional energy. "Reprocessing allows for a significant amount of plutonium to be recovered from used fuel, which is then mixed with depleted uranium oxide in a MOX fabrication plant to make fresh fuel," according to the World Nuclear Association.

Egypt may be able to export nuclear wastes to other countries that have the facilities to reprocess these wastes and reuse them in nuclear reactors. The IAEA, however, imposes strict controls on the export of nuclear material. In addition, many countries refuse to import radioactive waste, while some (such as France, Russia and the UK) import fuel for reprocessing.

Sustainable Future

In order for Egypt to build a sustainable future through the waste-to-energy industry, the country needs to attract further investment from private sector companies. Egypt needs to agree with investors on an attractive FiT. In addition, the country needs a clear legal frame for the waste management sector. Managing waste is vital for the waste-to-energy industry. However, waste management is challenging due to "the lack of effective legislations, a coherent and direct legal framework, in addition to the limited funds and the inability of municipal authorities to provide reliable services cost-efficiently," according to Mohamed Ibrahim and Nanis Abd El Monem Mohamed.

It is not only important to encourage waste management investments through legal frameworks, but it is of a great value to attract funds through a stable framework for the waste-to-energy industry. "The Egyptian government is working hard on re-organizing the waste industry and providing the adequate legal and institutional framework for attracting private sector investors; the financing of such projects is available from local banks and international financial institutions," El Hassanein, said. "However, the proper commercial framework is yet to be implemented in order to guarantee the survival of the model. Without a gate-fee for waste-to-energy projects, the model is just not feasible," he added.

The waste-to-energy industry is a good way for managing Egyptian waste. Investing more in the industry will help Egypt achieve its energy mix plans, and reach a future built on sustainable means of generating energy. While the Egyptian government is taking steps to attract investments in the waste-to-energy field, there remain several important financial and legal aspects to be tackled.

THE FUTURE OF ELECTRIC CARS IN EGYPT

By Omnia Farrag

The Egyptian electric car market has witnessed significant developments in 2018. In February, the country's first electric vehicle charging station opened at a state-owned Wataniya gas station on the Cairo-Suez highway. Two months later, BMW distributor Bavarian Auto presented the BMWi, the first electric car to be exhibited in Egypt. The car will be available in the Egyptian market in less than a year, Mohammad El Ghazaly Harb, Marketing and Product Manager at BMW Egypt, told Egypt Oil & Gas.

BMWi is not the only electric vehicle that is expected to enter the Egyptian market over the next year. Volkswagen will export one of its electric cars to Egypt in January 2019, Hyundai will introduce one of its electric models within 2018, while KIA and Nissan models are expected to be available soon, Mohamed Badawi, Revolta Egypt's CEO, told Egypt Oil & Gas.

The electric vehicles technology company Revolta Egypt owns the Wataneya charging station. The company now has 17 charging stations in the country, according to Badawi. Revolta Egypt has ambitious plans to cover almost all of Egypt within the coming two years. "By the end of 2018, we aim to have 65 charging units in seven governorates, including Cairo, Giza, Alexandria, Port Said, Ismailia, Suez, and the Red Sea. Then, in 2019, we will cover the whole Delta and, in 2020, we will cover Upper Egypt and South Sinai," he explained. Badawi further disclosed that "The first batch of e-cars will be available for purchase by the end of June or the beginning of July," and the company plans to sell at least 250 cars within 2018.

Charging vs. Filling

The charging cost is the main competitive edge of electric cars when compared with the gas-powered vehicles, especially at a time when the Egyptian government is gradually removing fuel subsidies. The government plans to lift fuel subsidies completely by 2020 following its loan agreement with the International Monetary Fund (IMF). A few days before signing the agreement in November 2016, the government raised the prices of all fuel types. Over the following seven months, the price of 92-octane benzene, the most common car fuel for household cars in Egypt, increased by almost 100%: from EGP 2.6 to EGP 5 per liter. Fuel prices will further increase within fiscal year (FY) 2018/19, since the Egyptian government is planning to decrease the value of fuel subsidies by a quarter, according to the government's draft 2018/19 financial budget.

Household and commercial electricity prices also increased in July 2017, and, according to government, plans prices will increase further in FY 2018/19 after the government halves electricity subsidies. While it is not yet clear how the cuts will be apportioned between the household and commercial sectors, private sector companies – such as charging station operators – are likely to pass any electricity price increases onto the consumer, making it more expensive to charge an electric car.

Badawi said that the cost of fully charging the battery of an electric vehicle depends on its model, but the average is currently EGP 50. "How long the battery lasts varies from a model to another, but it ranges from 150 km to 600 km," Badawi explained. He added that Revolta will offer two years of free charging to all its new customers. The price quoted by Badawi is significantly cheaper than gas-powered cars. It costs an average EGP 225 to fill a car running on 92-octane benzene in comparison.

Vehicle Prices

Although comparing charging/filling costs favors electric cars, comparing the vehicles prices favors gas-powered cars. Badawi admitted that electric cars are expensive. "The cheapest brand new electric car costs around EGP 750,000. This price is not affordable for everyone in Egypt," Badawi said.

The only ways to have affordable electric autos in the Egyptian market are either to manufacture them or to import used ones. Since Egypt does not have the infrastructure to produce electric cars, importing used electric cars remains the only available option. This option was illegal until March 2018, when the Minister of Trade and Industry, Tarek Kabil, issued a

> REVOLTA EGYPT AIMS TO SELL 250 ELECTRIC CARS DURING THE REST OF 2018.

decree to allow importing used electric cars that are less than three years old. “Imports of used vehicles are not allowed according to general rules, but an exception has been made to promote the use of environment-friendly cars in Egypt,” Kabil said.

Badawi supports this decision saying, “A used electric car costs EGP 300,000. This is the same price of an average brand new gas-powered car in Egypt nowadays like the Chinese brands.” Kabil’s decision will help to make electric cars more accessible to consumers. “This is how most of the countries worldwide started to import electric cars. For example, 70% of electric cars in Eastern Europe are used cars imported from the US and the rest of Europe. Our neighbor Jordan, during the last two years imported around 10,000 used cars from Europe and US,” Badawi explained.

Ownership Cost

Customers usually prefer buying new cars. Used cars are more likely to breakdown and need more money for maintenance than new ones. However, Badawi says that this is not the case with used electric cars. “Electric cars have longer time spans than gas-powered cars. So, if you buy a used electric car, it will be as good as the brand new ones as they do not breakdown as often as the used gas-powered cars,” he explained.

The cost of electric car ownership is less than owning a gas-powered car. The latter requires frequently replacing parts such as fan belts, air filters, timing belts, head gaskets, cylinder heads, and spark plugs, in addition to changing its motor’s oil. This is not the case in electric cars, as they do not need many components to operate, according to Constance Douris, Vice President of the US-based think tank The Lexington Institute. “Electric motors only have one moving part, while engines in traditional automobiles contain dozens,” Douris wrote for Forbes. Electric cars still need maintenance, such as replacing windshield wipers, suspension, and tire rotation. Yet, the maintenance is less often than that required for gas-powered cars and less costly, Douris added.

Challenges in Adopting E-Cars

Introducing electric cars in Egypt is not an easy task. “It needs your effort to educate everyone about what is unique about e-cars and why should we switch to them. It is not another car with different options. It is the whole concept of convincing customers of why they should shift to electric,” Harb said.

He advised the government to give incentives to electric cars users, assemblers, and importers to encourage spreading them, which is the case in many other countries. “We can follow the scheme of countries such as UAE, Morocco, or European countries… In these countries electric cars users are given certain taxation, certain incentives, and certain discounts. Some countries even offer money back value if you purchase an electric car,” he explained.

Manufacturers of electric cars and electric charging units faced logistical challenges bringing the products in Egypt. “The electric car for example doesn’t have a category in Egyptian customs. When they arrived in the country, even the importers will tell us that they don’t know which ministry has to certify the car,” said Naji Jreijiri, Managing Director of ABB Group in North & Central Africa. “I think the institutions need to be as fast as the development of the technology so that they can facilitate, instead of being a barrier,” Jreijiri commented.

Harb echoed Jreijiri regarding facing challenges to get the cars and charging units in Egypt. Harb said that it took BMW two years to get its electric car model BMWi into the country. “We started this project in 2016 with training and preparation in order to bring the car here. We still have challenges such as registration, incentives, taxes, because these aspects are not settled,” he added.

Revolta as well faced similar challenges. “The first cargo [of electric chargers] was kept in the port for two months and a half because they were the first electric charging units to arrive in Egypt. But things became smoother for next cargos, because we contacted the Ministry of Trade,” Badawi stated.

Disadvantages of E-vehicles

Electric cars are known to be environmentally-friendly because they cause less air pollution and produce less greenhouse gas. A report by the Ricardo consultancy firm cited by The Guardian shows that electric cars emit 20% less greenhouse gas during their live cycle when compared with petrol cars. Nonetheless, electric cars still have bad environmental effects. The same study by Ricardo consultancy pointed out that the production of an average electric vehicle will involve emissions amounting to the equivalent of 8.8 tons of CO_2, while the production of its gas-powered counterpart produces 5.6 tons of CO_2. Evidence about electric cars’ overall carbon footprints is inconclusive. In contrast, a study by the Institute for Energy and Environmental Research (IFEU) cited by Deutsche Welle found that the overall carbon footprint of electric cars is similar to that of petrol ones.

Electric cars also have other harmful effects beyond CO_2 emissions. The batteries are made from minerals such as copper and cobalt, and rare earths like neodymium. These minerals are imported from countries like China and Congo, where mining activities are accompanied by both human rights violations and ecological devastation.

These studies demonstrate that, while electric cars may provide environmental benefits on the road, their production involves questionable processes that also harm the environment in their own ways.

Welcome to Egypt

Promoting electric vehicles in Egypt will help reduce the consumption of petroleum products, a process which goes hand-in-hand with the government’s plan to decrease its petroleum imports 10% by 2019. At the microeconomic level, the availability of inexpensive used electric cars will make consumers consider them a budget-friendly option in terms of cheaper charging and ownership costs. There is evidence to suggest that the production of electric cars may also harm the environment – although to what degree is not yet known. What is undeniable is that electric cars produce less greenhouse gas during usage than their petroleum counterparts. Buying used cars produced overseas is therefore a cost-effective and environmentally-friendly way of introducing electric cars to Egypt in a big way.

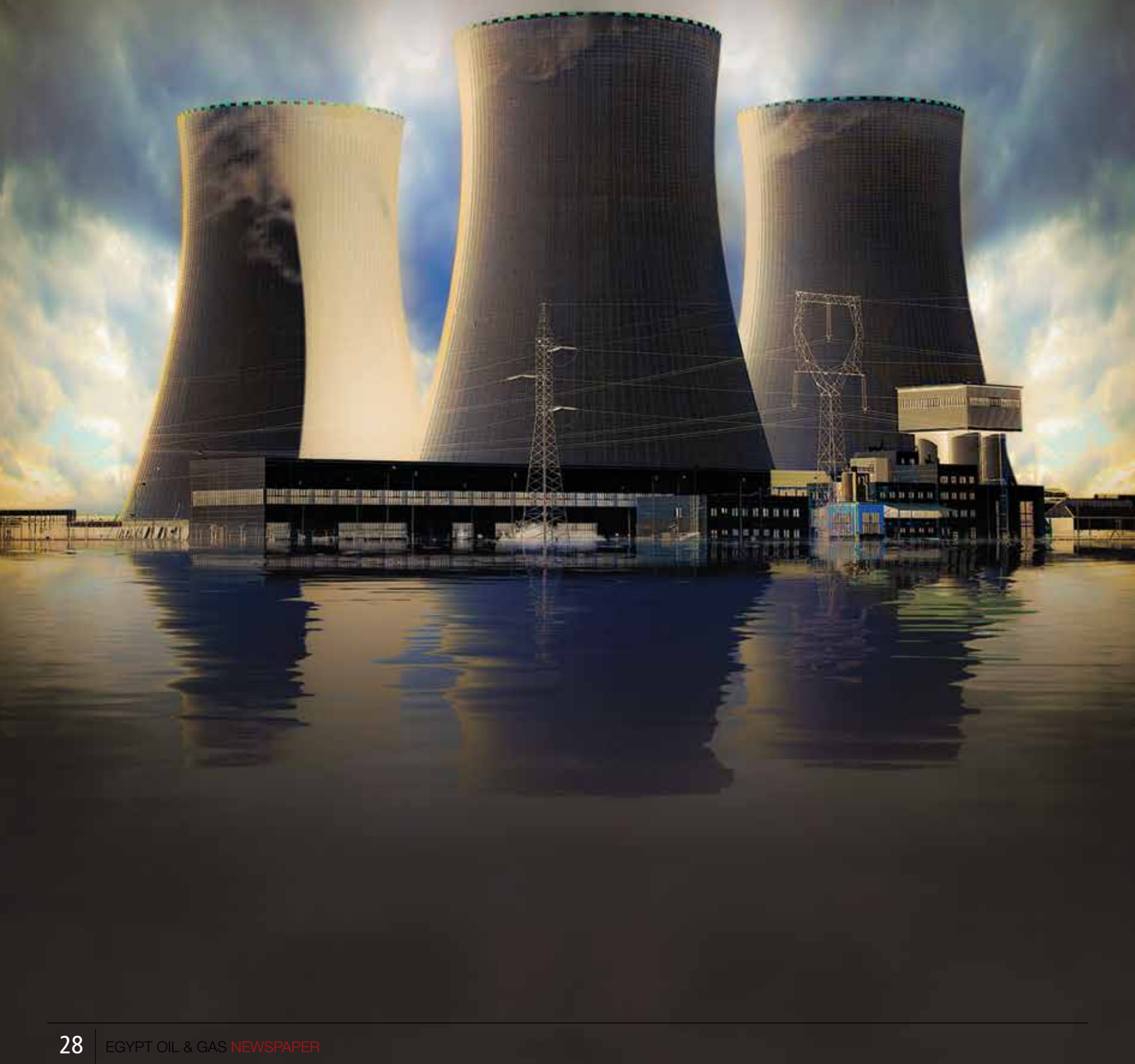
> “We can follow the scheme of countries such as UAE, Morocco, or European countries… In these countries electric cars users are given certain taxation, certain incentives, and certain discounts,”
>
> **MOHAMMAD EL GHAZALY HARB, MARKETING AND PRODUCT MANAGER AT BMW EGYPT**

THE DABAA

PROJECT IN NUMBERS:

Is Nuclear Energy the Right Option for Egypt?

By Omnia Farrag



Over the past few decades, nuclear energy projects have increasingly been seen by developing countries as an effective means of attaining western standards of development. According to the World Nuclear Association (WNA), 45 developed and developing countries are currently considering building nuclear reactors. More than half of these countries already have concrete plans to do so.

Egypt first considered establishing a nuclear power plant in 1955. Dabaa, a city 130 km northwest of Cairo on the Mediterranean coast, was chosen as the site for the facility. German, French, and American companies were originally chosen to build the facility in 1986, and Australia and Niger were approached to provide the uranium. However, following the Chernobyl catastrophe in the same year, the plan was put on hold. After several attempts to bring the project online, Egypt has recently signed new agreements to develop the project, bringing up discussions on whether nuclear power is a cost-effective alternative to diversify Egypt's energy sector.

ESTABLISHING THE PLANT

The Egyptian nuclear cooperation with Russia dates back to 2003, when a cooperation agreement was signed with Russian nuclear energy company Rosatom. The plan, however, was delayed several times. In 2013, Egypt approached Russia to renew its nuclear cooperation agreement, and later in 2017 the plan for the Dabaa plant was resurrected. Egypt took the final step to establish the Dabaa plant on December 11, 2017 when it signed the final contract confirming Russian involvement in its construction. The deal is comprised of four separate agreements governing the construction of the plant, the fuel supply, the construction of storage facilities for consumer fuel, and the technical support and training during the plant's first 10 years of operation.

While the Dabaa site can accommodate a maximum of eight reactors, the contract permits Rosatom to construct four third-generation 1.2GW reactors by 2029, and supply them with nuclear fuel for their entire 70-80-year lifespan.

Construction will start once Rosatom obtains the necessary approvals of location and designs from the Egyptian Atomic Energy Authority (EAEA), which are prerequisites for issuing the plant's commercial licenses. Rosatom's CEO, Alexei Likhachev, stated on March 2018 that the construction of the power plant may start in 2020. Electricity Minister Mohamed Shaker stated on December 11 that construction of the first nuclear reactor will finish in 2026, while the following three units will all be online by 2028.

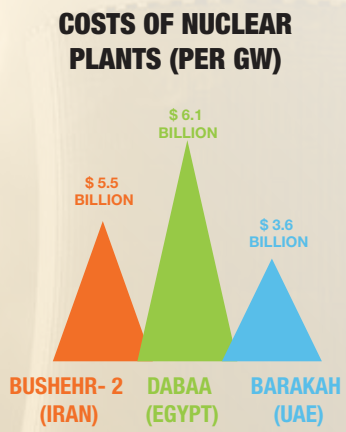
COST OF THE PROJECT

The total cost of the plant is estimated to be around $30 billion. Russia is providing Egypt with a loan to cover 85% of the cost while the Arab republic will cover the remainder in the form of installments, Likhachev has stated. Reuters reported in 2017 that Russia will extend a $25 billion loan to Egypt; however, other media groups cited a lower figure of $21 billion. Sources at the Ministry of Electricity told Daily News Egypt that Egypt was scheduled to receive the first tranche from Russia in January 2018. Yet, the ministry did not announce receiving the installment until press time. Egypt Oil & Gas contacted the ministry and the Egyptian Atomic Energy Authority (EAEA) to confirm receiving the tranche, but both organizations stated that they cannot disclose the project's details.

> THE TOTAL COST OF DABAA NUCLEAR PLANT IS ESTIMATED TO BE AROUND $30 BILLION.

Egypt will repay the loan at 3% interest over 22 years in 43 installments. Crucially, Russia has given Egypt a 12-year grace period on the loan, meaning that the first repayment will not be due until 2029. This means that if the loan's value is $25 billion, Egypt will pay Russia a total of $70.3 billion in nominal terms, or around $3.2 billion per year, according to Middle East Economic Survey (MEES) analysis cited by the Washington Institute for Near East Policy. Based on these figures, 1GW of generating capacity will cost Egypt $6.1 billion.

MEES's analysis argues that this cost per GW is high in comparison to other nuclear projects currently underway in the region. Iran's Bushehr-2, also being built by Rosatom, will cost the Iranian government $5.5 billion per GW, while the UAE will pay just $3.6 billion per GW for the construction of their Barakah reactors.



TRAINING EGYPTIAN WORKERS

The past few years has seen a number of joint Egyptian-Russian initiatives to improve the quality of Egypt's technical nuclear education, and to make the study of nuclear disciplines more accessible to Egyptian students. The National Research Nuclear University MEPhI, a Moscow-based university partnered with Rosatom, signed a Memorandum of Understanding (MoU) with Alexandria University in March 2017 to deliver joint research programs. During the Russian delegation's visit to Egypt, talks were held with representatives from Egyptian universities regarding the creation of a training program for Egyptian students that would enable them to work at Dabaa in the future. At the moment, there are 26 Egyptian students undergo training in MEPhI in nuclear specializations.

There is also a fellowship program which has been running since 2014, offering students with nuclear-related majors (such as physics, engineering, and chemistry) the opportunity to complete their degree at one of the Rosatom-affiliated universities, according to Arab Finance website. As well as studying nuclear disciplines, Egyptian students also learn Russian, so that they can communicate easily with Russian experts running Dabaa. Around 40 Egyptian students have benefited from this fellowship since 2014.

Additonally, nuclear-related bachelor's and master's degrees are now available at some Egyptian universities under the guidance of Rosatom, such as the joint master's program of Nuclear Engineering taught by the Egyptian-Russian University and Tomsk Polytechnic University in northern Russia. The first graduates of this program received their diplomas in June 2017.

Egypt has also embarked on nuclear education projects without Russian assistance. Egypt opened the Atomic Technical School in Marsa Matrouh in July 2016. Its first class started in November 2017 with 75 enrolled students split between three classes. Students were based at the Advanced Technical School for Maintenance Technology, Nasr City, Cairo, during the first semester, while the school at Marsa Matrouh was being built. After graduating from the course, all students will be given positions working in the Dabaa plant.

DABAA'S KEY INFORMATION

Total cost	$30 billion
Power	4.8 GW
Lifespan	70-80 years
Completion	2026-28

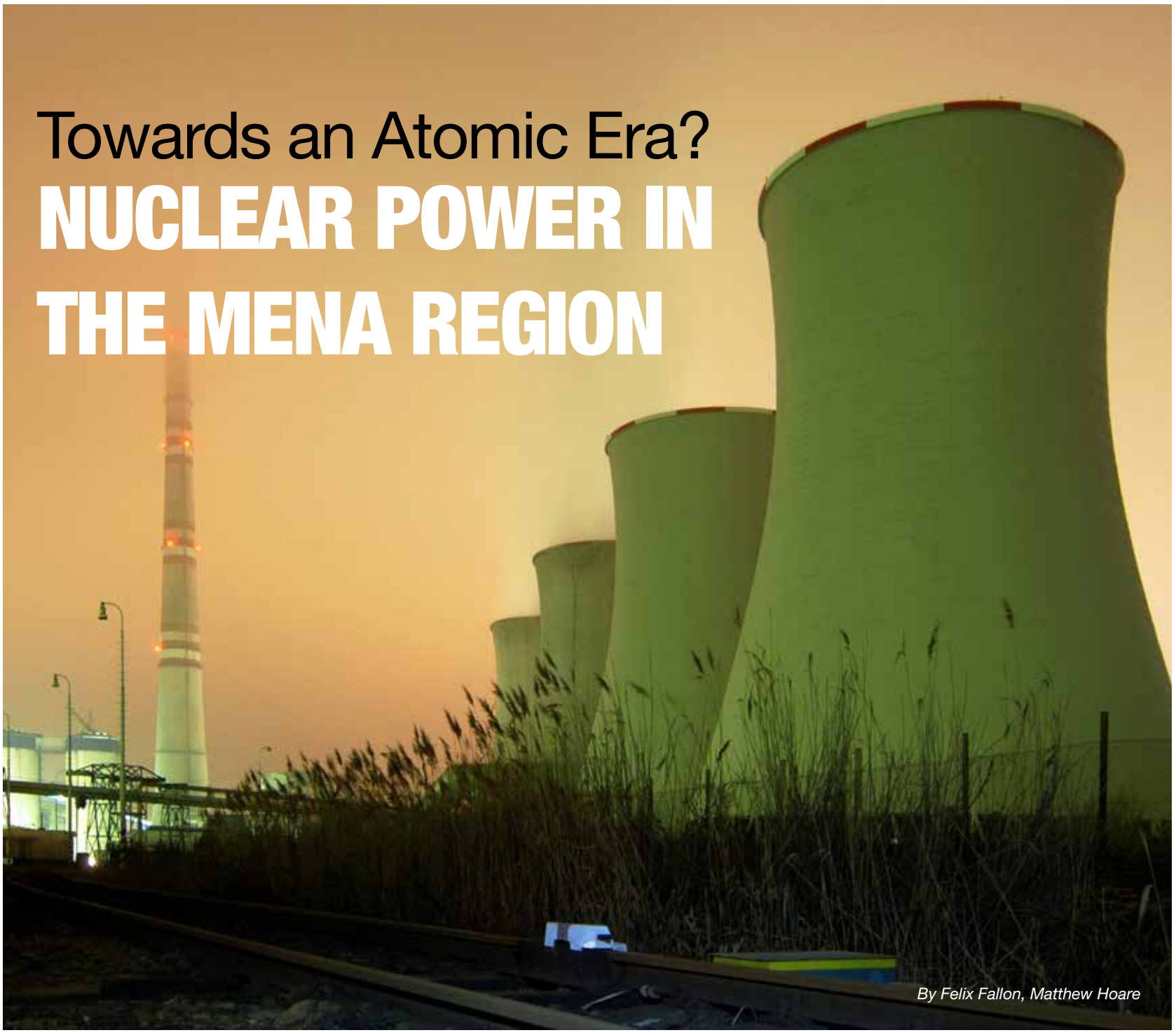
IS NUCLEAR COST-EFFECTIVE?

The World Nuclear Association (WNA) described nuclear power as "cost competitive with other forms of electricity generation, except where there is direct access to low-cost fossil fuels." This was the case when the Egyptian government began taking steps to realize the Dabaa project back in 2013. Nevertheless, this has no longer been the case since the discovery of Zohr natural gas field in August 2015, which will allow Egypt to reach natural gas self-sufficiency by 2020, according to Minister of Petroleum Tarek El Molla's latest statement reported by Al Ahram.

In addition, despite the low cost of operating nuclear power plants and the low risk of significant increases of operating costs, building them is both time and capital-intensive. The Dabaa plant will take 12 years before all of its reactors are operational. Establishing solar and wind farms are relatively quick in comparison, depending on the size of the facility. Comparing the cost of Dabaa to the Benban complex, the government's flagship solar facility in Aswan governorate, it is evident that Dabaa is significantly more expensive than establishing solar installations generating comparable amounts of electricity. Benban, once fully operational, will produce between 1.6 GW and 2 GW of electricity, and according to the New and Renewable Energy Agency, will have costed between $3.5 billion and $4 billion to construct. Constructing a solar facility capable of generating the same amount of power as Dabaa (around 4.8 GW) could therefore cost between $9.6 billion and $10.5 billion, significantly cheaper than the projected $30 billion needed for the Dabaa plant.

Dabaa's cost can also be compared with the $9 billion deal signed between Egypt and Siemens in 2015. The German company agreed to construct gas and wind plants that are expected to add an extra 16.4 GW to the Egyptian electricity grid. Although it is not mentioned whether the gas fuel cost is included in the deal or not, the huge gap between the cost and output of the two projects are still evident.

Egypt faced a major power deficit in 2013, which prevented it from meeting its gas exporting commitments and forced it to resort to either importing fuel or taking it in form of aid. That is why, over the past two years, the Egyptian government has signed many deals to build different types power plants and to increase its oil and gas production. The Dabaa power plant is a part of the government's strategy to secure and diversify the country's energy supply. Although Dabaa will eventually produce longstanding benefits to the Egyptian economy and its society as a whole, questions remain over the cost of the project when other more cost-effective means of electricity generation are available.



Towards an Atomic Era?

NUCLEAR POWER IN THE MENA REGION

By Felix Fallon, Matthew Hoare

Nuclear power generation has fallen out of favor across much of the world. It has declined 7% since 2006, and its share of energy mix has been decreasing steadily alongside an increase in the use of fossil fuels. There are several reasons for this. Since the oil price crash in 2014, nuclear power has become expensive in comparison to hydrocarbons. The costs of generating electricity from renewable sources are also falling rapidly, and according to a report by the International Renewable Energy Agency, will soon become cheaper than fossil fuels. Secondly, the 2011 Fukushima disaster presented further evidence of the potentially cataclysmic effects of nuclear power generation. Following the meltdown of the Dai-ichi reactors, Germany announced plans to close all 17 of its nuclear plants by 2022, while Japan shut down 41 of its reactors. Despite the global decrease, there has been a sharp rise in the number of nuclear power projects either under construction, planned, or proposed in the MENA region – as much as 48 have been put on paper in the last few years.

WHY NOW?

The MENA region is seemingly bucking the global trend. While much of the world is moving away from nuclear, countries in the region are making staunch efforts to add nuclear power to their energy mix.

Jonathan Cobb of the World Nuclear Association told Egypt Oil & Gas that this trend is being caused by the rapid economic growth in certain MENA countries. “With this economic growth has come a significant increase in demand for electricity, and modern nuclear power plants generate a lot of power,” he explained. The Barakah power plant in the UAE demonstrates this power and efficiency of nuclear energy. When Barakah’s four reactors are finished, 25% of Abu Dhabi’s electricity needs will be met from a single site.

Furthermore, gas and petroleum-exporting countries may see significant economic benefits to expanding their nuclear sectors. “By reducing domestic demand for hydrocarbon fuels, nuclear generation may allow more production to be exported,” Cobb explained.

Diversification strategies are also playing a key role in the moves by Arab states to integrate nuclear into their energy portfolios. Cobb says that nuclear generation is playing a “key part” in this process, acknowledging that there are many reasons for states wanting to diversify their energy supplies; from limited reserves, to over-dependency on a single energy source, to concerns about climate change.

SAUDI ARABIA

Saudi Arabia’s venture into the nuclear power industry is a part of Crown Prince Mohammed bin Salman’s Vision 2030 modernization project for the kingdom. According to the King Abdullah City for Atomic and Renewable Energy, the kingdom is pursuing a diversified energy mix because of the increasing demand for energy from the residential and industrial sectors, and to lessen the country’s dependence on hydrocarbons.

Around 25% of Saudi oil production is used to generate electricity for domestic use. The demand for electricity is projected to substantially increase, but oil production is not. This means that by 2030, a large amount of the country’s oil will go towards domestic power generation. The country’s current generating capacity is above 30 GWe, with demand increasing by 8-10% per year. Assuming that current rates continue, demand is expected to reach 70 GWe by 2020 and 120 GWe by 2032, partly driven by an increased need for water desalination.

As solutions to this problem, significant renewable and nuclear energy projects are being established. The nuclear energy plan initially approved by the

Saudi government in July 2017 mandates the construction of 16 reactors across the next 20-25 years, costing upwards of $80 billion. According to estimates, these projects will produce 18 GWe (15% of the country's energy demand) by 2040.

The current geopolitical realities of the Middle East may also affect Saudi policymaking towards the nuclear sector. Although Saudi Arabia is a signatory to the Nuclear Non-Proliferation Agreement, Foreign Minister Adel al-Jubeir has signalled that the country is willing to pursue nuclear weapons should Iran restart its program. "We will do whatever it takes to protect our people. We have made it very clear that if Iran acquires a nuclear capability we will do everything we can to do," he told CNN on May 9.

IRAN

Of all the MENA countries that are now seeking to develop their nuclear industries, Iran is the only country with preexisting nuclear capabilities. The country's nuclear program originates from the 1970s when the Shah still ruled from Tehran; a time when Western nations were much more inclined to provide political and financial support for Iran's nuclear sector. However, since the 1979 revolution, Iran's nuclear program has been subject to far greater international scrutiny. It was only in 2015 with the signing of the Joint Comprehensive Plan of Action (JCPOA) that the Iranian government could feasibly look to resume the development of its peaceful nuclear program.

The history of Bushehr, the country's only nuclear plant, has been plagued with disruptions. Although construction originally began in the 1970s, the revolution, the Iran-Iraq conflict, and Tehran's subsequent international isolation meant that the reactor only began generating power in May 2011, and was only connected to the national grid in September of that year. Russia finally handed over full control of the plant to Iran in September 2013, marking the beginning of its commercial operations.

Iran plans to expand the Bushehr plant by adding another two reactors. Bushehr's single reactor currently produces 1000 MW gross, while Bushehr 2 and 3 will each generate 1057 MW gross. The entire facility will therefore generate around 3100 MW upon completion – between 8 and 10% of the country's energy needs. The construction of Bushehr 2 is scheduled to start in 2019 and it is projected to begin commercial operations in 2024. Work on Bushehr 3, meanwhile, will start in 2020, with commercial operations starting in 2025. Bushehr 2 and 3 will be built by Rosatom at a cost of around $10 billion. Smaller facilities on the Makran coast are also planned. In 2015 the Atomic Energy Agency of Iran announced that a Chinese company would construct two small reactors, generating 100 MW each.

Although the country's electricity demand is rising by around 4% each year, Iran is one of the richest countries in the world in terms of proven hydrocarbon deposits. According to analysis by BP, the country possesses around 18% of global natural gas reserves. The country also exports sizeable amounts of oil; in April 2018, Iran shipped an average 2.6 million barrels of crude per day. Given this wealth, Iran clearly has different reasons for increasing its use of nuclear power than countries which are more dependent on energy imports such as Jordan and Egypt.

Analysis by the Oxford Institute for Energy Studies argues that it was the experience under the international sanctions regime that has prompted the country's leadership to diversify its energy supplies. Iran's economy has felt the full-force of UN and US economic sanctions over the past decade; an experience that has highlighted the importance of preemptively developing the country's domestic capabilities should sanctions ever be restored. Just last month, these fears were proven correct when US President Donald Trump reneged on the JCPOA and announced the re-imposition of sanctions. As Washington takes a more belligerent position towards Iran, it is likely that there will be a renewed focus on the so-called 'resistance economy' – of which generating energy outside of the oil and gas markets is an important component.

UAE

Like Saudi Arabia, the UAE's nuclear energy program has been born from a desire to diversify its energy supplies and reduce its reliance on hydrocarbons to meet domestic energy needs.

In 2008, the Emirates published a policy on nuclear energy, which projected an increasing electricity demand from 15.5 GWe in 2008 to over 40 GWe by 2020. A 2017 report on the UAE energy strategy states that the Emirates' investment in nuclear energy will help the UAE to develop more diversified and environmentally-friendly energy solutions for both domestic use and foreign distribution. The UAE's intention is for clean energy to make up 50% of its energy mix by 2050: 44% renewables, 38% gas, 12% clean coal and 6% nuclear.

In 2009, the Emirates Nuclear Energy Corporation (ENEC) accepted a $20 billion bid from the Korean KEPCO-led consortium to build and run four APR-1400 reactors on one site in Barakah. Construction for the first reactor started in 2012 and is expected to be operational by the end of 2018. All four are planned to be producing power by the end of 2020.

However, unlike Saudi Arabia, the UAE has been a proponent of nuclear non-proliferation. In 2009, UAE President Sheikh Khalifa bin Zayed Al Nahyan stated: "The model we have adopted is consistent with our support of and conformity with the Non-Proliferation Treaty, and our rejection in principle to the existence of weapons of mass destruction in the Middle East." Accordingly, the country has opted not to handle uranium conversion, enrichment and fuel fabrication, but, to manage its nuclear power program based on contractor services - with the plant operator, KEPCO, being responsible for uranium mining and the fuel cycle.

JORDAN

Unlike other nuclear-seeking MENA states, Jordan is a net energy importer. The kingdom imports more than 95% of its energy, spending around 20% of its annual gross domestic product on meeting its energy needs. This overwhelming reliance on energy imports means that the country is far more exposed to regional instability than the oil monarchies of the Gulf. "We lost the oil from Iraq, natural gas from Egypt, and the country has been bleeding and losing on an average $3 billion every year," Khalid Toukan, head of the Jordanian Atomic Energy Commission, said back in 2015. It is this susceptibility to regional events outside of its control that has been one of the motivating factors in forcing the government to begin generating more electricity within its borders.

In 2007, the government published its national energy strategy, which outlined plans to diversify its energy supplies. The document proposes that by 2020 the country will source 29% of its energy from natural gas, 14% from shale, 10% from renewable sources, and 6% from nuclear. In the same year, the government set up the Committee for Nuclear Strategy, a body tasked with delivering the government's nuclear plans. The committee envisioned that nuclear power would produce 30% of the country's energy by 2030.

From these plans, Jordan signed a $10 billion nuclear deal with Russian nuclear company Rosatom. The deal paved the way for the construction of two nuclear reactors in the north of the country; each capable of producing 1000 MW each.

Following the agreement, Toukan explained positioned nuclear energy as a key strategic tool for the government to lessen its dependency on hydrocarbon imports and improve the country's energy security. "Nuclear power is definitely one of the solutions to graduate from total dependency on oil and gas," he said.

However, more than three years later in May 2018, a Jordanian government official signaled that the original plans for the 2000 MW plant would be shelved in favor of smaller modular reactors. The anonymous source told The Jordan Times that financial issues had forced the government to scale back its initial plans. "Jordan is now focusing on small modular reactors because the large reactors place financial burden on the Kingdom and in light of the current fiscal conditions we believe it is best to focus on smaller reactors," he told the newspaper. Jordan has only recently signed a feasibility study with Rosatom so not much is yet known about the revised plans. What is evident is that the country's domestic energy shortages have played a crucial role in the government's decision to develop its nuclear sector.

TOWARDS A NEW NUCLEAR ERA?

The need for energy diversification, whether to fully reap the benefits of lucrative hydrocarbon reserves through exporting, or to become more self-sufficient in providing domestic power, have led to considerable investment in nuclear energy that complement existing hydrocarbon power generation and renewable energy programs.

Although nuclear power will still constitute a fairly small proportion of the region's energy mix, the number of initiatives over the past few years is unparalleled in the region's history. Despite the roughly 10-year build cycle of a nuclear plant and despite the high costs of construction, MENA states are evidently beginning to see nuclear power not just as a tool for satisfying policy needs, but also perhaps as a potent statement of power in a region beset by conflicts.

POWER PLANTS IN MENA

	Operational (MWh gross)	Under Construction (MWh gross)	Planned (MWh gross)	Proposed (MWh gross)	Uranium required (Tons)	% of current power generation
Egypt	----	----	2 (2400)	2 (2400)	----	----
Iran	1 (915)	----	4 (2200)	7 (6300)	157	2.1
Israel	----	----	----	1 (1200)	----	----
Jordan	----	----	2 (2000)	----	----	----
SA	----	----	----	16 (17,000)	----	----
UAE	----	4 (5600)	----	10 (14,400)	627	----

SOURCE: WORLD NUCLEAR ASSOCIATION

SCHLUMBERGER PAVES THE WAY FOR TALENTS

By Sarah Samir

A year ago, Schlumberger started the first phase of its protocol with the Egyptian Ministry of Manpower to train young technicians and to empower them to cope with work in the private sector. On May 7 2018, the company hosted a celebratory event in Cairo to honor 110 graduates from its Technician Development Training Program Protocol.The event celebrated the graduation of the third group of trainees and welcomed the fourth group. Schlumberger invests approximately EGP 10 million annually on the training program, according to the company's Education Services Training Center Manager, Heba Abaza. The protocol aims for training 100 people per batch over 4 months.

DIVERSITY & INCLUSION

Schlumberger supports diversity in its training program by including different genders and communities. "Schlumberger is always giving equal opportunities for employees as it supports equality and empowers women in the industry," Abaza said.

"The program is designed as a part of Schlumberger's corporate social responsibility for Egypt. All sectors of the Egyptian society need to be well represented. When the company found out that the program does not attract a lot of CVs from Egyptian Copts, it referred to the church to ask them to help Schlumberger reach the Egyptian Copts and have them present their CVs for the program in order to have the entire Egyptian society well represented," Hussein El Ghazzawy, vice president and managing director of Schlumberger Egypt & East Mediterranean, told Egypt Oil & Gas.

However, the company does not encourage quotas as part of its inclusion strategy. "Schlumberger does not have a quota of how many males, how many females or how many Copts join the program, in the next batch if there are 70% of good CVs belonging to females, then 70% females will join, El Ghazzawy noted. According to him, the first batch of trainees had 30% of women representation, the second batch had 45%, and the third batch had 46%. "Schlumberger gives equal opportunities to people regardless of their race, their nationality or their religion," El Ghazzawy added.

Female trainees faced some challenges during the program, including using the heavy machines. Yet, the company and trainers helped them overcome these challenges. "They taught us how to deal with others, how to handle the machines and be responsible for them. They taught us how to assemble any machine from scratch and to install it, and when we are carrying anything, how to carry it right," Moshera Mohamed Abu Ouf, one of the third batch members, described to Egypt Oil & Gas.

Schlumberger also exerts effort in including people from different governorates across Egypt. "The company encourages the full geographical representation for all of Egypt's governorates," El Ghazzawy highlighted.

RAISING AWARENESS ABOUT SAFETY

Safety has been a main concern for Schlumberger throughout the training program. After receiving soft skills training for six weeks, "the trainees started receiving health, safety, and environment training from Schlumberger," Abaza pointed out.

"The safety training … taught me how to deal with the machines and to take all the needed precautions. and it made me understand that the company is prioritizing workers' safety over the machines' safety," Abdelrahman Ihab, a member of the third group, told Egypt Oil & Gas.

El Ghazzawy emphasized the company's devotion to the safety of its employees. During Ramadan, Schlumberger is spreading safety awareness among trainees, in order to prevent any harm that might occur when people work while fasting.

Additionally, the company is keen to bridge the gap between education and practice. "It is very important to meet the needs of the industry with education, as no one wants people to study something and find a work that is totally

"The program is designed as a part of Schlumberger's corporate social responsibility for Egypt. All sectors of the Egyptian society need to be well represented."

Hussein El Ghazzawy, Vice President and Managing Director of Schlumberger Egypt & East Mediterranean

"The safety training ... taught me how to deal with the machines and to take all the needed precautions."

Abdelrahman Ihab, Trainee

different," El Ghazzawy pointed out. When employees study and get trained on the same technologies and risks they might face, the safety of the employees is more likely to be ensured.

TOWARDS A FRUITFUL FUTURE

Schlumberger further exerts effort to help young technicians graduated from the training program to pursue their careers. The company "hired 16 graduates, including four young women, and will hire more. Moreover, Ashraf Abdel Gawad, head of Qarun Petroleum Company, hired five graduates," El Ghazzawy said, explaining that Schlumberger established a database about the trainees to help them find jobs in other firms.

The Egyptian Minister of Manpower, Mohamed Safaan, urged other oil and gas companies to take the same initiative as Schlumberger. According to him, Egypt "needs at least 10 more companies to do the same experiment, so instead of graduating 300 youth each year, they graduate at least 10,000 youth with the same quality of training."

The Technician Development Training Program Protocol empowers a new generation of technicians who can handle challenging tasks and keep themselves and their colleagues safe.

This technical preparation strengthens Egypt's position in the oil and gas sector and helps the country become a global hub for professional technicians who could impart knowledge and expertise to the rest of the world.

ABB EXHIBITS NEW DIGITAL SOLUTIONS AT DIGITAL ABILITY SHOW

By Omnia Farrag

The pioneering technology leader ABB exhibited the world's first truly collaborative industrial robot during its Digital Ability Show, held in Cairo on May 8 and 9. YuMi, the collaborative, dual arm, small parts assembly robot, was displayed alongside other innovative digital solutions to optimize industrial operations in Egypt's energy sector.

The Show's inauguration was attended by the First Undersecretary of the Ministry of Electricity and Renewable Energy, Khaled El Destawy, Sweden's Ambassador to Egypt, Jan Thesleff, and Switzerland's Ambassador to Egypt, Paul Garnier.

In his speech, on behalf of the Electricity Minister Mohamed Shaker, El Destawy praised ABB's efforts in supporting the local electricity and renewable industry, which comes hand-in-hand with the ministry's plans to increase the share of local products used in the energy sector.

Besides YuMi, ABB further displayed its motor censors, which enable users to supervise the motors through the internet. "This small device, if inserted in a motor, can track its performance, which means that the engineer does not have to travel for few kilometers to check the problems of the motors," Naji Jreijiri, ABB's Managing Director in North and Central Africa, explained to Egypt Oil & Gas. He emphasized that the censors save time in terms of transportation and prevents haltting motors for a long time.

In addition to ABB's technology, the Show also brought the Bavarian Auto Group's BMWi, the first electric car to be introduced in the Egyptian market. The German e-car is expected to be available in less than a year, Mohammad El Ghazaly Harb, BMW Marketing and Product Manager at Bavarian Auto, told Egypt Oil & Gas.

During the event, ABB stressed that the company is working in collaboration with various Egyptian state apparatus in order to install the most updated technologies in the Egyptian process industries. "We are working with the Ministry of Higher Education in some universities, such as Cairo University and Ain Shams University, to upgrade the labs with latest technology of automation system in order to prepare the students for the industry," Jreijiri stated.

"As for the Ministry of Trade and Industry, it has its own technical schools, so we are also working with them in order to develop the trainers and change the curricular from the old mechanical technology to electronic technology," he added.

In the same context, ABB has signed a Public Private Partnership Agreement with the Egyptian Ministry of Trade and Industry, along with the Swiss and the Swedish Embassies in Egypt on May 13. As per the agreement, which will be valid for three years, technical training will be provided in collaboration with ABB.

ABB is a technology leader in electrification products, robotics and motion, industrial automation, and power grids, in addition to serving customers in utilities, industry and transport, infrastructure globally. The company is operating in more than 100 countries around the world and has been present in Egypt since 1920s.

> "We are working with the Ministry of Higher Education in some universities, such as Cairo University and Ain Shams University, to upgrade the labs with latest technology of automation system in order to prepare the students for the industry,"
>
> **NAJI JREIJIRI, ABB'S MANAGING DIRECTOR IN NORTH AND CENTRAL AFRICA**

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EGYPT OIL&GAS NEWSPAPER

DEA EGYPT WINS EGYPT OIL & GAS RAMADAN SOCCER TOURNAMENT

The 12th edition of the Egypt Oil & Gas Ramadan Petroleum Soccer Tournament kicked off on May 27 with the participation of 12 oil and gas companies. AlMansoori, Dara, DEA Egypt, Maridive Group, Petronas, Petroshahd, SAPESCO, Schlumberger, TKIS Egypt, TOYOTA TSUSHO, Triangle Group, and West Bakr kept the ball rolling until June 1 at Cairo's Manaret El Farouk School.

In line with the tournament's tradition of promoting social values and charity, this year's event had very special guests on the bleachers. Egypt Oil & Gas invited orphans to watch the competition's final and distributed special gifts for the occasion of Ramadan.

The tournament ended with DEA Egypt taking the cup home after winning the first place, while AlMansoori took the second place and Schlumberger the third.

AlMansoori, second place winner

Schulumberger, third place winner

Orphans receive special gifts during closing ceremony

TOURNAMENT AWARDS

Best Player	Ahmed Madian - AlMansoori
Best Scorer	Mahmoud Amr - West Bakr, Khaled Sallam – DEA Egypt, and Ahmed Mostafa – DEA Egypt
Best Goal Keeper	Ahmed El Sayed Aly - Schlumberger
Best Coach	Moustafa - AlMansoori
Best Team Spirit	Petroshahd
Most Entertaining Team	DEA Egypt
Fair Play	West Bakr
Best Audience	AlMansoori

EGYPT'S ASTONISHING GAS RENAISSANCE

Wood Mackenzie
A Verisk Business

By Stephen Fullerton, Research Analyst, Middle East and North Africa Upstream Oil and Gas

Not long ago, Egypt's gas industry was in crisis. Production fell by a third in the three years to 2015; a top 10 LNG exporter in the prior decade, the country had by then become a top 10 importer. Nearly all available gas had to be diverted by the government to serve the domestic market.

As a result, export revenue dried up, the cost of gas imports soared and there was insufficient cash to pay contract commitments to E&P investors. Arrears ballooned to US$7 billion, and producers were becoming uneasy.

Today, happily, things are very different and investment is flooding back in. What happened to turn things around?

First, Egypt is one of the lucky countries geologically, endowed with enormous resource potential which has fostered an active industry for 150 years. Attention has shifted this century from traditional onshore heartlands and the Gulf of Suez, to the deeper water gas discoveries in the Nile Delta and Mediterranean. Eni's spectacular giant Zohr find in 2015 (22 trillion cubic feet) not only opened up a completely new play in the wider region, but really put Egypt back on the global E&P map.

There is plenty more to play for. We estimate Egypt's current resources at 3 billion barrels of liquids and 61 trillion cubic feet of gas. There is likely the same still to come in gas. Our yet-to-find estimates are around 1 billion barrels of liquids and 45 trillion cubic feet of gas, which puts Egypt fourth in the global rankings of prospective conventional offshore basins behind Brazil, Gulf of Mexico, and Nigeria.

An experienced senior Egyptian geologist I met in 2013 told me 200 trillion cubic feet will eventually be found in Egypt's Mediterranean waters.

Second, the investment climate is much improved, in spite of production sharing contracts (PSCs), which typically have among the highest government shares around. The key has been a canny approach in dealing simultaneously with gas pricing and PSC terms for individual projects. For years, Egypt's fixed gas price of US$2.73 per million cubic feet discouraged exploration and development, especially in the more prospective but higher cost deep water.

The government recognized the challenge of attracting capital post-2014 and set about providing returns that would work for investors. Gas prices for offshore developments have been negotiated project-by-project these last few years. BP's large-scale West Nile Delta project, which had languished in the front-end engineering and design stage for years, demonstrated this new, flexible approach to terms, leading to project FID in 2015.

The country has also emerged as an unlikely global leader in project execution. Eni's giant Zohr project was brought onstream on budget and just 30 months after discovery – a world record for a development of such scale. Internal rates of return (IRRs) for West Nile Delta and Zohr are both in the mid- to high teens by our calculation. The upshot is that Egypt's gas sales will return to last decade's levels of around 6 billion cubic feet per day this year, and climb to nearly 8 billion cubic feet per day by 2020 as West Nile Delta and Zohr reach plateau.

Dealing with the payment arrears has helped restore confidence across the industry. The government has tapped a US$12 billion IMF loan to pay off creditors, reducing the liability in each of the last five years – and it will be wiped out completely by the end of 2019.

Licensing processes have been sharpened up, with regular bid rounds, relinquished acreage recycled quickly and new opportunities to fuel interest among prospective investors.

Egypt has assumed unprecedented importance in Eni and BP's global portfolios in the short passage of time since 2015. It is now the third most important country position for Eni by value at US$9 billion, NPV10; and fourth for BP at US$11 billion, NPV10. Rosneft's acquisition of 30% of Zohr in 2016 suggests that the resource potential will draw other big IOCs and NOCs into Egypt and the wider East Mediterranean gas play.

Many other countries, including mature upstream provinces, are still struggling to attract investment after the downturn. Egypt's pragmatism towards its big projects shows that with will on both sides it is possible to get capital – and production – flowing again.

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PRIVATIZATION OF THE EGYPTIAN OIL SECTOR

The privatization process is not one clear and absolute economic proposition. It means different things in different parts of the world—where both the fundamentals of the economy and the purpose served by privatization may differ. It includes a wide range of different activities that covers the sale of public assets to private owners, the contracting out of services formerly provided by government owned organizations to private producers, and the entry by private producers into markets that were formerly public monopolies…., all of which imply a transfer of the provision of goods and services from the public to the private sector.

Most developing countries in Asia, Africa, and Latin America have been quick to jump on the privatization bandwagon, sometimes as a matter of political and economic ideology "as in our case", other times simply to achieve efficiency & hence raise revenue.

According to privatization's supporters, this shift from public to private management is so profound & will result in significant improvements: boosting the efficiency and quality of remaining government activities, reducing taxes, and shrinking the size of government. In the functions that are privatized, they argue, the profit-seeking behavior of new, private sector managers will undoubtedly lead to cost cutting & a major fear is to increase the level of unemployment.

On the other hand, widespread privatization contend that private ownership does not necessarily translate into improved efficiency. More important, they argue, private sector managers may have no compunction about adopting profit-making strategies or corporate practices that make essential services unaffordable or unavailable to large segments of the population.

In my opinion, competition is the first factor to help privatization; a second factor is linking the compensation of private managers directly to their achievement of mutually recognized goals that represent the public interest, and for this to occur the government must define the public interest in such a way that private providers can understand it and contract for it. Goals and performance measures are critical elements in making privatization work: the failure to hold private managers to agreed-on results can be very costly.

After the Egyptian government obtained a loan from the International Monetary Fund (IMF) worth $12 billion, it had to follow the reform measures set in the plan developed by the IMF, starting by liberalizing the foreign exchange rate (Devaluation of the Egyptian pound against the US dollar), then gradually eliminating the subsidy for energy prices (Oil, Gas & Electricity), to finally reaching the stage of privatization of partial ownership through selling certain ratios of the public companies owned by the government " between 15% to 30% of the ownership of these companies" on the stock exchange - so not losing control upon these companies.

As the oil sector comes at the forefront of different sectors of Egypt in terms of strength and profitability, and as EGPC owns ownership interests in all companies at varying rates "up to full ownership in the public sector companies and varying shares in the investment sector companies", the decision makers decided to begin with the 11 best companies in terms of asset strength and profitability: Abu Qir Fertilizers and Chemicals Industries Company, Phosphate Industries Valley and Fertilizers Company, Assiut Oil Refinery Company, MIDOR, Egyptian Styrenics Company, Egyptian Drilling Company, SIDPEC, ETHIDCO, ELAB, ENNPI & AMOC.

Despite how impressive privatization announcements may look, a significant issue is not simply whether ownership is private or public. Rather, the key question is under what conditions will managers be more likely to act in the public's interest and whether the Egyptian petroleum sector is ready for privatization or we are just following the IMF Economic reform measures.

Mohamed El Haythem, MPhil, DBA, MBA, PMP
Gen. Manager, Foreign Companies' Control at EGPC

WORLD SHALE GAS AND EGYPT POTENTIAL

The first commercial gas well in the US, drilled in New York state in 1821, many years before the drilling of the first oil well, was actually a shale gas well, and thus produced limited amounts of gas from the shallow fractured shale. Although the existence of shale gas reserves around the world has been known for many years, most of these rocks were not considered potential sources of commercial quantities of natural gas.

According to geologists, there are more than 688 sediments in 142 repositories around the world. Currently, the production potential is limited to only a few dozen, mostly in North America. This means that natural gas can be produced from hundreds of structures around the world. Potential quantities are huge, which is likely to change the natural gas market map, especially in the US, Europe and the global LNG market.

According to information, the largest opportunities for future production of shale gas are available in China, Argentina, Mexico, Algeria and Australia. Geological information indicates that there are promising areas in Poland, France and Britain. It is assumed that shale gas deposits are also found in the Middle East, particularly in Saudi Arabia and Egypt.

The most reliable studies confirm that the volume of shale gas resources is estimated at 7795 trillion cubic feet, or 222.7 trillion cubic meters, compared with 187 trillion cubic meters of conventional gas. It is assumed that about 40% of these reserves will be economically feasible. The top 10 countries with significant potential of shale gas are China, Argentina, Algeria, USA, Canada, Mexico, Australia, Russia and Brazil. Estimated reserves of shale gas are either economically recoverable resources or attractive rock formations, which are large reserves, when compared with proven reserves of conventional natural gas.

The exploitation of shale gas: advantages and disadvantages

1. **Advantages of shale gas**

- adds significant quantities of natural gas to global resource reserves
- shorter time required for the first production process than conventional gas
- cleaner energy source
- development of new drilling techniques around the world
- improving the economic resources of gas-importing countries.

2. **Disadvantages of shale gas**

- higher cost of production compared to conventional gas
- doubts about environmental problems caused by unconventional production techniques
- decline in production is not clear, which may significantly affect estimates of recoverable reserves.

HASSAN SALEM
EGPC Reservoir Engineering General Manager

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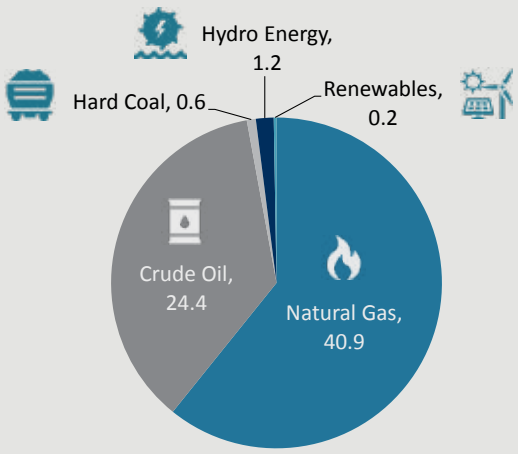
Economic Snapshot: Egypt's Energy Mix

Egypt's Energy Consumption Mix

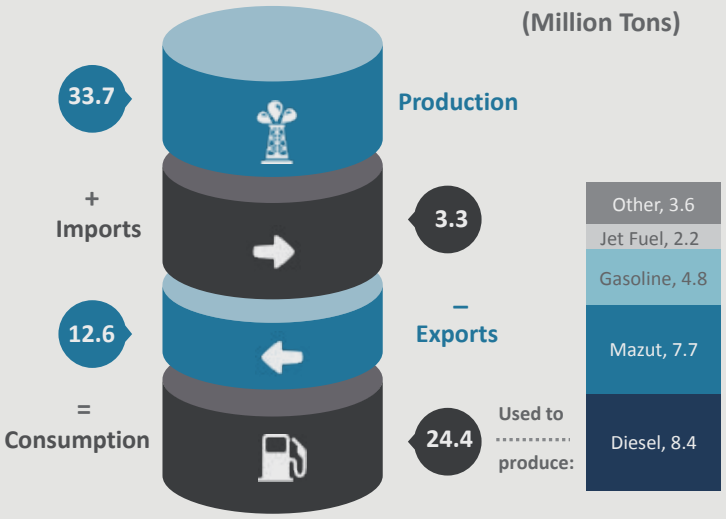
Primary Energy Consumption Mix in FY 2015/16
(Million Tons of Oil Equivalent)



Source: CAPMAS' Energy Balance.

Crude Oil

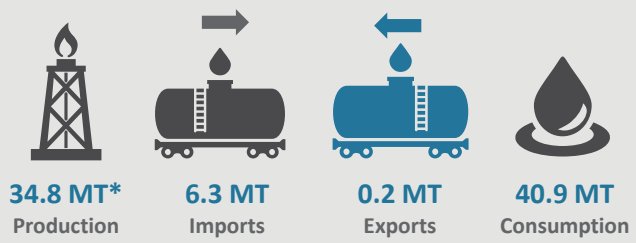
Crude Oil Balance in FY 2015/16
(Million Tons)



Source: CAPMAS' Energy Balance.

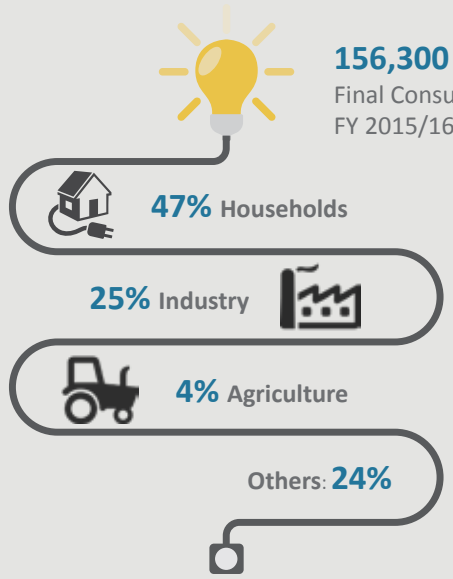
Natural Gas

Natural Gas Balance in FY 2015/16
(Million Tons of Oil Equivalent)



Source: CAPMAS' Energy Balance.

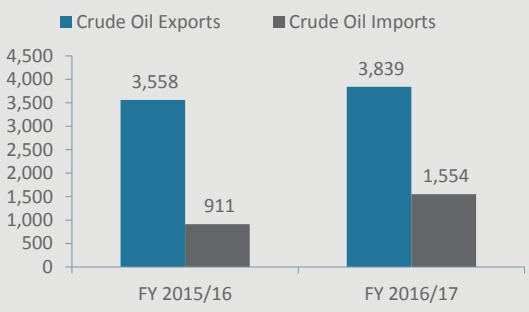
Electrical Energy



Source: CAPMAS' Energy Balance.

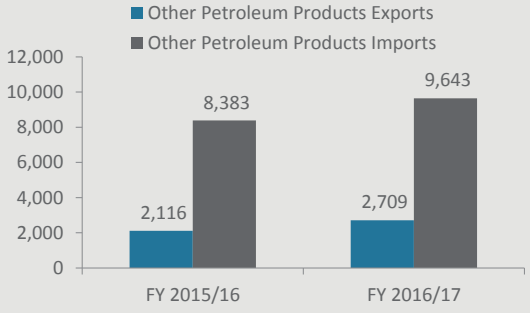
Exports & Imports

Crude Oil Trade (USD mn)



Source: Central Bank of Egypt (CBE).

Other Petroleum Products* Trade (USD mn)



Source: Central Bank of Egypt (CBE).

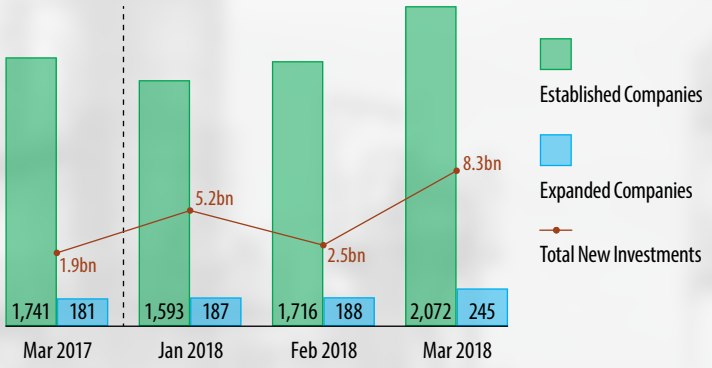
Egypt's Rank in Global Growth Projections Report 2018

1st In the Middle East

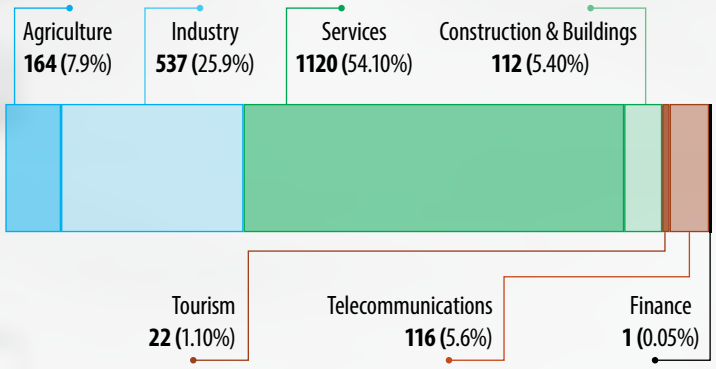
2nd In Africa after Uganda

3rd Fastest growing economy globally in the coming decade after India and Uganda

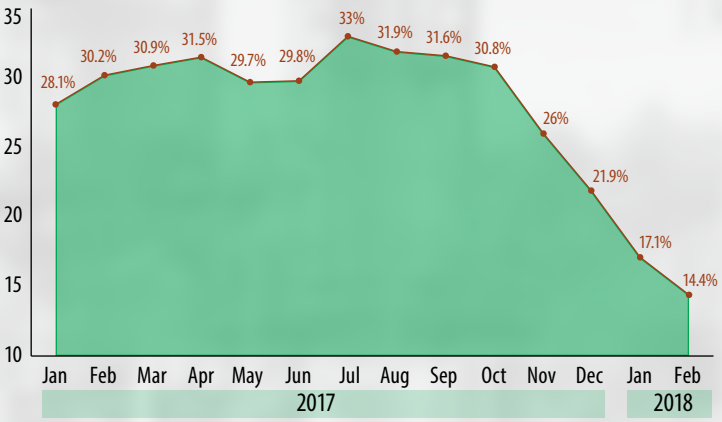
Established & Expanded Egyptian Companies in Q1 of 2018



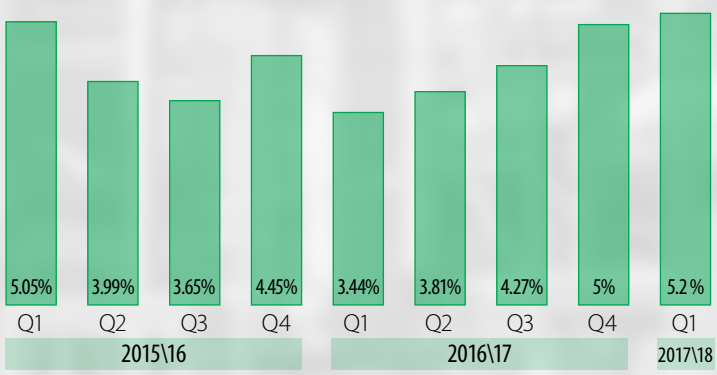
Egypt's Established Companies by Sector in Mar 2018



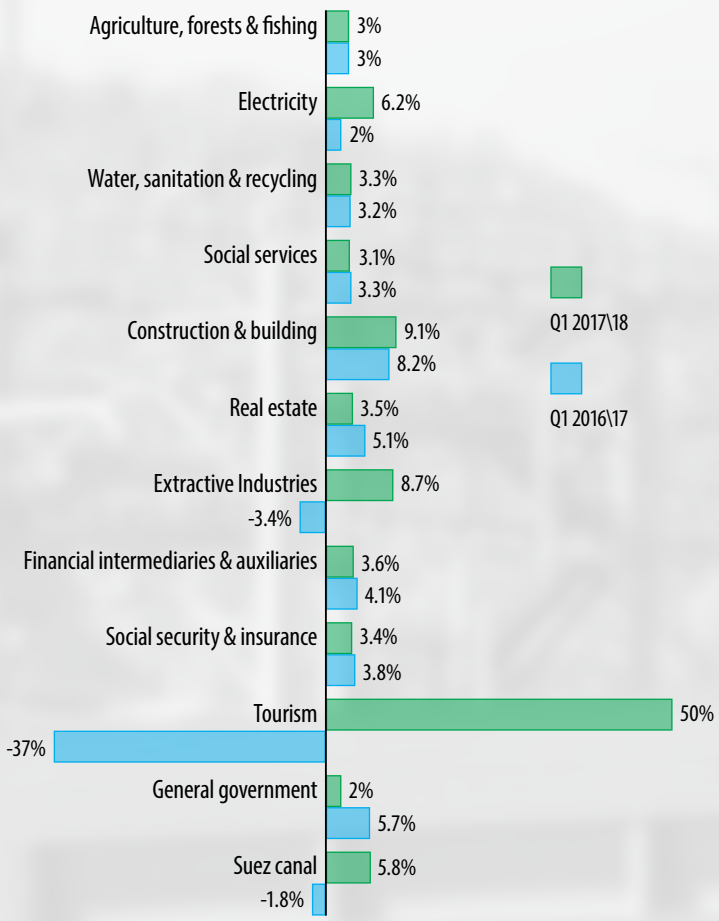
Egypt's Annual Headline Inflation (%)



Egypt's Annual Economic Growth Rate (%)



Sectoral Performance (Annual Growth Rate %) Q1 2017\18



RESEARCH BY HAGER MAGDY

Source of Raw Data: Central Bank of Egypt, Ministry Of Finance, CAPMAS, Ministry of Planning, Center for International Development (CID) at Harvard University, IMF

RIGS PER SPECIFICATION

Date	Land-Drilling	Land Workover	Jack-Up	Semi Submersible	Fixed Platform	Standby/ Stacking	Drillship	Total
Sep-17	39	40	10	1	0	56	2	149
Oct-17	41	43	10	1	1	50	2	148
Nov-17	41	45	10	1	1	49	2	149
Dec-17	41	47	11	1	1	46	2	149
Jan-18	46	46	11	1	0	43	2	149
Feb-18	46	48	11	1	1	0	2	109
Mar-18	46	48	11	1	1	40	2	149
Apr-18	45	46	10	1	0	51	2	155

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
Oct-17	10	4	64	12	6	2	98
Nov-17	10	4	63	13	7	3	100
Dec-17	11	4	65	14	6	3	103
Jan-18	10	4	68	13	8	3	106
Feb-18	11	4	69	14	8	3	109
Mar-18	11	4	69	14	8	3	109
Apr-18	9	4	69	13	5	4	104

PRODUCTION APRIL 2018

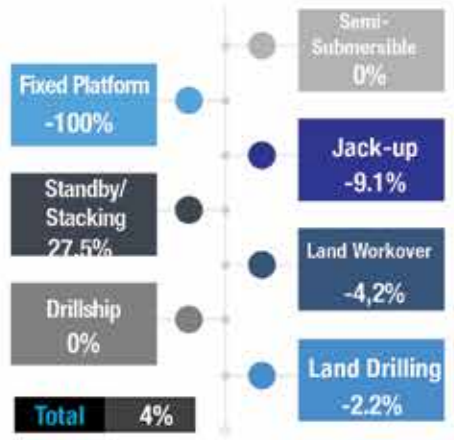
	Crude Oil	Equivalent Gas	Sold Gas	Condensate
Mediterranean Sea	0,016,000	14,023,105	78,529	883,700
Eastern Desert	1,866,000	0	0	0
Western Desert	9,477,000	7,015,160	39,285	1,192,909
Gulf of Suez	3,715,000	574,589	3,218	74,938
Delta	0,135,000	7,054,960	39,508	425,452
Sinai	1,395,000	554	3	14,580
Upper Egypt	0,005,000	0	0	0
Total	16,453,000 barrels	28,668,368 boe	160,543 million cubic feet	2,591,579 barrels

Unit: Barrel

*Crude total excludes Upper Egypt production

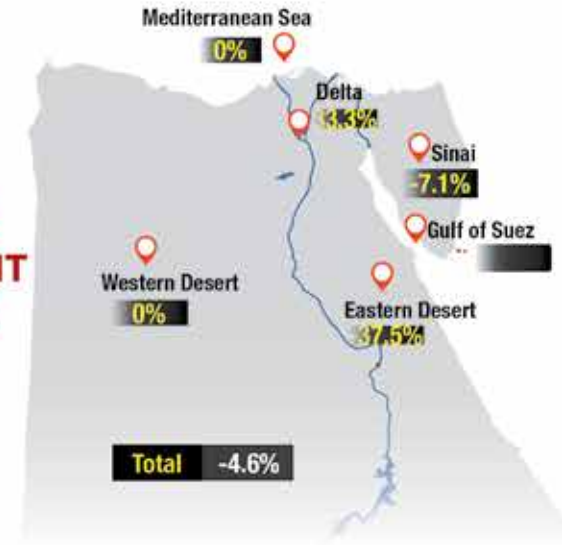
M.O.M CHANGE IN RIG COUNT PER SPECIFICATION

MoM calculations are for Jan & Feb figures.

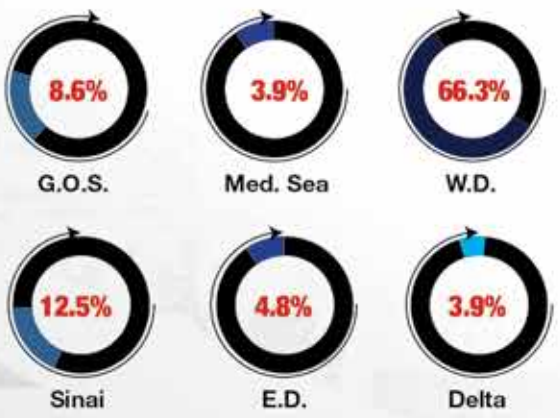


M.O.M CHANGE IN RIG COUNT PER AREA

MoM calculations are for Jan & Feb figures.



DISTRIBUTION OF RIGS APRIL 2018



DRILLING UPDATES

Region	Company	Well	Well Type	Rig	Depth	Well Investments
Mediterranean sea	ABU QIR	N.A/Q PIII#6 ST	Development	AL QAHR1	14,709	15.450 M$
Delta	ELMANSURA	W.KHILALA-8 ST-1	Development	PDI-94	10,181	1.215 M$
	PETROBEL	NIDOCO NW-7	Development	EDC-59	13,560	5.700 M$
	SDX ENERGY	IBN YOUNIS-1X	EXP	EDC-17	9,085	3.340 M$
	WASCO	SAEN-9	Development	ST-2	7,907	2.385 M$
Eastern Desert	GPC	HNW-1X	EXP	ST-9	5,413	4.100 M$
	WEST BAKR	K-45	Development	EDC-66	5,833	1.100 M$
Western Desert	PETROSILAH	SILA H-25	Development	IPR-1	7,550	1.700 M$
	PETROSILAH	N.SILAH D1-5	Development	ECDC-1	8,844	1.400 M$
	QARUN	ZAINA-7	Development	EDC-65	7,550	882,050 $

*DRILLING for April 2018.

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